



MINISTRY OF DEFENCE

# Driving the Successful Delivery of Major Defence Projects: Effective Project Control is a Key Factor in Successful Projects

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL | HC 30 Session 2005-2006 | 20 May 2005

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**MINISTRY OF DEFENCE**

Driving the Successful Delivery of Major  
Defence Projects: Effective Project Control  
is a Key Factor in Successful Projects

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**7 April 2005**

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## SUMMARY



**1** For the last 20 years the annual Major Projects Report has highlighted the variable performance of the Ministry of Defence's (the Department's) highest value defence equipment procurement projects, many of which have suffered cost overruns and delays.<sup>1</sup> This performance has been a matter of concern for both the Department and Parliament, and the Department has introduced a large number of reforms designed to improve project performance. To help understand why sustained improvements in performance are proving so difficult for the Department and its industry partners to deliver, we analysed the complex cultural and systemic drivers which need to be managed if military capability is to be delivered faster, cheaper and better. The initial results of this work were published in March 2004.<sup>2</sup>

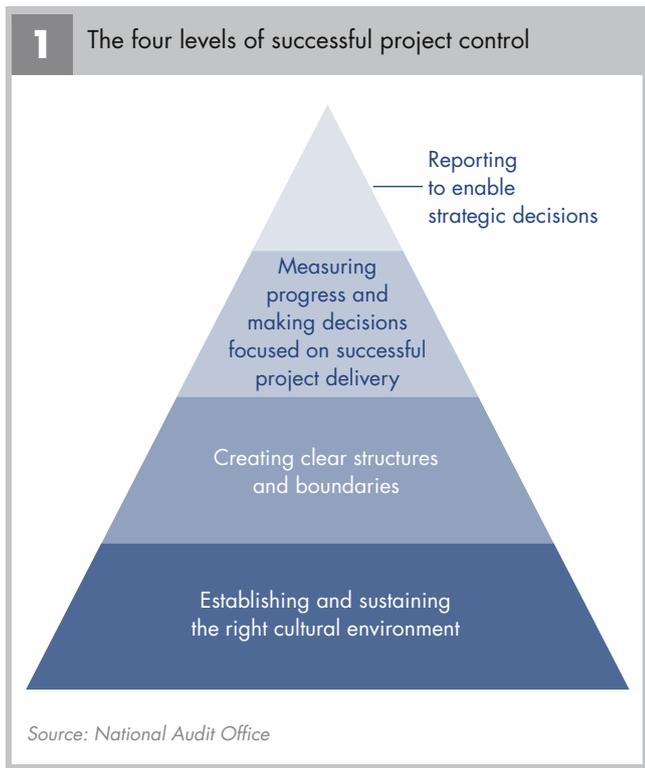
**2** Working with the Department, we are undertaking a series of studies examining some of the drivers identified by our initial modelling in more detail. Each study will examine practical evidence of how well a specific driver is being managed in the defence environment and explore how that driver is addressed by overseas and commercial comparators. Each study will compare current defence performance to a theoretical "gold standard" developed from this comparator work, against which no individual organisation is likely to perform consistently well in all areas. The recommendations in this and subsequent reports are intended to bring improvements in defence acquisition performance to help ensure all defence projects routinely adopt practices closer to our gold standard.

**3** This report, the first in the series, examines the effectiveness of project control on defence projects. For the purpose of our analysis we have defined project control as including how progress is tracked and decisions made on projects to ensure successful delivery, and the structures and processes which need to be put in place to underpin these activities. We chose project control as the first area for examination because it is a critical linking factor between a number of the key drivers of successful acquisition identified by our earlier work including management information, governance and assurance, risk and cost estimating, and ultimately budgeting and funding. The methodology for the study is described in Appendix 1 and more details about our case studies are given in Appendix 2.

**4** Drawing on the evidence from our comparators and the best defence projects, we have developed gold standard good practice criteria for project control within four main levels. The report is structured around these four levels, which are illustrated as a pyramid in **Figure 1** and presented in full in **Figure 2**. All four levels of the project control pyramid must function as a coherent whole if projects are to progress towards successful conclusions. Traditionally much activity has been focused on the top three, more quantifiable and scientific, levels of the pyramid. However, the strongest message emerging from our analysis is that it is the "softer" factors about building and sustaining relationships (the bottom level of the pyramid) upon which success is predicated. Without this strong foundation even projects which apply all of the right project management processes are unlikely to succeed.

<sup>1</sup> Report by the Comptroller and Auditor General on the Major Projects Report 2004, HC 1159-1, Session 2003-2004, 10 November 2004.

<sup>2</sup> Driving successful delivery of major defence projects: drawing on wider practice in tracking the progress of major projects. A Briefing and Consultation Document by the National Audit Office, March 2004.



**5** Overall, we found that some defence projects compare favourably with our gold standard with a number at the very forefront of good project control. However, there is a wide variety of performance against the gold standard across projects. The challenge for the Department and its industry partners will be to learn from its own good experiences and the success of others to help consistently deliver more successful project outcomes on all projects. Recognising this challenge, we are making the outcomes of this study available in two main formats. This report focuses on recommendations to help ensure all defence projects routinely adopt practices closer to our gold standard. The evidence included in the report is not exhaustive but provides an indication of current practices and the beneficial effects on projects where the changes we recommend have been applied. Given the richness of the evidence we have gathered, we are publishing it all on a website ([www.naodefencevm.org](http://www.naodefencevm.org)) to enable those interested to explore the evidence underpinning our recommendations in more detail and to better understand the gold standard criteria we have developed.



## 2 Our gold standard for effective project control

### Establishing and sustaining the right cultural environment

#### Good practice sub-criteria

Open, trusting and honest relationships between client, prime contractor and supply chain

#### Enablers

Explicit “no surprises/no blame” culture (defined as not penalising staff for bringing potential problems to light early) between all parties.

Regular and timely discussion of all matters that affect the project with no no-go areas.

Mutual benefits through shared ownership of end product or outcome between all parties.

Clarity of purpose and common understanding at all levels throughout all organisations.

Agreements between the parties to undertake a project as a partnership or alliance.

Measurement of client-contractor relationships

Regular independent assessments of client-contractor relationships as these develop during a project.

Supportive and open corporate environment

Explicit no surprises/no blame culture (defined as not penalising staff for bringing potential problems to light early) on the project and within the wider project-organisation.

Clear information requirements with clear purpose.

Clear boundaries of authority and action.

Clear link between corporate and project governance.

#### Creating clear structures and boundaries

Efficient organisational structures, responsibilities and lines of authority

Management boards, frequency and purpose of meetings, project controls and performance measures all agreed at the start.

Clear delegated authorities and decision-making/escalation criteria.

Flexible approach demonstrated by both client and contractors.

Project management, commercial, financial and technical skills available

Projects can select staff.

Organisation has a career development and skills training structure in place that covers each area of expertise.

Tenure in post for a large proportion of a phase and over key events.

Thorough review and understanding of project delivery plan, objectives, assumptions, risks and opportunities

Explicit review and agreement of work packages, costs, specification, risks and opportunities prior to contract signature and setting of performance, time and cost boundaries.

All stakeholders clearly informed and engaged in establishing structural foundations and boundaries.

Subject matter experts used in drawing up cost and risk models.

Set performance, time and cost boundaries when all risks are understood/formal investment approval gates

Performance, time and cost boundaries based on clear understanding of risks and grounded in realism.

Performance, time and cost boundaries and delivery plan independently reviewed before submission to investment board.

Clear information and evidence requirements for business case.

## 2 Our gold standard for effective project control *(continued)*

### Creating clear structures and boundaries *(continued)*

#### Good practice sub-criteria

#### Enablers

Ability to make trade-offs/change management mechanism

Mechanisms in place (such as working groups) for making informed trade offs between time, performance and cost as project progresses and delegated authority to do so.

All stakeholders clearly informed and in agreement.

Mechanism to apply lessons learned as project progresses.

### Measuring progress and making decisions focused on successful project delivery

Analysis of credible, timely and relevant metrics monitoring progress against the performance, time and cost baseline

Forward-looking analysis of information from techniques (such as Earned Value Management, milestones, planning/scheduling or risk management) and metrics (such as costs or in-service availability measures).

Verification/validation of data.

Arrangements for transparency and accuracy

Shared Data Environment or clear method for sharing documentation between all stakeholders.

Co-location of client and contractor teams/staff.

Arrangements for access to contractor/client's data.

Use of IT where practical (common software, email connection).

Contract as key component of project control

Recognition of contract as control tool during negotiation.

Commercial staff reside with project.

Contract is realistic, mutually beneficial and reflects ownership of risk.

Project-to-project peer reviews and Learning From Experience

Formal and informal mechanisms for exchange of ideas, problem-solving and sharing experience between projects for benefit of project staff.

Formal capture of lessons learned.

### Reporting to enable strategic decisions

Consistent reporting system for all projects feeding into analysis for senior management

Reporting system based on principle of "generate once, use many times".

Clear purpose for reporting system (whether that is to track delivery, track against corporate targets or for forward planning).

Analysis of reports by dedicated staff.

Formalised, regular system of senior management review to give assurance of delivery

Clear information requirement, format and purpose for regular reviews.

Feedback mechanism.

Independent, non-advocate reviews

Clear purpose for independent input (advice for project staff or assurance for senior managers, or both).

Avoidance of duplication and over-burdening project staff.

Benefits are clear - not viewed as a hurdle to overcome.

Ongoing measurement of supplier performance to learn lessons

Collection of data and maintenance of historical database.

Senior level contact with contractors.

Analysis of trends and issues.

Contractors are clear as to confidentiality and use of data on their performance.

## PART ONE

### Establishing and sustaining the right cultural environment



**1.1** Successful working relationships are characterised by soft factors such as team working, trust and honesty. When the Department and its industry partners on a project display these behaviours they are more likely to develop a common understanding of the task, the progress being made and give early warning of problems. When a project operates in a supportive and open corporate environment the other parts of the project's own organisation, such as senior management, are more likely to have timely and accurate information about the status of the project to enable them to make sensible decisions.

**1.2** **Figure 3** summarises the key success factors we have identified to establish and sustain the right cultural environment on projects.<sup>3</sup> Many of our external comparators stressed the importance of open, positive relationships between project stakeholders because these enable open communication to take place about the progress being made and help develop solutions to problems that arise. They prioritised good working relationships highly and often put shared incentives in place to encourage constructive relationships. Overall, the Department:

- has strong examples of good practice in gaining shared ownership with industry partners with indications of more widespread good practice developing;
- can point to a few cases where projects specifically measure the strength of the client-contractor relationship, but application of the techniques is not widespread; and
- has some pockets of good practice in fostering an open environment although there is substantial scope for improvement in this area.

**1.3** **Figures 4 to 8** provide examples of the evidence upon which our conclusions are based. Full details of all of the evidence are available on our website [www.naodefencevmf.org](http://www.naodefencevmf.org).

**1.4** **Figure 9** presents our recommendations to help ensure all defence projects routinely adopt practices closer to the gold standard.

### 3 Our gold standard for establishing and sustaining the right cultural environment

#### Good practice sub-criteria

Open, trusting and honest relationships between client, prime contractor and supply chain

Measurement of client-contractor relationships

Supportive and open corporate environment

#### Enablers

Explicit no surprises/no blame culture (defined as not penalising staff for bringing potential problems to light early) between all parties.

Regular and timely discussion of all matters that affect the project with no no-go areas.

Mutual benefits through shared ownership of end product or outcome between all parties.

Clarity of purpose and common understanding at all levels throughout all organisations.

Agreements between the parties to undertake a project as a partnership or alliance.

Regular independent assessments of client-contractor relationships as these develop during a project.

Explicit no surprises/no blame culture (defined as not penalising staff for bringing potential problems to light early) on the project and within the wider project-organisation.

Clear information requirements with clear purpose.

Clear boundaries of authority and action.

Clear link between corporate and project governance.

Source: National Audit Office

<sup>3</sup> By cultural environment, we mean the values, beliefs, traditions and attitudes of the project team members and stakeholders. This includes the general attitude towards projects within the business or organisation as most projects do not operate in isolation.

**4** How the Department compares in developing open, trusting and honest client-contractor relationships

There are strong examples of good practice with the Department achieving shared ownership with industry partners and further indications of more widespread good practice.

**Examples of the Department’s Current Approaches**

The Watchkeeper, Trojan and Titan and Future Infantry Soldier Technology projects all structured their projects to achieve mutual benefits with their contractors.

The Special Projects CISR and the Joint Casualty Treatment Ship projects emphasised the importance of trust and openness with their contractors.

Interviewees recognised the benefits of being open and honest with contractors. Interviewees also recognised that the Department still needs, in some cases, to make a cultural change away from being adversarial with industry.

71 per cent of Departmental project teams had informal day-to-day contact with their suppliers, which is indicative of open relationships. See Figure 5.

Departmental project teams consistently viewed commonality of use with contractor as an advantage of tracking methods in our survey, which is also indicative of openness. See Figure 20 for each tracking method.

**Examples of Comparator Organisations’ Approaches**

The Swedish Defence Materiel Administration and its industry partner Saab Aerospace attributed the successful delivery of the Gripen aircraft partly to trust, teamworking and a sense of common purpose.

BP’s Clair project team worked on the basis of eye to eye understanding with their contractors.

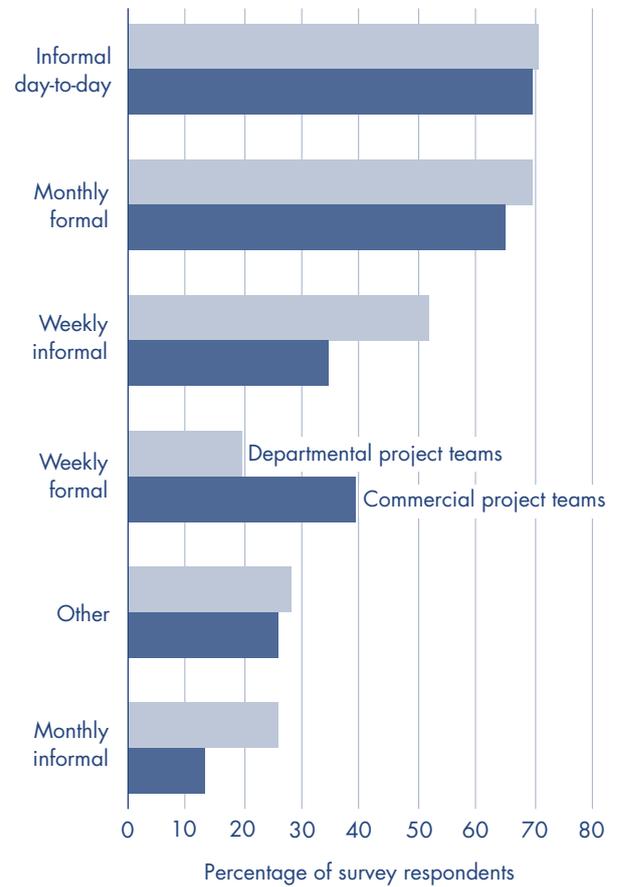
Bechtel worked with sub-contractors on the basis of discrete targets with fixed dates based on financial incentives to meet them.

Mace put in place Key Project Performance Indicators throughout the supply chain to give all parties a common focus on success.

BP’s Angola project considered familiarity with contractors’ schedules to be crucial to understanding different company cultures.

**5** Departmental and commercial project teams had similar frequencies of contact with suppliers

Frequency of contact



Source: National Audit Office

## 6 How the Department compares in measuring its client-contractor relationships

There are a few cases where defence projects specifically measure the strength of the client-contractor relationship, but application of the techniques is not widespread.

### Examples of the Department's Current Approaches

The partners on the *HMS Illustrious* Refit project measured their relationship using a Collaboration Assessment Tool. The Tool was split into six areas (culture, communication, management, processes, opportunities and performance measurement) and was used as the basis for facilitated discussions. The key benefit was continuous improvement of a previously adversarial relationship.

The Watchkeeper project used the Supply Chain Relationships in Action code of practice to promote better team working with the contractor.<sup>4</sup>

### Examples of Comparator Organisations' Approaches

Within the wider context of alliancing or partnering, AMEC emphasised the benefits of investing early in joint training to develop cultural and soft issues together with the value of dedicated third party facilitation.

BP's Clair project held quarterly performance reviews as group sessions with all Clair major contractors present. These events were spread over two days, enabling both formal and informal exchange.

## 7 How the Department compares in fostering a supportive and open corporate environment

The Department has some pockets of good practice but there is substantial scope for improvement in developing a supportive and open corporate environment.

### Examples of the Department's Current Approaches

Several case studies explicitly took actions to reinforce a no-blame culture within their teams. For example, on the Trojan and Titan project there was a monthly Thursday meeting, which was an open forum for airing views and for all team members to understand how the project is progressing and look to the future.

Interviewees noted that early warning of problems on projects is dependent on staff having confidence that the organisation will react constructively to the reporting of bad news.

The different organisations in the Department were described by a senior interviewee as a collection of tribes with the elements not acting collectively.

Departmental project teams viewed slow decision-making as a barrier to timely and effective action. See Figure 8.

### Examples of Comparator Organisations' Approaches

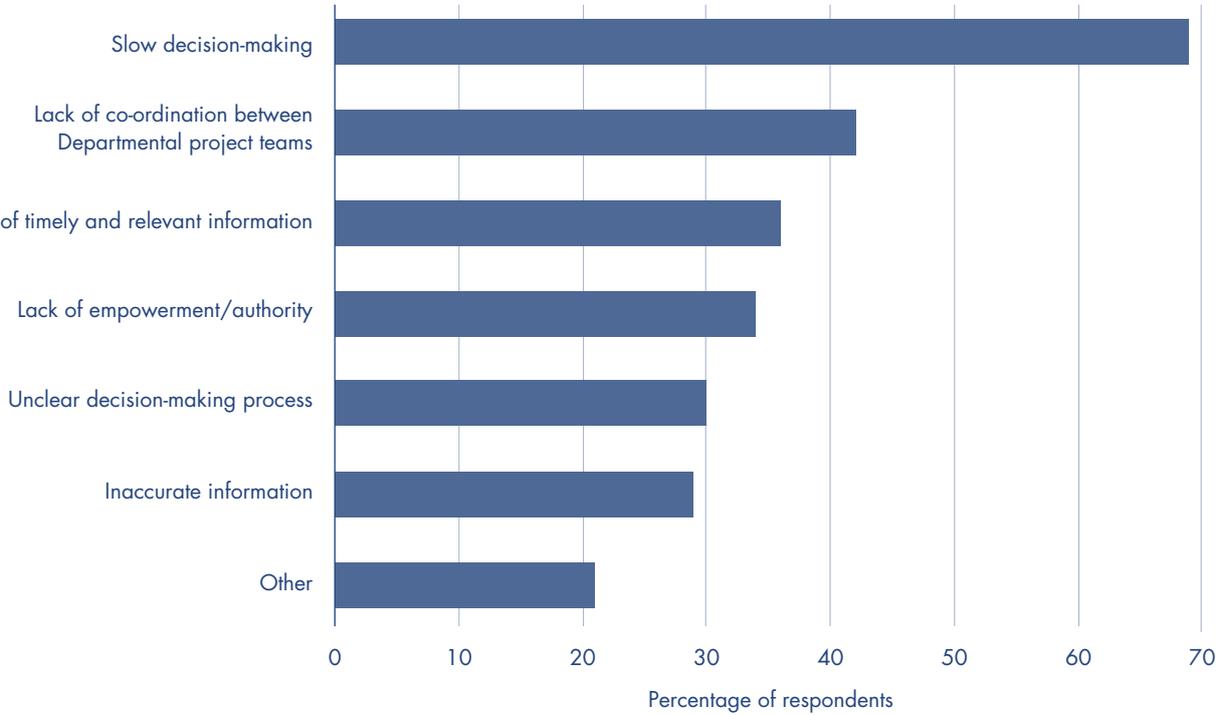
BP's Angola project fostered a no surprises approach which meant managers did not throw the book at anyone reporting bad news.

Eli Lilly recognised the cultural tension between the vested interests of individual projects and the wider business perspective. Eli Lilly sought to overcome this tension by ensuring full visibility of common project data across the organisation.

4 For more details on Supply Chain Relationships in Action see [www.bestpracticecentre.com](http://www.bestpracticecentre.com)

**8** The majority of Departmental project teams in our survey experienced slow decision-making as a barrier to timely and effective action

Barriers to timely and effective action



Source: National Audit Office

**9** Recommendations to establish the right cultural environment

**Recommendation**

That the Department and industry use project charters at the start of projects to establish common goals and behaviours.

That the Department and industry regularly measure and develop client-contractor relationships on individual projects.

Through their actions, the Department’s senior management continues to foster a corporate culture of transparency based on no surprises/no blame (defined as not penalising staff for bringing potential problems to light early).

**Good Practice Example**

The *HMS Illustrious* Refit project was managed in a three-way partnership between the Department, contractor Babcock BES and the ships’ staff based on a partnering charter setting out the partners’ mission, conduct and objectives. The partnership resulted in savings shared between the partners, enabled the delivery of further modifications such as an internet café on the ship and savings of £1 million for the Department.

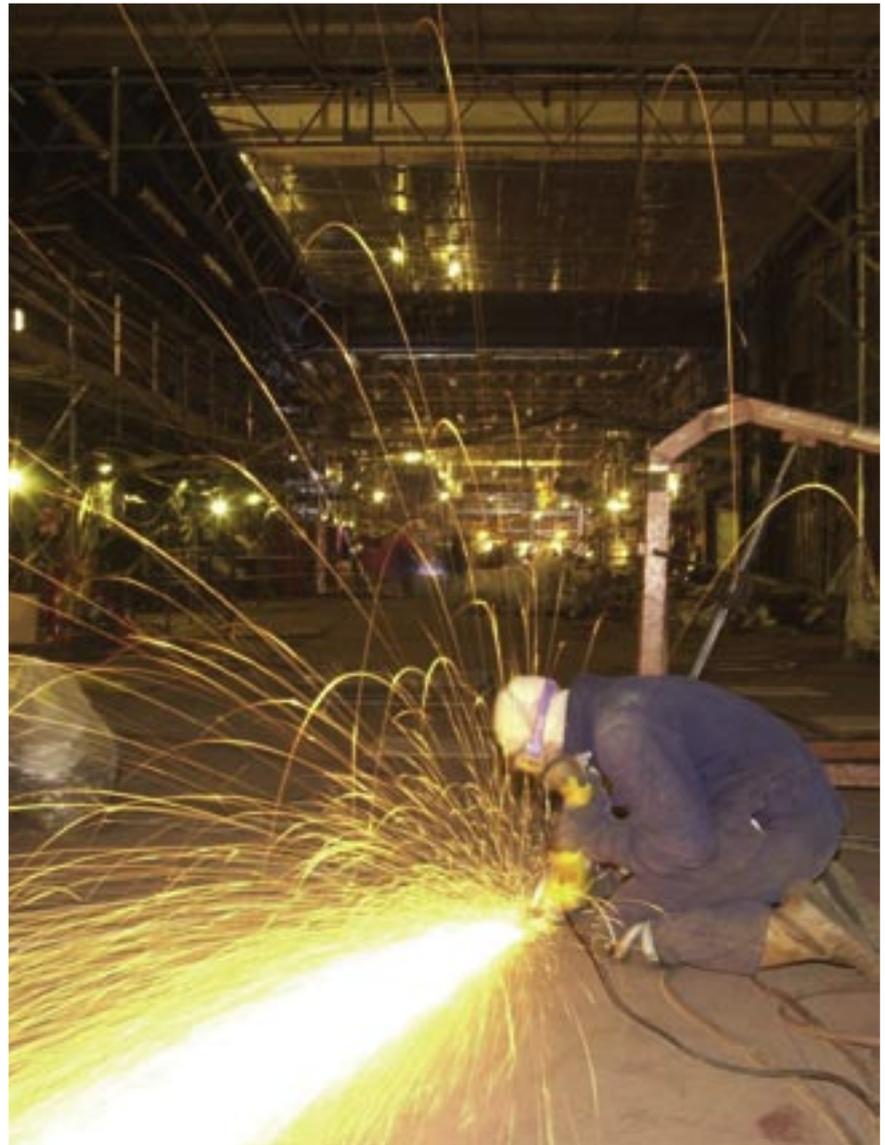
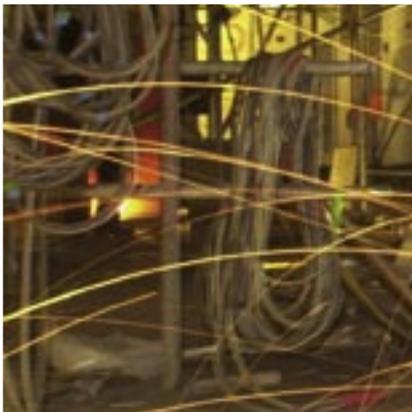
On the Future Infantry Solider Technology project, the Department and its main industry partners regularly assessed the strengths and weaknesses of the relationship. The results not only enabled them to work together to continuously build stronger relationships but also served as a second check on the formal project controls process.

Personnel at Ericsson were encouraged to identify, report and take action to resolve problems quickly supported by a positive management culture.



## PART TWO

### Creating clear structures and boundaries



**2.1** The organisational and managerial structures of a project are the practical arrangements which underpin its successful progress. These arrangements maximise efficiency by ensuring that the right people come together at the right time. They build on the cultural foundation described in Part 1. The boundaries of a project are the objectives, the time, cost and performance targets that the project has to deliver against and the plan for achieving them. The boundaries must be realistic and accepted by all stakeholders at the start of the project but, as with the project's structures, must be flexible enough to evolve given that the circumstances to which the project is responding will inevitably change during its life.

**2.2** **Figure 10** summarises the key success factors we have identified that support the establishment of clear structures and organisational boundaries on projects. Many of our comparators emphasised the importance of establishing simple, practical arrangements for organising projects that were well understood. They also sought to put in place realistic boundaries for projects to deliver against.

**2.3** Overall, the Department:

- has good examples of projects establishing appropriate organisational structures. In addition, the Department operates a system based on delegated authority and empowerment with strong functional oversight, which compares well with other organisations. However, there is a lack of clarity about how the revised arrangements for project team leader accountability to both the Chief of Defence Procurement and Chief of Defence Logistics will work in practice;
- needs to do more to reach parity with other organisations in developing project management, commercial, financial and technical skills;
- can point to several examples of good practice in working jointly with industry to review and understand project delivery plans, objectives, assumptions, risks and opportunities;
- has a track record on understanding risks when setting performance, time and cost boundaries that does not compare well. The Department has recognised the issue and is taking steps to remedy it; and
- has some examples of good practice in making trade-offs but can do more to make the process work consistently and efficiently.

**2.4** **Figures 11 to 16** provide examples of the evidence upon which our conclusions are based. Full details of all of the evidence are available on our website [www.naodefencevm.org](http://www.naodefencevm.org).

**2.5** **Figure 17** presents our recommendations to help ensure all defence projects routinely adopt practices closer to the gold standard.

**10** Our gold standard for establishing clear structural foundations and boundaries through which to manage the project

**Good practice sub-criteria**

Efficient organisational structures, responsibilities and lines of authority

Project management, commercial, financial and technical skills available

Thorough review and understanding of project delivery plan, objectives, assumptions, risks and opportunities

Set performance, time and cost boundaries when all risks are understood/formal investment approval gates

Ability to make trade offs/change management mechanism

**Enablers**

Management boards, frequency and purpose of meetings, project controls and performance measures all agreed at the start.

Clear delegated authorities and decision-making/escalation criteria.

Flexible approach demonstrated by both client and contractors.

Projects can select staff.

Organisation has a career development and skills training structure in place that covers each area of expertise.

Tenure in post for a large proportion of a phase and over key events.

Explicit review and agreement of work packages, costs, specification, risks and opportunities prior to contract signature and setting of performance, time and cost boundaries.

All stakeholders clearly informed and engaged in establishing structural foundations and boundaries.

Subject matter experts used in drawing up cost and risk models.

Performance, time and cost boundaries based on clear understanding of risks and grounded in realism.

Performance, time and cost boundaries and delivery plan independently reviewed before submission to investment board.

Clear information and evidence requirements for business case.

Mechanisms in place (such as working groups) for making informed trade-offs between time, performance and cost as project progresses and delegated authority to do so.

All stakeholders clearly informed and in agreement.

Mechanism to apply lessons learned as project progresses.

Source: National Audit Office

## 11 How the Department compares in having efficient organisational structures, clear responsibilities and lines of authority

The Department has examples of good practice in organising projects.

### Examples of the Department's Current Approaches

Departmental project teams are free to choose their own arrangements for managing and monitoring progress.

On the *HMS Illustrious* Refit project there was a simple organisational structure based around the four main areas of the refit with delegated financial authority to key team members and a regular meeting cycle.

The Special Projects CISR project team had a structure of four assistant team leaders to manage the 50+ projects in their area.

The Department operates a system based on empowerment with strong functional oversight, which compares well with other organisations. However, there is a lack of clarity about how the revised arrangements for project team leader accountability to both the Chief of Defence Procurement and Chief of Defence Logistics will work in practice.

### Examples of the Department's Current Approaches

The Defence Procurement Agency Stocktake, now "DPA Forward", revised the arrangements for delegated authority to project team leaders by implementing a joint package that comprised delegation from Chief Defence Procurement alongside delegation from Chief Defence Logistics.<sup>5</sup>

At the time of our survey, just under half of Departmental project teams considered themselves to be dual accountable to Chief Defence Procurement and Chief Defence Logistics. See Figure 12.

DPA Forward has also reinvigorated the functional assurance process in both the Defence Procurement Agency and Defence Logistics Organisation.<sup>6</sup>

34 per cent of the Department's project teams cited lack of empowerment/authority as a barrier to timely and effective action. See Figure 8.

Historically, project teams have had a high turnover of staff and have often lost large numbers of personnel during transition between the Defence Procurement Agency and the Defence Logistics Organisation.<sup>7</sup> Following the introduction of project teams based in one organisation throughout the procurement and in-services phases of a project, the Department is trying to address this issue.

### Examples of Comparator Organisations' Approaches

Before a project starts, Mace hold an Anchor Workshop with each client to work out the information requirements, management arrangements and to achieve clarity on project boundaries.

### Examples of Comparator Organisations' Approaches

At Bechtel, project managers are empowered and in post for duration of the project. They are subject to a formal bi-annual functional review process.

On BP's Angola project, cost, time and resource are managed by empowered sub-project managers. Project control is a responsibility of the whole team.

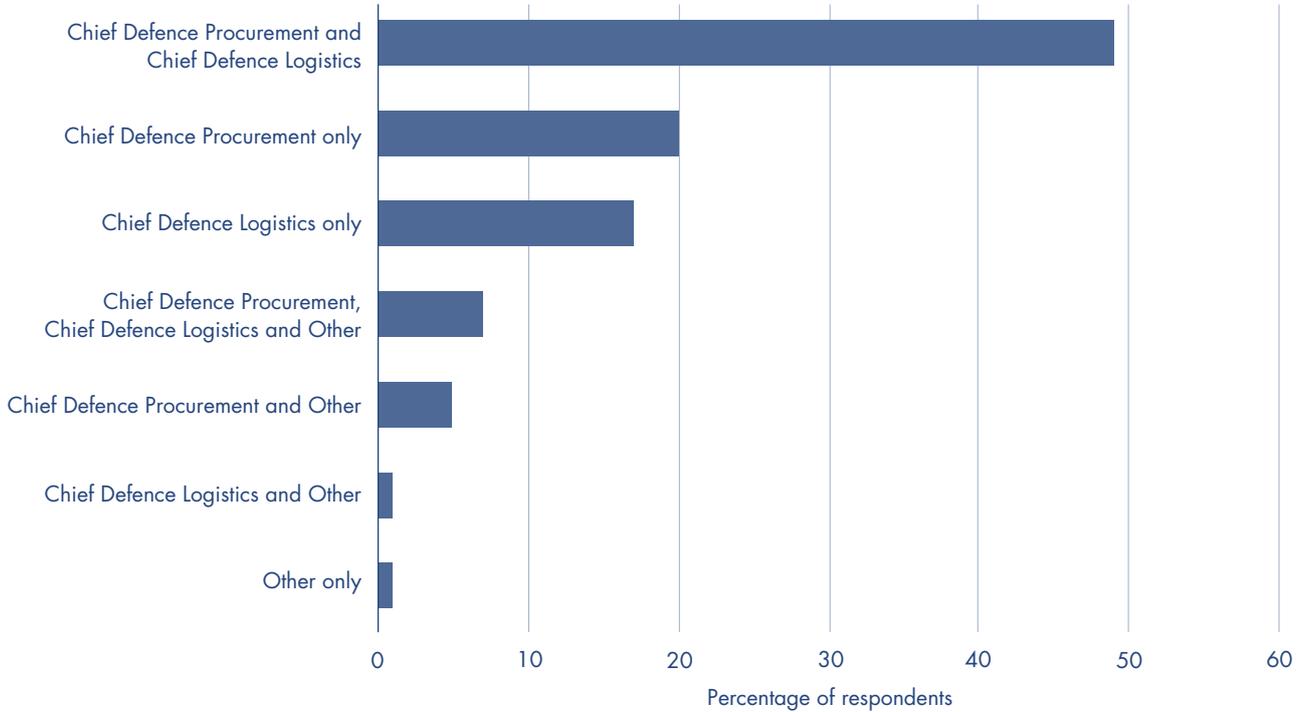
5 White Paper "A Stocktake of Smart Acquisition in the Defence Procurement Agency. The Agreed Way Forward" (January 2004). The issues identified in the Stocktake are being addressed in the change programme Defence Procurement Agency Forward, known as "DPA Forward".

6 Following the Stocktake, the Defence Procurement Agency reconstituted its Board to establish three Operations Directors and three Functional Directors. This new structure bolstered senior level project oversight and assurance and introduced improved clarity over the role of functional experts in Support Groups. The Stocktake also outlined areas for joint working between the Defence Procurement Agency and the Defence Logistics Organisation.

7 Report by the Comptroller and Auditor General on Through-Life Management, HC698, Session 2002-2003, 21 May 2003.

**12** In mid-2004, half of Departmental project teams considered themselves to be dual accountable to Chief Defence Procurement and Chief Defence Logistics<sup>8</sup>

Source of delegated authority



Source: National Audit Office

<sup>8</sup> At the time of our survey, the Department had released guidance and was in the process of issuing formal letters delegating authority to project team leaders. The graphic therefore illustrates project team perceptions of their accountabilities rather than the Department's formal delegations.

### 13 How the Department compares in making project management, commercial, financial and technical skills available

The Department needs to do more to reach parity with other organisations.

#### Examples of the Department's Current Approaches

The levels of skills available in the Department and industry emerged as an important success factor in our previous modelling work.<sup>9</sup>

Interviewees recognised that the Department needs world class project management skills and noted the shortage of skills in the Department and industry.

DPA Forward has recognised that the Defence Procurement Agency does not have a sufficiently detailed picture of the skills needed in the future, given the large number of complex projects for which they are responsible. As a consequence, work force planning is now being conducted, career development for project managers and other specialist streams developed, and the role of Head of Profession for Project Management strengthened.

#### Examples of Comparator Organisations' Approaches

In Australia, a comprehensive Programme Managers Certification Framework was being developed and was a central part of the reform of the Defence Materiel Organisation.

In the USA, there is a specific Programme Management Career Track at the Defence Acquisition University.

United States projects are supported by Integrated Product Teams that include representatives of all stakeholder organisations and functional subject matter experts. This ensures that appropriate expertise is brought to bear for example, to develop project strategies.

Bechtel has a Project Controls University and regard the Project Controls Manager as a key posting within teams.

In France, the Delegation Generale pour L'armement appoint specialists to project teams for specific purposes using a matrix organisational structure.

### 14 How the Department compares in thorough review and understanding of project delivery plan, objectives, assumptions, risks and opportunities

The Department has several examples of good practice in this area.

#### Examples of the Department's Current Approaches

The Watchkeeper project went "open book" during final preferred bidder stage which enabled open disclosure of costs to between the parties in developing the pricing and contract arrangement.

The Future Infantry Soldier Technology project conducted a Competitive Integrated Baseline Review as part of selecting the final bidder from the two remaining companies. Each company was given four months and a budget to complete a planning process and produce a delivery plan. The plans were independently assessed by the Defence Procurement Agency's Price Forecasting Group and MTC Consultants. The purpose and key benefit of the Review was to flush out all potential problems and vague planning assumptions.

#### Examples of Comparator Organisations' Approaches

An Integrated Baseline Review is mandated for every major United States defence project at the outset as part of their Earned Value Management approach. This involves examining contractors' plans, schedules and costs to achieve and agree a project baseline.

Mace hold an Anchor Workshop with clients before projects commence to achieve clarity on the project boundaries.

Following a competitive down-select on the United States Advanced Amphibious Armoured Vehicle programme, the Department of Defense and the contractor jointly reviewed the requirement and proposed solution to ensure a common understanding that the programme was achievable.

<sup>9</sup> Driving successful delivery of major defence projects: drawing on wider practice in tracking the progress of major projects. A Briefing and Consultation Document by the National Audit Office, March 2004.

## 15 How the Department compares in setting performance, time and cost boundaries when all risks are understood and use of formal investment approval gates

The Department's track record does not compare well, but it has recognised the issue and is taking steps to remedy it.

### Examples of the Department's Current Approaches

Interviewees referred to a conspiracy of optimism which works against establishment of realistic baselines that affects all parts of acquisition including industry.

Recent Major Projects Reports show that an average of five percent of total procurement cost is being spent during early project phases to fully understand and mitigate risks. Projects are going wrong soon after the main investment decision has been made.<sup>10</sup>

The recent Smarter Approvals initiative recognised the problems and a part of the DPA Forward programme is to spend more time and resource understanding and mitigating project risks prior to the main investment decision.

Interviewees referred to the tendency of the customer community to set time and cost boundaries for projects early on. There is then an unwillingness to change expectations as project understanding develops. Sometimes these early time and cost boundaries are announced publicly, which exacerbates the issue of unrealistic expectations.

The Joint Casualty Treatment Ship project was put through the early investment gate prematurely with the cost element of the project baseline set against cheapest of 240 options.

Whilst not specifically covered in our survey, in passing general comment 10 per cent of the Department's project teams pointed out that they saw the Investment Approvals process as slow and cumbersome.

The Department's budgeting and funding system emerged as the most important success factor of procurement performance in our previous modelling work.<sup>11</sup>

### Examples of Comparator Organisations' Approaches

BP's Clair Project underwent "front end loading" prior to the main investment decision to develop a sufficiently detailed scope and plan, with buy-in from all stakeholders, to minimise changes after project approval. Recommendations and supporting rationale were documented in a Decision Support Package of which the business case and financial appraisal were a key part.

In BP there were three gates before a project gets to the Capital Allocation Board (CAB), which is the main investment decision. Gates were designed to create choice and authority is delegated to Business Unit Leader until the CAB. The CAB Business Case is highly structured and undergoes assurance before submission.

Ericsson operated six Toll Gates which are the major decision points that decide if the project has reached its goals. The Toll Gate Checklist includes impact on business situation, use of resources and project status. Projects run through passages of milestones which are prerequisite for the Toll Gates. These milestones are important intermediate objectives that should be reached at certain, predefined points in the project flow. The project baseline is set at the third Toll Gate and checked six months later at the fourth.

At Eli Lilly, projects spent a number of years in early development phases prior to main investment decision. This was in order to gain a mature understanding of the medical benefits and risks prior to proceeding into large-scale clinical trials.

<sup>10</sup> Report by the Comptroller and Auditor General on the Major Projects Report 2004, HC 1159-1, Session 2003-2004, 10 November 2004.

<sup>11</sup> Driving successful delivery of major defence projects: drawing on wider practice in tracking the progress of major projects. A Briefing and Consultation Document by the National Audit Office, March 2004.

## 16 How the Department compares in making trade-offs and change management

The

### Examples of the Department's Current Approaches

The *HMS Illustrious* Refit partnership actively made trade-offs between time, cost and performance to achieve the in-service date.

On the Trojan and Titan project, a Joint Validation and Acceptance Team and working groups were established involving industry and the military customer. The trade-offs made meant the equipment will be delivered a year earlier than would otherwise have been the case.

Interviewees commented that the Requirements Manager role, which is key to a project's ability to make trade-offs, is not operating effectively due to the short tenure in post and lack of empowerment.

More support is being put in place for Requirements Managers, in the form of speakeasy sessions to provide opportunities for networking and sharing of experience. The Department is also developing improved guidance for requirements management.

The Equipment Capability Customer is exploring how better to enable Departmental project team leaders to trade time, cost and performance.

### Examples of Comparator Organisations' Approaches

On BP's Clair project, funding was fixed at the main investment decision. A Project Intervention Plan clearly set out how to deal with changes and was based on a culture of no surprises, no heavy involvement from senior management.

BP's Angola project used an explicit management of change system which was agreed at the outset.

Bechtel also used an explicit change management system.

Eli Lilly has an explicit change review mechanism to engage the portfolio management board if cost or timelines change.

## 17 Recommendations to help create clear structural foundations and boundaries through which to manage projects

### Recommendations

Widely adopt the principle of baseline review conducted jointly by the customer, project team and contractor to agree what is required and how to deliver it prior to main contract signature.

Departmental project teams should agree an explicit change management mechanism with customers and contractors at the outset of the project.

### Good Practice Example

Trojan and Titan went open book during the final preferred bidder stage which gave full visibility of contractor costs and the Departmental budget (where appropriate) to both parties. This enabled free and frank discussion to agree a realistic contract and the common objective to deliver the equipment on time.

The Joint Strike Fighter project, a United States-led collaborative programme with the United Kingdom as main partner, is based on Key Performance Parameters which are being actively traded until they are at maximum and minimum levels of performance. There is a management structure in place coordinating these trade-offs between the United States and the United Kingdom.

## PART THREE

Measuring progress and making decisions focused on successful project delivery



**3.1** Essentially, this criterion covers the regular flows of information and activities that enable decisions to be made to successfully deliver desired project outcomes. Activities and analytical techniques such as technical verification, Earned Value Management and risk management are commonly used across a number of industries. Successful projects use a combination of techniques, rather than rely on a single measure of progress, and always look to the future, rather than focusing on work already done. This objective, forward-looking approach to project management reduces the chances of problems being missed. Underpinning this approach are the arrangements for sharing data between the client and contractor.

**3.2** **Figure 18** summarises the key success factors we have identified which support the measurement of project progress and underpin decision-making focused on successful project delivery. Our comparators used the full range of techniques in ways that suited their aims and business objectives. Overall, the Department

- uses the same monitoring methods as the comparators, albeit to differing degrees. More specifically, the Department can use Earned Value Management techniques even more widely and is aware that, to match the commercial comparators, it can improve the use of cost data to track progress;

- compares well with other organisations in its arrangements to ensure the transparency and accuracy of project data;
- has examples of good practice in using contracts as a component of project control. We will be reporting in greater detail on the development of effective contracting practices in a report that will publish in early 2006; and
- uses informal project-to-project peer reviews to share experience and lessons learned between projects, although there is no formal system for this.

**2.6** **Figures 19 to 28** provide examples of the evidence upon which our conclusions are based. Full details of all of the evidence are available on our website [www.naodefencevfm.org](http://www.naodefencevfm.org).

**2.7** **Figure 29** presents our recommendations to help ensure all defence projects routinely adopt practices closer to the gold standard.

**18** Our gold standard for measuring progress and making decisions focused on successful project delivery

**Good practice sub-criteria**

Analysis of credible, timely and relevant metrics monitoring progress against the performance, time and cost baseline

Arrangements for transparency and accuracy

Contract as key component of project control

Project-to-project peer reviews and Learning From Experience

**Enablers**

Forward-looking analysis of information from techniques (such as Earned Value Management, milestones, planning/scheduling or risk management) and metrics (such as costs or in-service availability measures).

Verification/validation of data.

Shared Data Environment or clear method for sharing documentation between all stakeholders.

Co-location of client and contractor teams/staff.

Arrangements for access to contractor/client’s data.

Use of IT where practical (common software, email connection).

Recognition of contract as control tool during negotiation.

Commercial staff reside with project.

Contract is realistic, mutually beneficial and reflects ownership of risk.

Formal and informal mechanisms for exchange of ideas, problem-solving and sharing experience between projects for benefit of project staff.

Formal capture of lessons learned.

*Source: National Audit Office*

**19** How the Department compares in analysing credible, timely and relevant metrics monitoring progress against performance, time and cost boundaries

The Department uses the same methods to differing degrees to comparators.

**Examples of the Department’s Current Approaches**

The Future Infantry Soldier Technology project used “rolling wave planning”, detailed planning in short chunks, to better incorporate lessons learned.

See also Figures 20 and 21.

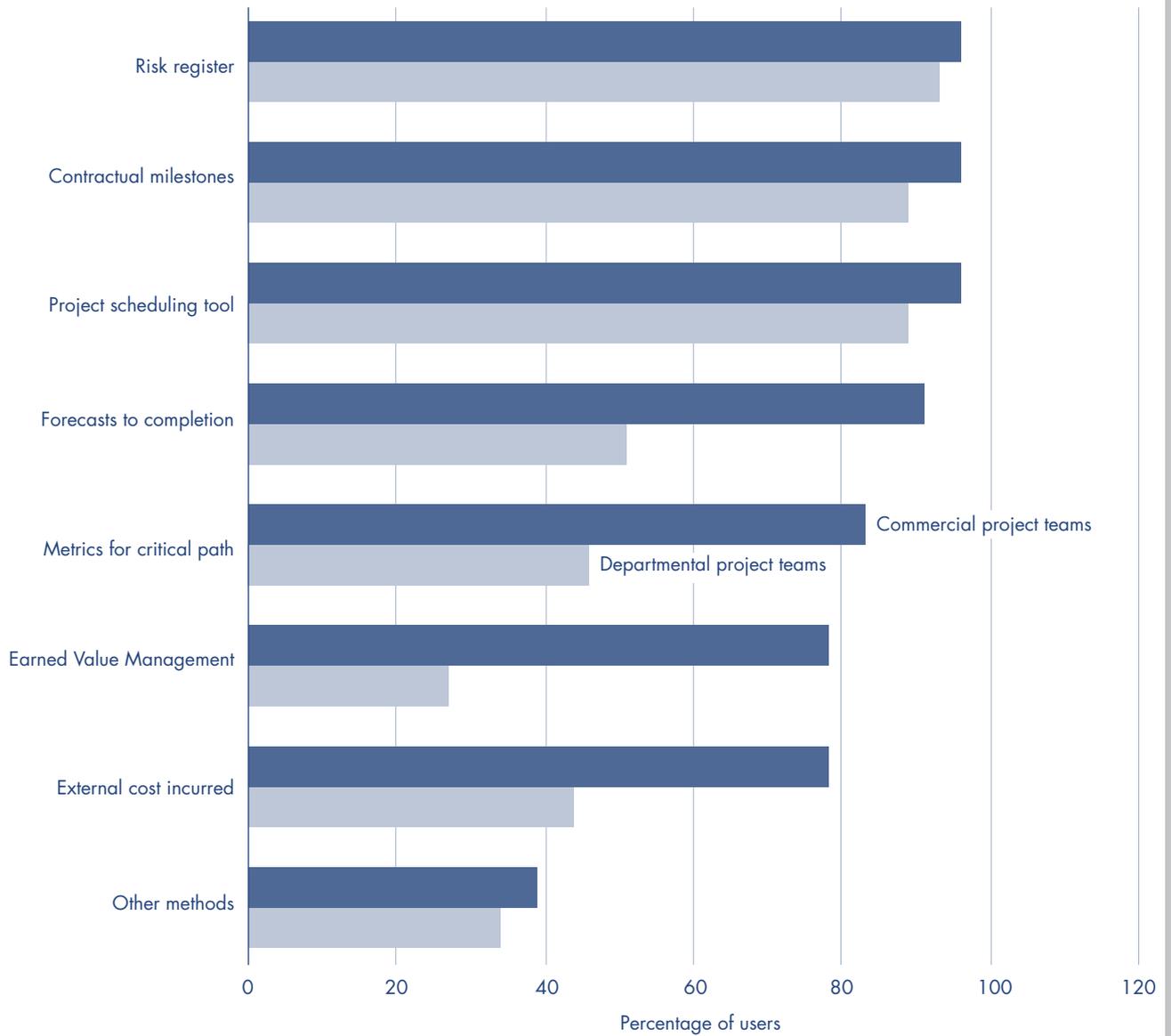
**Examples of Comparator Organisations’ Approaches**

The Swedish Excalibur project used “inchstones to milestones” to provide the desired level of timeliness and granularity in reporting data.

The Australian Defence Materiel Organisation Project Performance Management Guide provided practical guidance on project control for all equipment procurement and support projects.

**20** Departmental project teams used similar monitoring tools to commercial teams although consistency of application varied

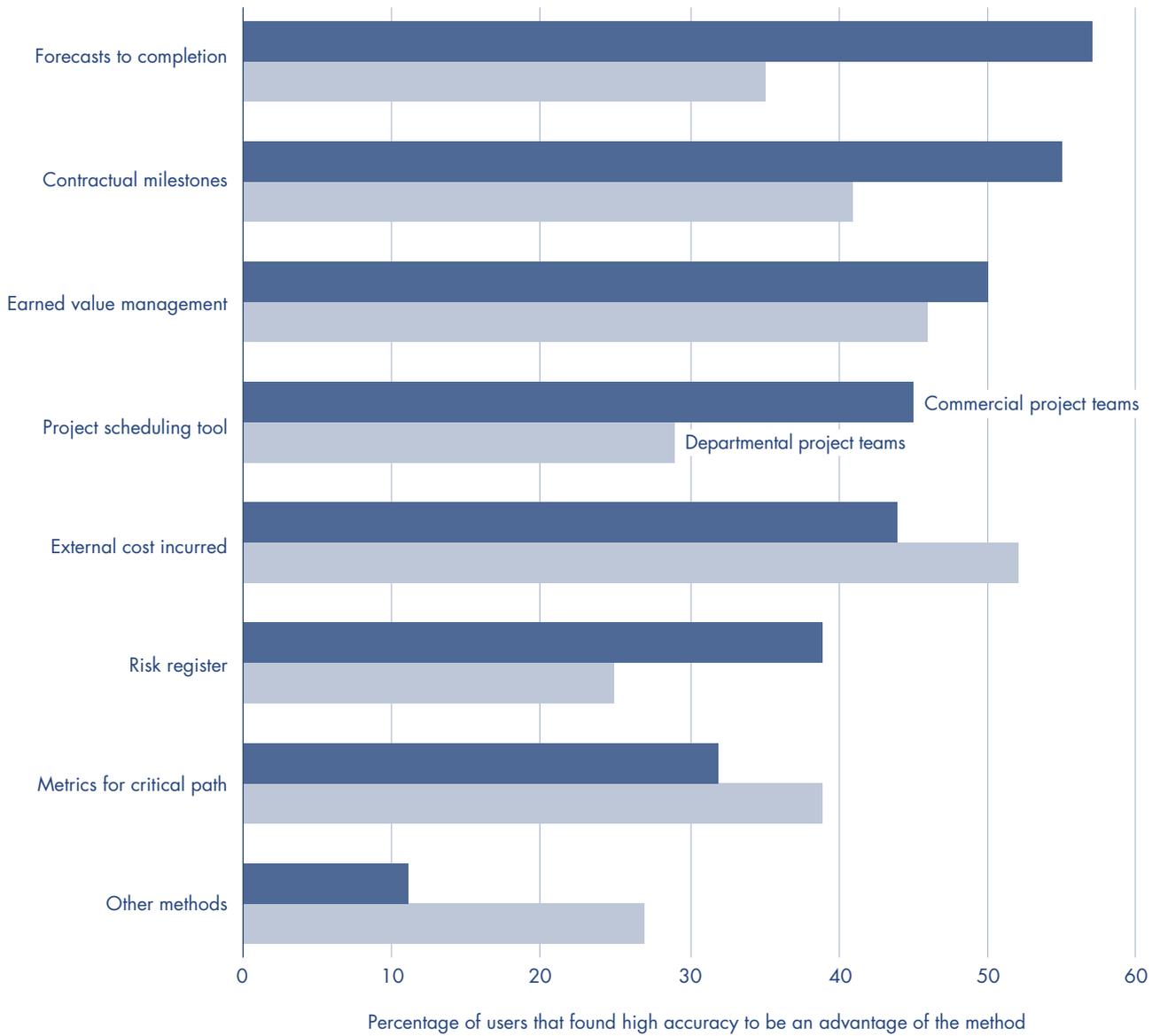
Methods to track progress



Source: National Audit Office

**21** Views on the utility of methods to track progress varied, with the historic external cost incurred rated highly by Departmental project teams

Methods to track progress



Source: National Audit Office

## 22 How the Department compares in analysing credible, timely and relevant metrics monitoring progress against performance, time and cost boundaries

The Department can use Earned Value Management techniques even more widely.

### Examples of the Department's Current Approaches

27 per cent of Departmental project teams used Earned Value Management. See Figure 20. The majority of those that used the technique managed projects equal to or greater than £100 million in total procurement cost.

The Future Infantry Soldier Technology team used Earned Value Management data to manage the project and derive forecast data, although its utility for the latter use was limited by the inflexibility of the Department's budgeting systems.

The Special Projects CISR project team considered Earned Value Management to be integral to Resource Accounting and Budgeting because the principle of paying on the basis of earned value tallies with the principle of accounting for resources in the financial period to which they relate.

Interviewees recognised the potential benefits of Earned Value Management to provide early warning of project performance issues to all levels of management. To make best use of the technique they also recognised that industry would need a clear framework for its application.

The joint Department/Industry Commercial Policy Group has recently agreed guidelines for use of Earned Value Management.

See also Figure 23.

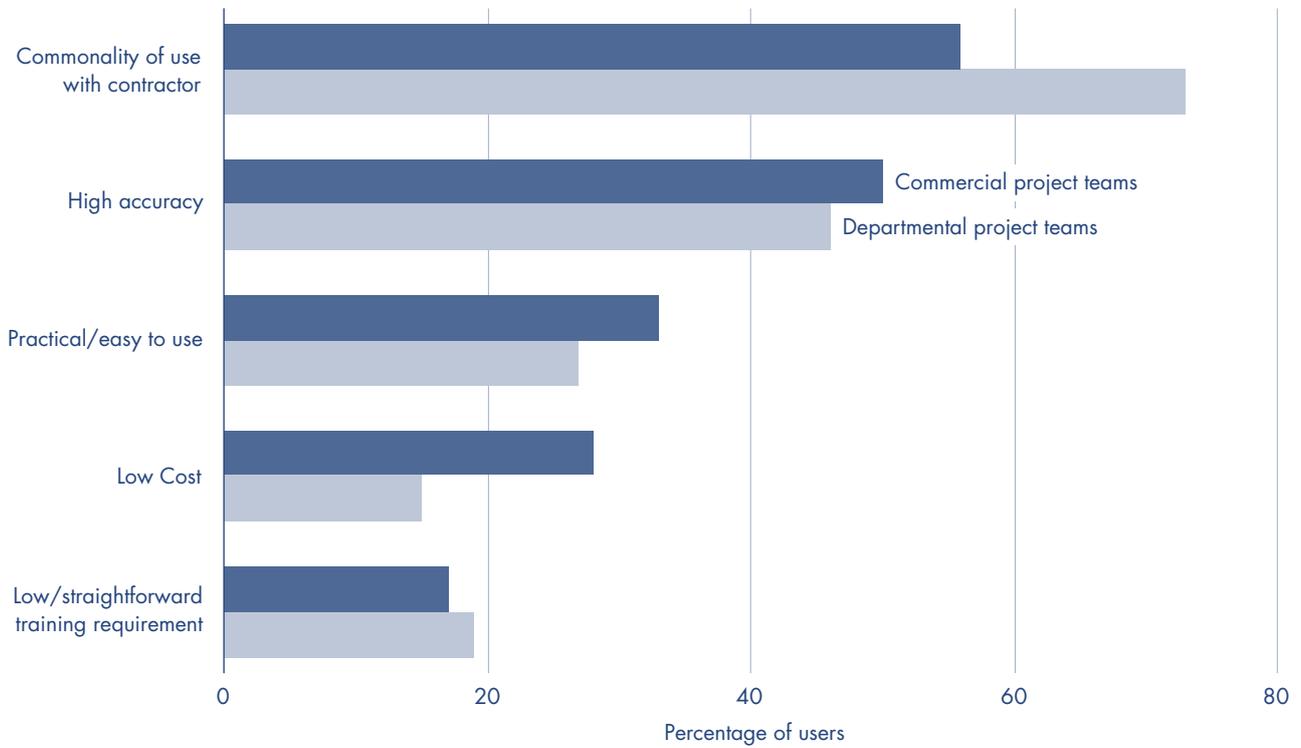
### Examples of Comparator Organisations' Approaches

Earned Value Management is mandated for large projects in USA and Sweden.

In Australia, Earned Value Management is mandatory for projects valued at more than \$20 million. However, the approach may be considered unnecessary if the contract is low risk.

**23** Departmental project teams using Earned Value Management had a well developed view of the technique, in particular viewing commonality of use with contractor as an advantage

Advantages of tracking method



Source: National Audit Office

## 24 How the Department compares in analysing credible, timely and relevant metrics monitoring progress against performance, time and cost boundaries

To match the commercial comparators, the Department is aware that it can improve its use of cost data to track progress.

### Examples of the Department's Current Approaches

44 per cent of the Department's project teams used external cost incurred to track progress compared to 78 per cent of commercial project managers. See Figure 20.

Contract type did not appear to have any bearing on whether external costs are tracked by the Department's project teams. Those that tracked external costs used the full range of contract types such as firm price, fixed price and target cost/incentive fee.

Interviewee noted that the financial position reported to Defence Procurement Agency Board does not always square with other indicators of project performance.

Equipment projects managed in the Defence Procurement Agency are based on a ten-year funding plan. Support projects managed in the Defence Logistics Organisation are based on a four-year funding plan.

The DPA Forward reforms included placing financial controllers in high profile project teams.

Departmental project teams and the Department's central finance organisations did not use a common financial recording/reporting tool. There was an aspiration to develop a partial solution consisting of a common cost-tracking spreadsheet for project teams.

The Defence Logistics Organisation and the Defence Procurement Agency will have common financial processes in place by April 2005.

### Examples of Comparator Organisations' Approaches

The Australian Department of Defense Improve Project Scheduling and Status Reporting project provided projects with a toolset based on Earned Value Management techniques to forecast and report current performance against the four key metrics of Cost, Schedule, Capability and Staffing.

Eli Lilly had an eight-quarter rolling financial forecast. This shorter funding horizon gives greater certainty.

## 25 How the Department compares in its arrangements for transparency and accuracy

The Department compares well with other organisations.

### Examples of the Department's Current Approaches

The Trojan and Titan project had a dedicated team member who verified contractor's reports.

The Watchkeeper, Defence Fixed Telecommunications Service, *HMS Illustrious* Refit, Future Infantry Soldier Technology and Special Projects CISR projects were all co-located with their contractors in some form.

The Trojan and Titan, Joint Strike Fighter and *HMS Illustrious* Refit projects were all very positive about impact of Shared Data Environments on their ability to manage projects. The *HMS Illustrious* project team noted some IT connection problems.

More Departmental project teams used a joint risk register with contractors in our comparison with commercial teams. See Figure 26.

### Examples of Comparator Organisations' Approaches

United States defence projects such as the amphibious transport dock ship programme had dedicated verification/surveillance staff and co-located with industry.

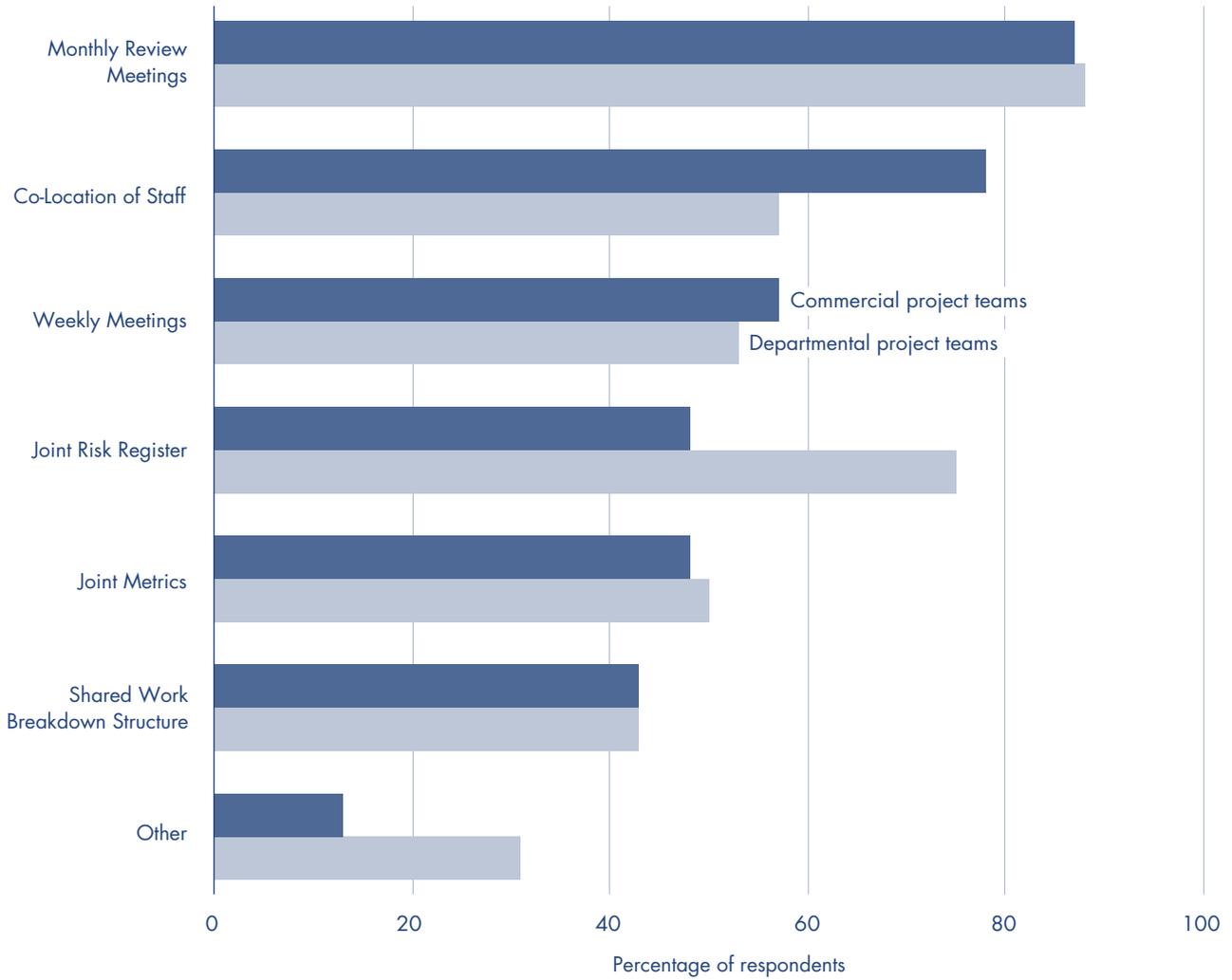
In Australia, the AIR 87 (Armed Reconnaissance Helicopter) project co-located elements of the team at all prime contractor sites.

Mace placed a great emphasis on the management of information and the transparency of this. For this they use a web based project collaboration tool that gives stakeholders on-line real time information about their programme.

BP Angola, AMEC and Bechtel all emphasised the importance of Shared Data Environments.

**26** Departmental and commercial project teams gained access to information from contractors in similar ways, however more Departmental teams used a joint risk register

Means to gain access to information



Source: National Audit Office

## 27 How the Department compares in using the contract as a key component of project control

The Department has examples of good practice in this area.

### Examples of the Department's Current Approaches

Interviewees noted that project teams and contractors should be prepared to work with the contract but not rely on it as a means to enforce behaviour.

The *HMS Illustrious* Refit partners did not use the contract as a means to enforce behaviours on the project.

The More Effective Contracting initiative is examining options to 'deconstruct' contracts into shorter periods to allow for greater certainty and the better allocation and management of risks between the Department and industry.

61 per cent of the Department's projects had contractual milestones linked to risks.

16 of the Department's projects explicitly linked milestones in project schedule to risks.

We will be reporting in greater detail on the development of effective contracting practices in a report which will publish in early 2006.

### Examples of Comparator Organisations' Approaches

The Australian Defence Materiel Organisation was working with industry on new tendering and contracting templates, based on best commercial practice, with a view to agreeing to contracts that are more effective in managing risk and opportunity.

## 28 How the Department compares in having project-to-project peer reviews<sup>12</sup> and Learning from Experience

The use of informal project-to-project peer reviews to share experience appears to be quite widespread in the Department.

### Examples of the Department's Current Approaches

Whilst Key Stage Peer Review is undertaken to provide assurance (see Figure 34), there is no evidence of a formal system of project-to-project peer review in the Defence Procurement Agency. However, 56 per cent of Departmental project teams responded that they had project-to-project peer review (at any frequency).

### Examples of Comparator Organisations' Approaches

BP encouraged connectivity with colleagues across business units to facilitate portfolio management and knowledge sharing.

57 per cent of commercial project teams had peer review (at any frequency).

<sup>12</sup> This refers to the exchange of ideas, problem-solving and sharing of experience that can occur between peers within an organisation, for example between project team leaders or between specialists such as risk managers or financial staff. It is not to be confused with the Department's Key Stage Peer Review which is based on the Office of Government Commerce Gateway Review, referred to in Figure 34.

**29** Recommendations to improve how progress is measured to enable decision-making focused on successful project delivery

**Recommendation**

Introduce a project controls post for every large project or cluster of projects, with joint training with industry.

Make financial tracking an integral part of decision-making on project progress and support this by ensuring suitably qualified staff are key members of project teams and project team leaders are trained to understand financial measures.

To make the most of Earned Value Management, project teams and their contractors should both be motivated to share the results in a timely manner and to use the outcomes constructively.

Plan for certainty by taking shorter planning chunks: in the short term plan in great detail bearing in mind the longer term perspective.

**Good practice example**

On BP's Clair project, the project controls officer was the team leaders' right-hand man. The experience and competence gained from the post were highly valued.

Cost was one of five key metrics against which BP monitor progress. The others were schedule, quality, 1st year operability, health and safety.

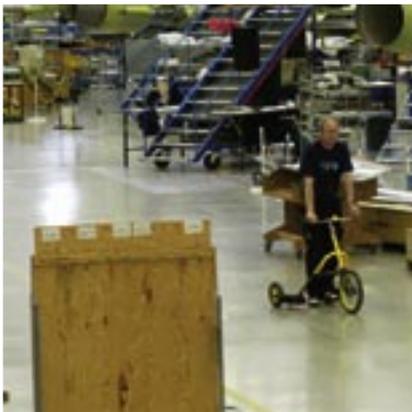
The Swedish Next Generation Anti-Armour project used Earned Value Management to good effect but noted that both client and contractor must be well motivated and share a common view of how the information generated will be used.

Bechtel made basic project plans covering up to 25 year periods but focused detailed plans on the next three years and iterated the plans to reduce uncertainty.



## PART FOUR

### Reporting to enable strategic decisions



**4.1** To successfully progress it is not enough for individual projects to take decisions in isolation. Senior management must also understand project status to enable them to take decisions affecting the achievement of the strategic objectives of the organisation and to enable the delivery of individual projects. To facilitate such decisions, accurate and timely data must be available on the individual projects and senior managers must be assured that each project is going about its business in a manner appropriate to that project.

**4.2** **Figure 30** summarises the key success factors we have identified for project reporting to enable strategic decision-making. In the comparator organisations, flows of information occurred in a standard way, to a regular timetable with their accuracy underpinned by regular reviews. Recognising the importance of public accountability, the extent of external scrutiny was often greater in the public sector comparators and we found that minimising the burden on projects was a challenge for these organisations. Overall, the Department:

- does not have a consistent system for reporting project status across all parts of its acquisition organisation but recent initiatives, led by the Defence Procurement Agency, mean it is now moving in the right direction;

- having implemented a well-received new system of review for all projects, now compares well in providing senior management with assurance that the right processes are in place to underpin successful project delivery;
- is introducing a system of independent non-advocate peer review which compares well with practice elsewhere; and
- has introduced a system of Key Supplier Management the success of which, drawing on comparator experience, will depend on the Department and industry using results constructively.

**4.3** **Figures 31 to 35** provide examples of the evidence upon which our conclusions are based. Full details of all of the evidence are available on our website [www.naodefencevfm.org](http://www.naodefencevfm.org).

**4.4** **Figures 36 and 37** present and illustrate our recommendations to help ensure all defence projects routinely adopt practices closer to the gold standard.

**30** Our gold standard for project reporting to enable strategic decision-making

**Good practice sub-criteria**

Consistent reporting system for all projects feeding into analysis for senior management

Formalised, regular system of senior management review to give assurance of delivery

Independent, non-advocate reviews

Ongoing measurement of supplier performance to learn lessons

**Enablers**

Reporting system based on principle of generate once, use many times.

Clear purpose for reporting system (whether that is to track delivery, track against corporate targets or for forward planning).

Analysis of reports by dedicated staff.

Clear information requirement, format and purpose for regular reviews.

Feedback mechanism.

Clear purpose for independent input (advice for project staff or assurance for senior managers, or both).

Avoidance of duplication and over-burdening project staff.

Benefits are clear - not viewed as a hurdle to overcome.

Collection of data and maintenance of historical database.

Senior level contact with contractors.

Analysis of trends and issues.

Contractors are clear as to confidentiality and use of data on their performance.

*Source: National Audit Office*

## 31 How the Department compares in having a consistent reporting system for all projects feeding into analysis for senior management

The Department does not have a consistent system across all parts of its acquisition organisation but recent initiatives, led by the Defence Procurement Agency, mean it is now moving in the right direction.

### Example of the Department's Current Approaches

Interviewees recognised that the Department has not in the past had an effective business management system.

Reporting between different parts of the Department is hindered by incompatible computer systems (see Figure 32). There is scope for a more automated system which the Defence Information Infrastructure project should address from January 2007.

The equipment and support elements of the Defence Balanced Scorecard are cascaded down to the Defence Procurement Agency and Defence Logistics Organisation and their respective Board reports feed back into the Defence Balanced Scorecard on a quarterly basis.

From April 2004, both the Defence Procurement Agency and Defence Logistics Organisation Boards have received monthly financial reports in the same format covering key aspects of both of their businesses. The Equipment Capability Customer receives copies of the Defence Procurement Agency Board reports.

The Defence Procurement Agency's Corporate Management Information System was rolled out in April 2004 and now covers all projects over £20 million that have passed the Concept Phase and have not come into service. It is accessed by the Defence Procurement Agency, Defence Logistics Organisation, Equipment Capability Customer and other acquisition stakeholders. In January 2005, 97 per cent of projects reported into this system on time.

In addition to the reports referred to above, project reporting to the Equipment Capability Customer was often ad hoc in frequency and method across the project lifecycle. 21 per cent of project teams reported to them in both standard and non-standard ways.

Nearly a third of the Department's projects spent 10 per cent or more of team time reporting information to others.

*Source: National Audit Office*

### Examples of Comparator Organisations' Approaches

Eli Lilly had an SAP Corporation Software Package across the entire business with schedule and cost status reported monthly in a standard format. It was deemed to be worth the high investment and the large transition for staff to make project data completely visible. Trigger points, such as a delay achieving a milestone, triggered senior review.

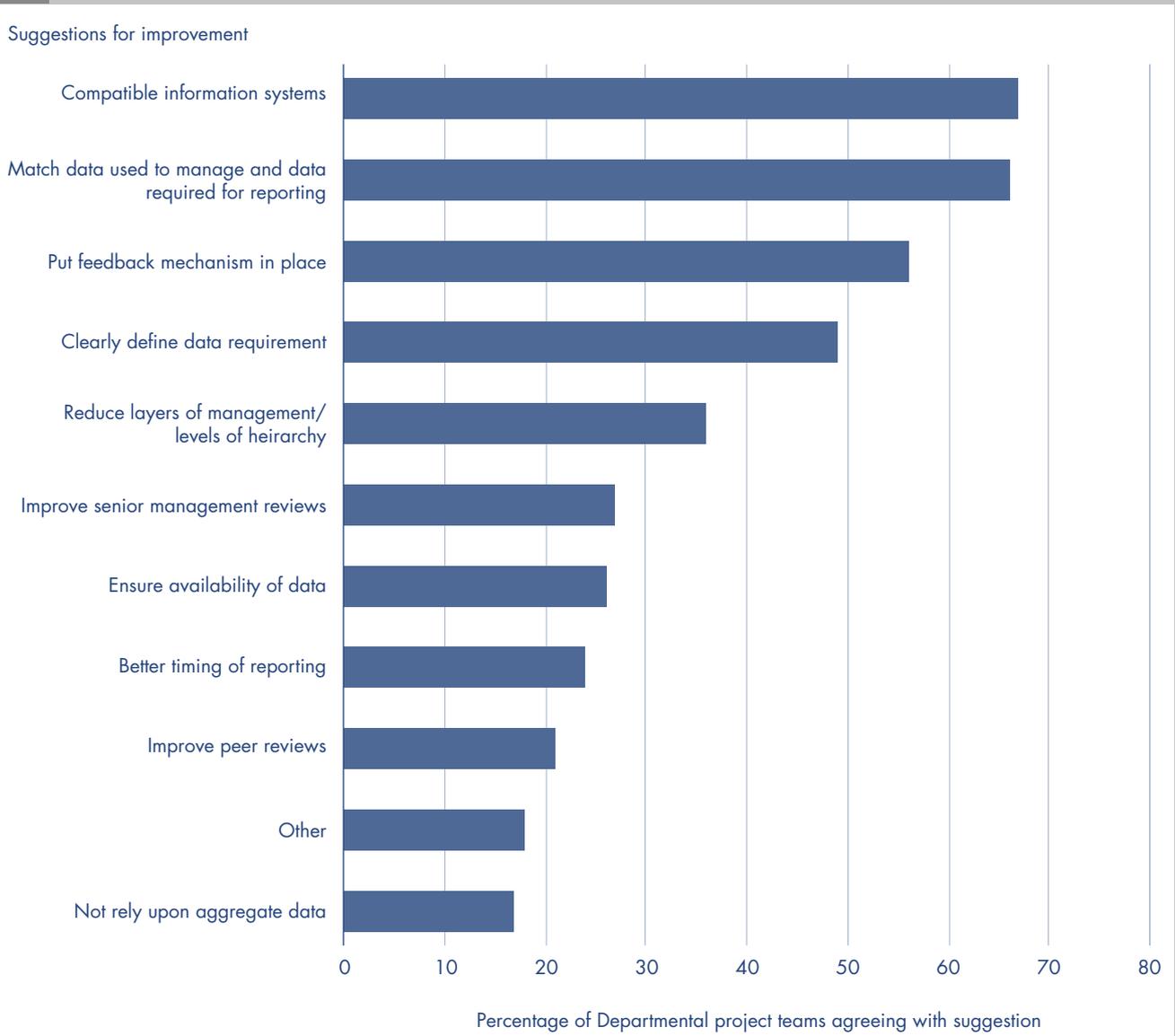
In Bechtel, 80-90 per cent of projects were compliant with the reporting system. This was the only way to see exceptions early. They also had two-monthly standard reports to senior management with a rigid timetable.

BP had a regular Corporate General Financial Outlook and each project contributed capital expenditure figures and progress against milestones.

90 per cent of senior commercial managers kept a consistent set of metrics for all projects.

91 per cent of commercial projects reported progress upwards in their organisations on a monthly basis.

**32** The top three suggestions for improving the Department’s reporting system were compatible information systems, match reporting and management data, and feedback mechanism



Source: National Audit Office

### 33 How the Department compares in having a formalised, regular system of senior management review to give assurance of delivery

The Department now compares well having implemented a new system of review for all projects, which was positively received.

#### Example of the Department's Current Approaches

The Defence Procurement Agency introduced quarterly Project Performance Reviews in April 2004 which involve senior managers and other stakeholders. They review projects using a dashboard of Key Performance Indicators which include logistics and support indicators.

The process will be used in the Defence Logistics Organisation while the Equipment Capability Customer participates in the Defence Procurement Agency's Project Performance Reviews.

Five out of eight case studies were positive about the approach and several had tailored it to suit their own needs.

The DPA Forward reforms included creation of six business analyst posts, two for each Operational Director. The business analyst posts were created to collate and analyse all performance indicators and undertake assurance activities.

#### Examples of Comparator Organisations' Approaches

Eli Lilly conducted non-advocate, functional reviews prior to the main investment decision.

On each major defence project in the United States, an overarching Integrated Product Team fed into Defence Acquisition Board process and approved strategies prior to submission to the Board.

Ericsson operated risk based assessment at Business Unit level.

Ericsson also mandated use of balanced scorecards to follow-up operational performance. Five areas were monitored: financial, customer, competitive position, internal efficiency and staffing. Action plans were prepared as needed.

Bechtel had bi-annual functional reviews.

### 34 How the Department compares in having non-advocate reviews of projects

The Office of Government Commerce Gateway Review system has been adopted by the Department in a tailored form.

#### Example of the Department's Current Approaches

The Defence Procurement Agency and Defence Logistics Organisation have adopted a tailored version of the Office of Government Commerce Gateway Review system known as Key Stage Peer Review. Four Key Stage Peer Reviews are recommended by the Department during a project's life, two in the earliest, concept phase, one prior to the main investment decision and one prior to going into service. The Office of Government Commerce recommends six Gateway Reviews in total. In future, the Department intends to obtain an Office of Government Commerce franchise.

There is potential for overlap between quarterly Project Performance Review, assurance activity in the Defence Procurement Agency before the main investment decision and the newly implemented Key Stage Peer Review. See Figure 37.

#### Example of Comparator Organisations' Approaches

The Australian Defence Materiel Organisation operated Project Governance Boards for advice only; however they did provide independent oversight of project and assurance to senior management. Members of the Boards were drawn at the Senior Executive level and came from wider defence, other departments and the private sector. They were part of the broader governance framework but were independent of line management within the Defence Materiel Organisation.

### 35 How the Department compares in ongoing measurement of supplier performance to learn lessons

The Department has introduced a system of Key Supplier Management. Drawing on comparator experience, success will depend on the Department and industry using results constructively.

#### Example of the Department's Current Approaches

Key Supplier Management is intended to improve the Department's knowledge and understanding of the supplier base. The Defence Procurement Agency, Defence Logistics Organisation and the Equipment Capability Customer will adopt this common approach.

The Warship Support Agency operated in-house assessment of the top 19 companies that account for 80 per cent of budget.

#### Examples of Comparator Organisations' Approaches

BP's Clair project emphasised the need to know the capabilities of contractors. At the start, the Clair project worked for six months with contractors to create the template for monthly contractor reports using existing software tools. This enabled them, in part, to look for trends in performance and their contractors see the benefits. Large contractors have to share performance data with smaller contractors. They stressed that individuals and relationships made this work successfully.

Australia had mixed results in using company scorecards to formalise the Defence Materiel Organisation's corporate knowledge of contractors' performance. Difficulties resulted in part from adversarial relationships between the Defence Materiel Organisation and industry, although the process did lead to some common understanding of company and Defence Materiel Organisation performance on projects.

Australia attempted to provide a foundation for industrial relations with sector plans developed jointly with industry.

### 36 Recommendations to improve project reporting to enable strategic decision-making

#### Recommendations

Develop a common corporate monitoring tool to collect relevant project performance data for the Defence Procurement Agency, Defence Logistics Organisation and the Equipment Capability Customer.

Introduce business analyst posts in the Defence Procurement Agency, Defence Logistics Organisation and the Equipment Capability Customer to examine acquisition performance.

Balance the various review, assurance and approval activities, particularly before the investment decision gates, to avoid duplication of effort whilst meeting stakeholders' needs and sharing good practice and experience.

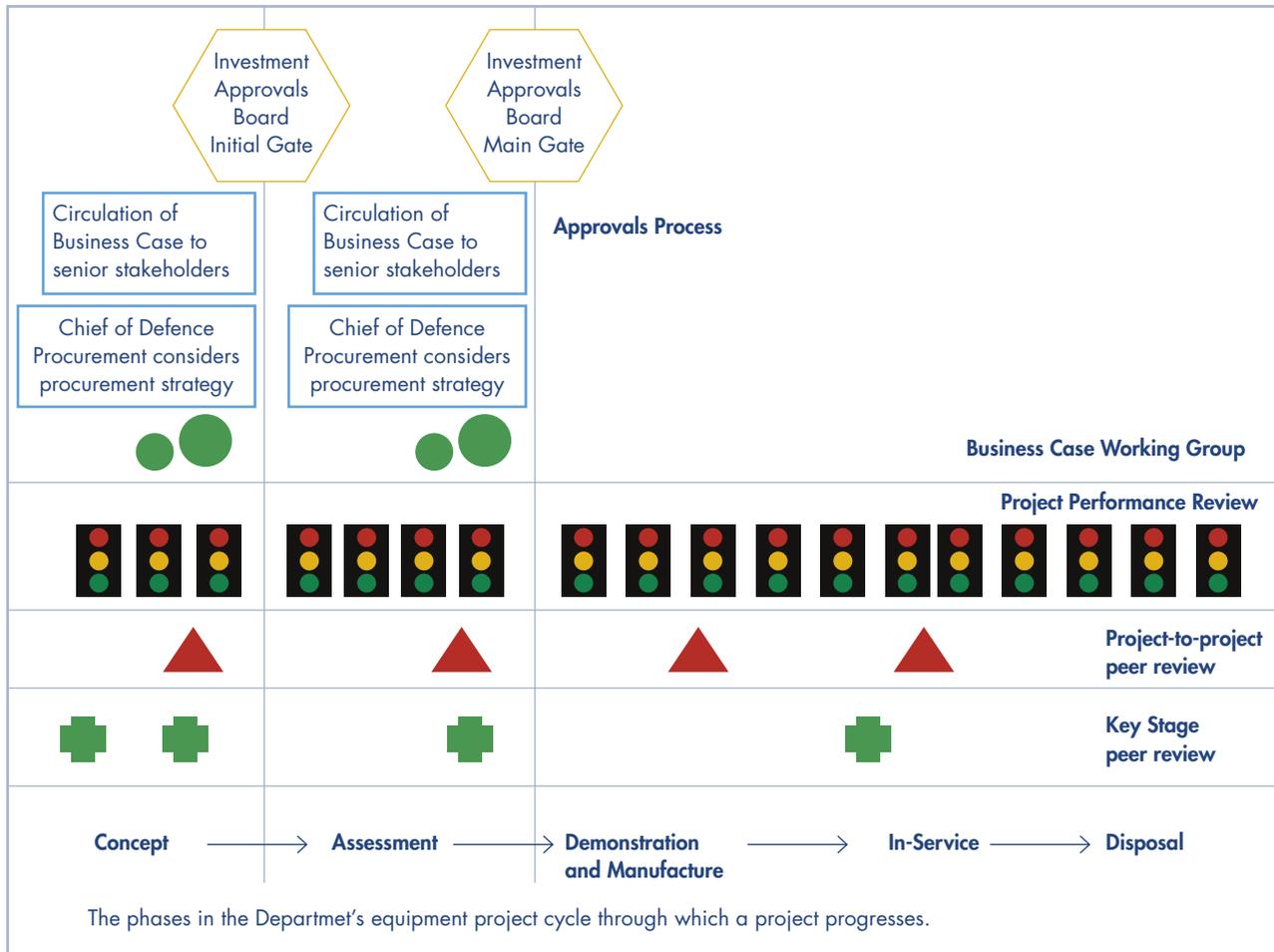
#### Good Practice Example

In the United States there was a single common Consolidated Acquisition Reporting System which contained data on the performance of all major projects based in all four military services.

The Australian Defence Materiel Organisation analysed and reviewed systemic issues affecting projects. This analysis fed into top level risk assessment and budgetary planning.

**37** Large Departmental projects can undergo a number of reviews, in particular before the investment decision gates when there is potential for reviews to overlap

Diagram showing project reviews across the Department's project cycle linked to Investment Approvals Process assurance activities.



Source: National Audit Office/Ministry of Defence

NOTE

**Business Case Working Group:** Includes Defence Procurement Agency Technical Directorate and Investment Approvals Board scrutiny staff.

**Project Performance Review:** Mandatory quarterly progress review.

**Project-to-Project Peer Review:** Exchange of ideas and experience between Departmental project team leaders and other staff (optional).

**Key Stage Peer Review:** Review by experienced staff from across the Department at request of Director of Equipment Capability and Departmental Project Team Leader (optional).

# APPENDIX 1

## Study scope and methodology

**1** This study has compared the Department’s practices in exercising project control over its major equipment projects with overseas and commercial organisations. A central part of the analysis was the development and use of a theoretical gold standard as the benchmark for comparison. The following paragraphs describe the methodologies we employed to inform the design of the study, to gather and analyse our evidence and to conduct the comparative analysis. More information can also be found on [www.naodefencevm.org](http://www.naodefencevm.org).

### Informing the design of the study

**2** The starting point for this study was our analysis of the complex cultural and systemic drivers that need to be managed to deliver military capability successfully, the results of which were published in March 2004.<sup>13</sup> This analysis is the foundation for a series of studies to examine some of the issues identified in more detail. This first study took forward a group of the key drivers (listed in **Figure 38**) linked under the concept of Tracking Progress, which was selected jointly by the Department and study team.

**38** The elements of Tracking Progress drawn from previous analysis

**Tracking progress group of key drivers**

- The quality of the Department and Industry’s estimating
- The effectiveness of the Department and Industry’s governance and assurance arrangements
- The maturity of the Department and Industry’s understanding of risk
- The availability of management information
- Budgeting and funding

Source: National Audit Office

**3** We developed the concept of Tracking Progress into the following four issue-areas:

- What are the methods used to track the progress of major projects? (What information is gathered, how is it analysed and reviewed).
- What are the sources of tracking information? (Internal and external sources; shared information between clients/contractors; similarities and differences in methods used by clients/contractors to track progress).
- How is progress reported up the management chain? (What information, how frequently and to whom within the project organisation).
- How is tracking information used to make decisions? (At project and strategic levels).

These four issue-areas were taken forward into the evidence-gathering phase and formed the basis of our consultation exercise. During the final stages of analysis, we modified the concept of Tracking Progress into a broader concept of Project Control which better described the criteria within the gold standard and underpinning evidence.

### Gathering evidence

**4** Our evidence gathering was largely based on collection of new data through surveys, case studies and semi-structured interviews with some use of existing Departmental data and documentation.

#### Collection of new data - Surveys

**5** We conducted three surveys between April and July 2004 and details of the approach and returns are given in **Figure 39**.

<sup>13</sup> Further details of both the drivers identified and the selection of Tracking Progress as the first subject for study can be found in Driving successful delivery of major defence projects: drawing on wider practice in tracking the progress of major projects. A Briefing and Consultation Document by the National Audit Office, March 2004 and via [www.naodefencevm.org](http://www.naodefencevm.org)

**6** We could not extrapolate the results of surveys one and two (the broad commercial consultation) as being representative of commercial practice in the round due to the uncertain total population size and small sample sizes. We included them in the analysis however because of the variety of organisations that responded which gave an indicative picture of wider commercial practice. Further details of the survey results and the organisations that responded can be found on the study website [www.naodefencevfm.org](http://www.naodefencevfm.org).

**7** Our survey of Departmental project teams had a return rate of 76 per cent and a large enough sample size to enable us to extrapolate the results over the whole population. The breakdown of responses by project stage is given in **Figure 40**. The majority of the responses (80 per cent) used a conventional equipment procurement method and Figure 40 shows that the majority of respondents were based in the Defence Procurement Agency. However, over a quarter of the returns were in-service and therefore practices in the Defence Logistics Organisation were represented.

### 39 Survey approach and coverage

Survey	Reason and approach	Returns
1 Commercial project managers (those having management responsibility over a single project or programme)	Broad consultation across different industrial sectors. Distributed through relevant Trade Associations and available on the web.	23 returns across 7 sectors: 11 defence projects (48 per cent of total returns). Other sectors represented were oil and gas (3), nuclear (2), utilities/energy (2), communications (1), construction (1) and transport (2).
2 Commercial strategic managers (those that have a perspective over a number of projects or programmes)	Broad consultation across different industrial sectors. Distributed through relevant Trade Associations and available on the web.	20 returns across 6 sectors: 11 defence projects (55 per cent of total returns). Other sectors represented were oil and gas (2), nuclear (3), utilities/energy (2), communications (1) and transport (1).
3 Departmental integrated project teams	Representative data on Departmental practice. Majority of survey questions mirrored surveys 1 and 2 to enable comparison.	97 returns from a total of 128 project teams (including all Category A projects with procurement cost >£400 million) 76 per cent return rate.

Source: National Audit Office

### 40 Breakdown of Departmental survey responses

	Projects based in the Defence Procurement Agency				Projects based in the Defence Logistics Organisation		Other (no answer)	Total
	Concept	Assessment	Demonstration	Manufacture	In-service	Disposal		
Number of responses	6	18	16	26	26	1	4	97
Percentage of total	6	19	17	27	27	1	4	100

Source: National Audit Office

### Collection of new data – Case studies

**8** Between February and August 2004, we visited 10 comparator organisations to gain a more detailed understanding of how project progress is tracked outside of the Department. This was to complement the broad, consultative surveys outlined above and a standard set of issue-areas, based on the concept of Tracking Progress outlined in paragraph 3 above, was used to gather evidence. The comparators were divided into two categories: overseas defence departments and commercial organisations. The Department was closely involved in their selection, and participated in the study visits.

**9** The overseas defence departments were selected on the basis of one or more of the following: having a comparable defence budget; being recognised as operating good practice; having a domestic defence industry and projects of technological complexity. In each defence department, we visited project managers and procurement process specialists. The commercial organisations were selected on the basis of being recognised good practitioners and being within industries with projects of comparable technological complexity, risk and scale. We interviewed project managers, senior managers and project process specialists depending on availability.

**10** In July and August 2004, following our survey of Departmental project teams, we also examined eight Departmental projects as case studies to explore tracking progress practices in more detail. The teams were selected primarily on the basis of good practice indicated in the survey returns, but we also sought to ensure a spread across different acquisition-types and stages of project (see Figure 41). We balanced the case studies by including one on the basis of a high reporting overhead as an indicator that there might be difficulties on the project. Full details of all of our case studies and the reasons for selection are given in Appendix 2.

### Collection of new data – Semi-structured interviews

**11** We conducted some 30 semi-structured interviews between May and September 2004 covering acquisition and project management experts and senior management stakeholders in the Department (see Figure 42). Our framework of questions covered key issues from their perspective, what works well, what could be improved and how things could be done differently to enable better tracking of project progress. Most of the interviews were with one or two interviewees and were held in the Department’s offices in London, in the Defence Procurement Agency in Bristol and at various Defence

#### 41 Departmental case study coverage

Project	Method of procurement	Stage in cycle	Category <sup>1</sup>	Total number of projects/equipments being looked after by team
Watchkeeper	Conventional – equipment	Assessment	A	4
Future Infantry Soldier Technology	Conventional – equipment	Assessment	A	38
Joint Casualty Treatment Ship	Conventional – equipment	Assessment	A	1
Secure communications project	Conventional – equipment	Assessment	B	50
Future Joint Combat Aircraft	Conventional – equipment	Demonstration	A	1
Trojan and Titan	Conventional – equipment	Manufacture	B	2
HMS <i>Illustrious</i> Re-fit	Conventional – equipment	In-service	B	16 <sup>2</sup>
Defence Fixed Telecommunications Services	Private Finance Initiative - equipment	In-service	A	20

Source: National Audit Office

NOTES

- 1 In the Department, projects are categorised according to procurement cost. Category A: >£400 million. Category B: £100-£400 million.
- 2 The HMS *Illustrious* Refit was managed by a dedicated team at the waterfront.

Logistics Organisation sites. Each interview lasted between one and two hours and the majority were tape recorded. The recordings were transcribed and the transcripts fed into textual analysis software which enabled the study team to group and analyse quotations and recurring themes. Further details of the interview findings can be found on the study website [www.naodefencevfm.org](http://www.naodefencevfm.org).

### Use of existing data – Departmental documents and reports

**12** We analysed individual project tracking reports, Board reports and the Defence Balanced Scorecard to trace how project progress is tracked at different levels in the Department. We examined Defence Procurement Agency and Defence Logistics Organisation organisational and process development papers to understand how approaches are evolving and to evaluate new initiatives alongside interview and case study data. Other documents examined include sample Corporate Management Information System reports, guidance papers on Project Performance Review and Assurance, Key Stage Peer Review and Key Supplier Management, and terms of reference for Senior Responsible Owners and Single Points of Accountability for delivery of military capability.

### Comparative analysis

**13** Our gold standard for major project control was developed during the fieldwork phase to provide a framework for the comparative analysis and development of recommendations. The criteria within the gold standard evolved as more comparative data became available and we sought the input of a panel of experts at key stages to gain their advice and comments (see Figure 43). We actively sought to base the criteria on good practice from all of our comparator organisations in order to develop a credible benchmark for comparing the Department's practices.

**14** Our comparative analysis was structured around the criteria within the gold standard and findings from the surveys, case studies and interviews were brigaded against each sub-set of criteria. The use of the same question structures in all of the surveys enabled direct comparison between Departmental and commercial practice. The use of textual analysis software to analyse the interview transcripts enabled the study team to group quotations along the gold standard criteria.

#### 42 Interview coverage

	Defence Procurement Agency	Equipment Capability Customer	Defence Logistics Organisation	Front Line Commands	Investment Approvals Board	Defence Management Board
Experts and stakeholders interviewed	6 x Board members; Secretariat; Central Finance and Planning Group; Integration Authority; Price Forecasting Group; Information Solutions Group; Procurement Development Group; Supplier Relations Group	1 x Director Equipment Capability Expert involved in development of Single Points of Accountability	2 x Agency Chief Executives	RAF Strike Command	Secretariat Directorate Deepening Start Acquisition	1 x Board Member Defence Plans and Analysis Senior Responsible Owner (Carrier Strike)

Source: National Audit Office

#### 43 Composition of Expert Panel

Name	Organisation
Dr Martin Barnes	Major Projects Association
Dr Terry Cooke-Davies	Human Systems Limited
Geoff Beaven	Thales Group UK
David Shannon	Oxford Project Management

## APPENDIX 2

### Our case studies

#### Commercial Case Studies

Name of company	<b>Bechtel Corporation</b>	
Description of the company	Bechtel is a global engineering, construction and project management company with more than a century of experience on complex projects in challenging locations. It has 40,000 employees and operates in a variety of sectors including transportation, oil and gas, energy, environmental cleanup, defence and telecommunications. <sup>14</sup>	
Research and Development	Bechtel continues to update its software tools and techniques as an inherent part of its standard operations.	
Definition of a major project (if applicable)	Signature project defined as worth US\$1 billion (£532 million) or more and involving significant degree of complexity and multiple challenges. <sup>15</sup>	
Total number of complex, high technology projects	Projects ranging from defence through to heavy civil are currently in operation in 57 countries.  The company earned revenue from projects worth a total of US\$16.3 billion (£8.7 billion) in 2003 and booked new work worth a total of US\$21 billion (£11.2 billion).	
Average cost and duration of projects	Projects range in size from US\$1.6 million (£851,000) to US\$21 billion (£11.2 billion) and duration 9 months to 30 years.	
Indicative data on project performance (delivery on time and to budget)	After stepping into the Eurotunnel, and Jubilee Line projects and completed mega projects such as the Channel Tunnel Rail Link and Hong Kong Airport Core Programme to time and budget, Bechtel has earned an excellent reputation.	
Reason for selection as case study	Construction industry selected as comparable to defence due to:  High project values.  Capital projects of large scale and scope.  Bechtel is a world-leader with a long history of delivering large scale, complex projects.	

14 Source: www.bechtel.com accessed on 14 January 2005.

15 Source: www.bechtel.com accessed on 14 January 2005. Sterling figures based on an exchange rate of £1 = \$1.88 as at 13 January 2005.

Name of company	<b>BP</b>	
Description of the company	BP is a global energy group employing over 100,000 people worldwide. Its main activities are the exploration and production of crude oil and natural gas; refining, marketing, supply and transportation; and the manufacture and marketing of petrochemicals. <sup>16</sup>	
Research and Development	US\$349 million (£187 million) (2003 Annual Accounts). <sup>17</sup>	
Definition of a major project (if applicable)	Previously, a major project was defined as having an investment of more than US\$500 million (£266 million). In 2005, a major project has a BP net investment of more than US\$100 million (£53 million).	
Total number of complex, high technology projects	As of June 2004, 19 major projects involving investment of more than \$500 million (£266 million).	
Average cost and duration of projects	<p>The 19 major projects above represented a capital investment of US\$55 billion (\$2.9 billion average) (£29 billion or £1.5 billion average).</p> <p>For major projects in excess of US\$100 million (£53 million), the average cost is US\$1.5 to 2 million (£780,000 - £1 million) with a schedule of between 34 and 39 months (approximately three years).</p>	
Indicative data on project performance (delivery on time and to budget)	BP is involved in many major projects including the 1,743 kilometre oil pipeline from Azerbaijan to Turkey employing over 17,000 people and costing some \$2.9 billion. The project is on budget and on track to come online by the end of 2006. Similarly, BP has invested in the Trinidadian gas reserve which is expanding to make a major contribution to energy security in the US.	
Reason for selection as case study	<p>Oil and gas industry selected as comparable to defence due to:</p> <p>High project values.</p> <p>Capital projects of large scale and technical complexity.</p> <p>The industry is also known for its innovation.</p> <p>BP is the leading UK company in this industry.</p>	
Projects visited	<p><b>Clair</b></p> <p>The Clair field is located off The Shetland Isles in about 140 metres (460 feet) of water. It covers an area of 220 square kilometres (85 square miles). For the initial stage of the Clair development, it is planned to drill 15 producing wells, 8 water injectors and one drill cuttings re-injection well.</p> <p><b>Angola (Greater Plutonio)</b></p> <p>The project to develop six fields will be the first BP-operated project in Angola. The fields Galio, Cromio, Paladio, Plutonio, Cobalto and Platina, collectively known as Greater Plutonio, are located in water depths of 1,200 to 1,500 metres. The development will consist of a single spread-moored floating, production, storage and offloading vessel linked by risers to a network of subsea flowlines, manifolds and wells.</p>	

<sup>16</sup> Source: www.bp.com accessed on 14 January 2004.

<sup>17</sup> Sterling figures based on an exchange rate of £1 = \$1.88 as at 13 January 2005.

Name of company	<b>Eli Lilly &amp; Co.</b>	
Description of the company	<p>128-year old global research-based pharmaceutical corporation with more than 46,000 employees worldwide. The company has developed a range of best-selling products including Iletin®, the first commercially available insulin product, developed in 1923; Prozac®, which revolutionized the treatment of depression; and Gemzar®, for pancreatic and non-small-cell lung cancer, one of the world's best-selling oncology agents.<sup>18</sup></p>	
Research and Development	<p>US\$2.4 billion (£1.3 billion) in 2003.<sup>19</sup></p>	
Definition of a major project (if applicable)	<p>The development of all new drugs are considered major projects.</p>	
Average cost and duration of projects	<p>Industry-wide data show that the average cost to discover and develop a new drug is in excess of US\$800 million (£426 million).</p> <p>The average length of time from discovery to regulatory approval is 10 to 15 years.</p>	
Indicative data on project performance (delivery on time and to budget)	<p>Historically, the maximum possible success rates for self-originating New Chemical Entities (Investigational New Drugs first filed in 1981 – 1992) ranged from 12 to 33 per cent, depending upon therapeutic class.<sup>20</sup></p>	
Reason for selection as case study	<p>Pharmaceutical industry selected as comparable to defence due to:</p> <ul style="list-style-type: none"> <li>High research and development costs.</li> <li>High project risk.</li> <li>Long timescales for research and development.</li> </ul> <p>Eli Lilly &amp; Co is a widely respected company with a significant project management operation.</p>	

18 Source: [www.lilly.com/about/highlights](http://www.lilly.com/about/highlights) accessed on 14 January 2005.

19 Source: [www.lilly.com/about/highlights](http://www.lilly.com/about/highlights) accessed on 14 January 2005. Sterling figures based on an exchange rate of £1 = \$1.88 as at 13 January 2005.

20 Source: DiMasi, J. A. 2001. Risks in new drug development: approval success rates for investigational drugs. *Clin Pharmacol Ther*; 69:297-307.

Name of company	<b>AMEC</b>	
Description of the company	AMEC plc is an international project management and services company that designs, delivers and supports infrastructure assets for customers worldwide across the public and private sectors. AMEC employs 45,000 people in more than 40 countries, generating annual revenues of around £5 billion.	
Research and Development	AMEC's Front End capability develops new concepts for customers.	
Definition of a major project (if applicable)	This will vary depending on the type of work and the industry but major projects often include design, build and operation of large-scale equipment and infrastructure plus multiple partnerships.	
Total number of complex, high technology projects	Approximately 50 in 2004 (in the Oil and Gas division which comprises 27 per cent of turnover).	
Average cost and duration of projects	This will vary widely between projects. Large new build projects can turnover several hundred million pounds sterling and last around three years. Major asset support projects can turnover 10-20 million pounds per year and last around five years, but may be renewed.	
Indicative data on project performance (delivery on time and to budget)	AMEC includes government departments, cities and communities across the globe on its client list, which choose AMEC for their ability to deliver.	
Reason for selection as case study	Construction industry selected as comparable to defence due to: High project values. Capital projects of large scale and scope. AMEC is a large and well-respected project management and services company.	

Name of company	<b>Mace Limited</b>	
Description of the company	Mace is an international project management company. With 1500 employees throughout Europe, Middle East and Africa; it offers an integrated management service for the design, delivery and operation of infrastructure and property related projects. In the UK the company works for 30 per cent of the FTSE 100 list and a good proportion of the local government authorities and government agencies.	
Research and Development	Mace has been involved in most of the Government-led initiatives to drive through change and improvement in the construction industry	
Definition of a major project (if applicable)	Major projects are categorised in different ways, some by value, some by complexity but all are business critical and offer a major business risk if they go wrong.	
Total number of complex, high technology projects	Mace has been involved in delivering complex projects such as Heathrow Terminal 5, The London Eye, Commonwealth Games, the deliverability piece for the Olympic Games 2012 London bid and a major IT relocation for Visa.	
Average cost and duration of projects	Individual projects range from £100,000 to several billion pounds. On behalf of our clients in 2004 Mace managed £5 billion of construction work.	
Indicative data on project performance (delivery on time and to budget)	Mace has a high value of repeat order work and customers regularly give scores of 85 per cent plus satisfaction.	
Reason for selection as case study	Construction industry selected as comparable to defence due to: High project values. Capital projects of large scale and scope. Mace is a recognised leader in their field and a well respected medium sized enterprise.	

Name of company	<b>Ericsson</b>
Description of the company	Ericsson is the largest supplier of mobile systems in the world and employs over 51,000 people. It has been operating globally for over 100 years and customers include the world's 10 largest mobile operators. Ericsson Microwave Systems is the defence-arm of the business, developing and manufacturing products for the Swedish National Defence and export market.
Research and Development	Skr23.2 billion (£1.8 billion). <sup>21</sup>
Definition of a major project (if applicable)	Greater than Skr1 billion (£76 million).
Total number of complex, high technology projects	Currently, greater than 100.
Average cost and duration of projects	Skr1 million to Skr10 billion (£78,000 to £775 million). Less than 1 year to 5 years.
Indicative data on project performance (delivery on time and to budget)	Ericsson has a long history of delivering complex projects. It has also delivered at times of pressing need, for example, successful execution of the contract for MAMBA to the UK MoD.
Reason for selection as case study	Telecommunications industry selected as comparable to defence due to: Projects of technological complexity. Ericsson is a well respected leader in the field. It also has a significant defence business, which uses the same Project Management methods as the rest of the business.

21 Sterling figures based on an exchange rate of £1 = Skr12.9 as at 14 January 2005.

## Overseas Case Studies

Country and organisation	<b>Australia Defence Materiel Organisation</b>
Total defence budget	\$A16.4 billion (£6.7 billion). <sup>22</sup>
Definition of a major project	Major Capital Project Threshold is \$A20 million <sup>23</sup> (£8.1 million).
Total number of complex, high technology projects	243 Major Capital Projects.
Average cost and duration of projects	The total value of projects within the current Approved Major Capital Investment Programme is \$A51.4 billion (£21 billion) with \$A36.2 billion (£15 billion) spent to date and \$A15.2 billion (£6 billion) remaining to be spent.  Average duration across the top 30 projects (by remaining spend) is 9 years 11 months.
Indicative data on project performance (delivery on time and to budget). <sup>24</sup>	For the current top 30 projects, total of net real cost changes (which includes approved scope changes as well as cost overruns) is \$A1.2 billion (£488 million) against aggregate total approval of \$A25.1 billion (£10.2 billion), (aggregate of 5 per cent cost growth).  13 of the current top 30 projects are expected to achieve their In Service Date as originally scheduled.
Reasons for selection as case study	Undergoing large-scale change.  Has large domestic defence industry.
List of projects visited during fieldwork (February 2004)	Military satellite (MILSATCOM)  Armed Reconnaissance Helicopter (AIR 87)  Air-to-Air Refuelling (AIR 5402)  Project Wedgetail Airborne Early Warning & Control (AIR 5077)  ANZAC Class Frigate (SEA 1348)

22 The Military Balance 2004-2005, International Institute for Strategic Studies, Oxford University Press, October 2004. Sterling figures based on an exchange rate of £1 = \$A2.46 as at 13 January 2005.

23 Source: [www.defence.gov.au/dmo](http://www.defence.gov.au/dmo) accessed on 13 January 2004.

24 Also see [www.anao.gov.au](http://www.anao.gov.au)

Country and organisation	<b>France Délégation Générale pour L'Armement (Defence Procurement Agency)</b>
Total defence budget	€32.4 billion (£22.7 billion). <sup>25</sup> DGA annual investment budget is in the order of €7.7 billion (£5.4 billion) including €1.1 billion Research and Technology expenditure (£770 million).
Definition of a major project	An investment operation or a set of operations intended for the armed forces and for which the Minister of Defence has decided to apply specific management provisions. Named "armament programme".
Total number of complex, high technology projects	78 ongoing armament programmes (excluding Research and Technology)
Average cost and duration of projects	Average cost is €1.5 billion (£1 billion) (excluding nuclear weapons programs) Average duration is 100 months from development start to main operational gate (8 <sup>1</sup> / <sub>3</sub> years).
Indicative data on project performance (delivery on time and to budget) <sup>26</sup>	Average yearly delay to next programme milestone is approximately 2 months (per programme). Average yearly programme cost increase is less than 1 per cent (per programme).
Reasons for selection as case study	Similar budget for defence as the UK. European context.
List of projects visited during fieldwork (February 2004)	Long range cruise missile (Storm Shadow/Scalp EG) Air Command and Control System (SCCOA)

25 The Military Balance 2004-2005, International Institute for Strategic Studies, Oxford University Press, October 2004. Sterling figures based on an exchange rate of

£1 = €1.43 as at 14 January 2005.

26 See also [www.ccomptes.fr](http://www.ccomptes.fr)

Country and organisation	<b>Sweden Försvarets Materielverk (Defence Materiel Administration)</b>
Total defence budget	Skr44.3 billion (£3.4 billion). <sup>27</sup>
Definition of a major project	Greater than Skr100 million (£7.8 million).
Total number of complex, high technology projects	11 arms orders and deliveries 2000-04. <sup>28</sup>
Indicative data on project performance (delivery on time and to budget) <sup>29</sup>	73 per cent of milestones were approved in comparison to contracted milestones (preliminary results in FMV Annual report 2004).
Reasons for selection as case study	History of self-reliance in defence. Has large domestic defence industry.
List of projects visited during fieldwork (February 2004)	Fighter/Attack Aircraft – JAS 39 Gripen Next Generation Light Anti-Armour Weapon Armoured Combat Vehicle (CV 90) Gotland Class Submarine Precision guided munition (Excalibur)

27 The Military Balance 2004-2005, International Institute for Strategic Studies, Oxford University Press, October 2004. Sterling figures based on an exchange rate of £1 = Skr12.9 as at 14 January 2005.

28 The Military Balance 2004-2005, International Institute for Strategic Studies, Oxford University Press, October 2004.

29 See also [www.riksrevisionen.se](http://www.riksrevisionen.se)

Country and organisation	<b>United States Department of Defense</b>
Total defence budget	US\$453.6 billion (2004) (£241.3 billion). <sup>30</sup>
Definition of a major project	The Major Defence Acquisition Programme threshold is US\$2.19 billion (£1.2 billion) total procurement cost. <sup>31</sup>
Total number of complex, high technology projects	82 Major Defence Acquisition Programs as of September 2004. <sup>32</sup>
Average cost and duration of projects	The average total acquisition cost for the 82 Major Programmes, which includes research, development, procurement and support costs, is \$16.7 billion (£8.9 billion) (September 2004 estimate).
Indicative data on project performance (delivery on time and to budget) <sup>33</sup>	In the third quarter of 2004, the 82 Major Programmes experienced some US\$958 million (£510 million) total net cost growth or plus 0.1 per cent, which was due primarily to an increase in missile quantities in a single programme.  Scheduling changes accounted for some 5 per cent of the total net cost growth.
Reasons for selection as case study	At the cutting edge of defence with a large number of high value, complex major projects.
List of projects visited during fieldwork (February 2004)	Aircraft Carriers (CVN) Amphibious Transport Dock (LPD 17) Virginia Class Submarine (SSN 774) Advanced Tactical Fighter (F/A-22) High Altitude Endurance Unmanned Aerial Vehicle (GLOBAL HAWK)

## Departmental Overview

Country and organisation	<b>United Kingdom Ministry of Defence</b>	
Total defence budget	£30.9 billion. <sup>34</sup> Of which £16 billion on procurement and support. <sup>35</sup>	
Definition of a major project	The Ministry of Defence uses four categories for its equipment programmes with Category A being a procurement cost of £400 million or more. <sup>36</sup>	
Total number of complex, high technology projects	36 Category A projects approved (as of February 2005).	
Average cost and duration of projects	Average project cost was £2.5 billion and average duration was 88 months (7 <sup>1</sup> / <sub>3</sub> years) (20 Category A projects in the Major Projects Report 2004).	
Data on project performance (delivery on time and to budget)	Average of £87 million increase in costs (3.6 per cent) and an average of 3.4 months delay (20 Category A projects in the Major Projects Report 2004).	

30 The Military Balance 2004-2005, International Institute for Strategic Studies, Oxford University Press, October 2004. Sterling figures based on an exchange rate of £1 = \$1.88 as at 13 January 2005.

31 In FY2000 constant dollars. Source: [www.acq.osd.mil/ap/mdap/index.html](http://www.acq.osd.mil/ap/mdap/index.html) accessed on 4 January 2005.

32 Source: Selected Acquisition Report Summary Tables, September 2004 via [www.acq.osd.mil/ara/am/sar/index.html](http://www.acq.osd.mil/ara/am/sar/index.html) accessed on 28 January 2005.

33 Also see [www.gao.gov](http://www.gao.gov)

34 Total Departmental Expenditure Limit 2005-06 as set out in HM Treasury 2004 Spending Review.

35 Planned 2004-05 (under 2002 Spending Review rules). Source: Ministry of Defence Resources by Budgetary Areas via [www.dasa.mod.uk](http://www.dasa.mod.uk)

36 The other four categories are Category B: £100-400 million; Category C: £20-100 million; Category D: Less than £20 million. Note that the approvals levels differ for other projects undertaken by the Department, in areas such as Defence Estates and Information Systems.

## Departmental Case Studies

Name of Integrated Project Team (IPT) and title of project	<b>Tactical Unmanned Aerial Vehicle Watchkeeper Project</b>
Phase	Four and a half years in to Assessment, the de-risking phase prior to the main investment decision. About to submit proposal for main investment.
Approximate value	£52 million approved for the Assessment phase Indicative procurement cost is £800 million
Description of the project	The Watchkeeper system will consist of unmanned air vehicles, sensors and ground control stations. It will provide the Land Component Commander with a 24-hour, all weather, Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) capability supplying accurate, timely and high quality imagery to answer commanders' critical information requirements.
Reason for selection as case study	Selected from the survey returns answering 'yes' to use of: Project scheduling tool; Linked project management and reporting systems; Shared Working Environment with contractor; Real-time electronic data system.

Name of IPT and title of project	<b>Major Warships HMS <i>Illustrious</i> Re-fit Project</b>
Phase	In-service upgrade. Two years in length as part of rolling cycle of major warship refits.
Approximate value	£110 million contract-value
Description of the project	The <i>HMS Illustrious</i> re-fit was composed of routine maintenance, alterations and additions and updates to the ship and equipment on board. The re-fit was undertaken under a partnering arrangement between the Warship Support Agency, Babcock BES and Ship Staff.  At the time of our visit in August 2004, the re-fit was 6 months away from completion.
Reason for selection as case study	In-service. Highlighted from the survey returns due to references to: Innovative partnering arrangement; Joint Refit Status Report/Shared Data Environment.

Name of IPT and title of project	<b>Dismounted Close Combat Future Infantry Soldier Technology Project</b>
Phase	Three and a half years in to Assessment phase, the de-risking phase prior to main investment decision.
Approximate value	£29 million approved for Assessment phase.
Description of the project	Indicative procurement cost is £583 million (most likely)  The programme will integrate key technologies that British soldiers will need to have access to in order to maintain their place among the world's best. Technologies receiving special emphasis include:  Improved protection (body armour and helmet); Improved communications and computing equipment to improve the transmission of orders and situational awareness; Improved surveillance devices and sights; Improvements to the underslung grenade launcher.  This programme will provide an integrated suite of equipment resulting in a reduction to the individual burden carried by the individual soldier.
Reason for selection as case study	Highlighted from the survey returns due to references to:  Formal partnering relationship;  Use of Earned Value Management data.

Name of IPT and title of project	<b>Joint Casualty Treatment Ship (JCTS)</b>
Phase	Three years in to Assessment phase, the de-risking phase prior to the main investment decision.
Approximate value	
Description of the project	Subject to further consideration  The JCTS Project is to develop and build, or convert, a ship to provide a casualty treatment facility. The JCTS differs from a hospital ship in that will operate as part of a maritime task force, and is not subject to the kinds of restrictions that the Geneva Convention places on a white-painted, red-cross hospital ship. JCTS will be an essential element of any naval task group deploying on operations and will therefore be held at five-day readiness. Subject to further study, the JCTS requirement is expected to be not more than 8 operating tables and 150 beds.
Reason for selection as case study	Selected from the survey returns answering 'yes' to:  Greater than 20 per cent of team time is taken up by reporting.

Name of IPT and title of project	<b>Special Projects CISR A Secure Communications Project</b>
Phase	18 months into Assessment phase, the de-risking phase prior to the main investment decision.
Approximate value	£20.2 million Assessment Phase approval Indicative procurement cost is £115 million (as estimated at the start of the Assessment phase)
Description of the project	Tactical Secure Voice and Data Radio Communications Capability for UK forces and to provide inter-operability with Allies. This capability will be hosted on Man, Land, Air and Sea Platforms. The system will facilitate Network Enabled Capability and provide Situational Awareness.
Reason for selection as case study	“Cluster” Integrated Project Team managing 50 projects. Selected from the survey returns answering ‘yes’ to: Linked project management and reporting system.

Name of IPT and title of project	<b>Defence Fixed Networks Defence Fixed Telecommunication Services (DFTS)</b>
Phase	Seven years into a 10-year Private Finance Initiative to provide a service to the Department. Currently renegotiating to extend the contract for a further 5 years to 2012.
Approximate value	£1.6 billion total contract value (current contract).
Description of the project	The purpose of the DFTS Agreement was to secure for the Department (Authority) a strategic rationalisation of the means of delivery and operation of its end-to-end fixed telecommunications service requirements within the United Kingdom and selected overseas locations.
Reason for selection as case study	Involves private financing. Selected from the survey returns answering ‘yes’ to: Project scheduling tool; Use of Earned Value Management data.

Name of IPT and title of project	<b>Engineer Tank Systems Trojan And Titan Project</b>
Phase	9 months into Manufacture phase, post main investment decision
Approximate value	£294 million contract value
Description of the project	Trojan and Titan are new armoured engineer vehicles to replace the ageing Chieftain engineer vehicle and bridge launcher that are unable to keep pace with the Challenger 2 Main Battle Tanks. They are the first heavy armoured engineer vehicles to be purpose built.
Reason for selection as case study	Post main investment decision and in main procurement phases. Selected from the survey returns answering 'yes' to: Project scheduling tool; Linked project management and reporting systems; Shared Working Environment with contractor; Real-time electronic data system.

Name of IPT and title of project	<b>Future Joint Combat Aircraft</b>
Phase	Four years in to Demonstration phase (post tailored investment decision covering Demonstration only).
Approximate value	£2 billion approved for participation in the Joint Strike Fighter System Development and Demonstration (SDD) phase and post SDD effort to develop full UK capability.
Description of the project	The Strategic Defence Review confirmed the requirement to provide the Joint Force 2000 (joint command for all Harrier forces) with a multi-role fighter/attack aircraft to replace the Royal Navy Sea Harrier and the Royal Air Force Harrier GR7. Following participation in the Concept Demonstration Phase of the US Joint Strike Fighter (JSF) programme, JSF was selected to meet the UK requirement. The planned in-service date is 2012 to coincide with the first of the new aircraft carriers entering service.
Reason for selection as case study	Involves international collaboration. High procurement value and complexity.

## APPENDIX 3

### Terminology

<b>Approval point</b>	The point at which the costs and timescale for a project are approved by the relevant authority.
<b>Assessment phase</b>	Second phase of a UK defence project which occurs after the first approval point, Initial Gate, and aims to identify the most cost-effective technological and procurement solution and reduce risk.
<b>Assurance</b>	The process by which senior managers and stakeholders satisfy themselves that the approaches to achieving the organisation's objectives are sound.
<b>Concept phase</b>	First phase of a UK defence project to define the users' requirements and identify technology and procurement options for meeting the need.
<b>Contractual milestones</b>	Targets linked to payments schedule in the contract or are stipulated in the contract (for example, a certain level of achievement by a certain date at a certain cost) and could have an incentive or penalty attached.
<b>Corporate Management Information System</b>	Database of monthly project performance data used by the Defence Procurement Agency to manage its business.
<b>Critical path</b>	The longest route to delivery, based on the plan for the execution of a project which consists of activities and their logical relationships to one another.
<b>Defence Balanced Scorecard</b>	The management system used by the Department to track internal processes and external outcomes, as well as financial position, to continuously improve strategic performance.
<b>Defence Information Infrastructure</b>	Project to provide a single common information system for the Department.
<b>Defence Logistics Organisation</b>	The tri-Service logistics organisation formed on 1 April 1999 to provide joint logistics support to the Armed Forces. Headed by the Chief of Defence Logistics.
<b>Defence Procurement Agency</b>	An executive agency of the Department formed on 1 April 1999 to procure new equipment for the Armed Forces. Headed by the Chief of Defence Procurement.
<b>Defence Management Board</b>	The highest non-ministerial committee in the Department. It acts as the main executive board providing senior level leadership and strategic management.
<b>Demonstration phase</b>	Third phase of a UK defence project which occurs after the second approval point, Main Gate, and aims to eliminate development risk in order to fix performance targets for manufacture.
<b>Director Equipment Capability</b>	The single point of contact between the Integrated Project Team Leader and the Equipment Capability Customer, responsible for a defined area of capability.

<b>Disposal phase</b>	Final phase of a UK defence project where plans are carried out for the efficient, effective and safe disposal of the equipment.
<b>DPA Forward</b>	Programme of change and reform in the Defence Procurement Agency.
<b>Dual accountable</b>	Defence integrated project team leaders receive delegated authority from the Chief of Defence Procurement and the Chief of Defence Logistics and are therefore accountable to both of them.
<b>Earned Value Management</b>	Process of representing physical progress achieved in terms of a cost based measure and integration of the cost, schedule and technical aspects of a contract.
<b>Equipment Capability Customer</b>	The customer organisation of the Department, responsible for developing and managing a balanced and affordable equipment programme to meet capability needs.
<b>External cost</b>	Reference to project balance sheet or ledgers - monitoring on the basis of money spent.
<b>Forecasts to completion</b>	Measuring progress in terms of what remains to be done, rather than work already done, and forecasting how long this may take, at what cost and at what level of quality.
<b>Front line commands</b>	Uses of equipment in-service.
<b>Functional oversight</b>	In the Defence Procurement Agency this refers to the Financial, Commercial and Technical pillars and their expertise and input into project planning and monitoring of progress.
<b>Gold Standard</b>	Framework for the comparative analysis during this study comprising good practice criteria in the area of project control.
<b>Governance</b>	The structure through which the objectives of the organisation are set and the means of attaining those objectives and monitoring performance are laid down.
<b>In-service phase</b>	Fifth phase of a UK defence project when the military capability is available for operational use. Projects must provide effective support to the front line, maintain levels of performance and carry out any upgrades as agreed.
<b>Integrated Baseline Review</b>	Aimed at achieving/maintaining a common client-contractor understanding of the risks inherent in the performance targets of the project from the start. (Often associated with the Earned Value Management approach).
<b>Integrated Project Team</b>	The term referring to the Departmental team responsible for delivering timely and cost-effective equipment to meet the stipulated requirements of the user. The team includes the core skills necessary to manage the project in each phase from concept to disposal and is led by an Integrated Project Team Leader.
<b>Joint Validation and Acceptance Team</b>	Mixed team of project stakeholders including front line users to guide the process of accepting equipment into operational service.
<b>Manufacture phase</b>	Fourth phase of a UK defence project when production is undertaken.
<b>Military capability</b>	An operational outcome or effect that users of equipment need to achieve.

<b>Project Performance Review</b>	A key part of the Project Review and Assurance process in the Defence Procurement Agency. Quarterly review meetings based on Key Performance Indicators between the Integrated Project Team Leader and relevant Operations Director.
<b>Project scheduling tool</b>	Use of a software package to plan out project activities. This may involve creating work packages that correspond to those being undertaken by a contractor/client.
<b>Project-to-project peer review</b>	The exchange of ideas, problem-solving and sharing experience that can occur between peers within an organisation.
<b>Key Stage Peer Review</b>	Review of a project by a review team comprising independent, non advocate, highly skilled and experienced members drawn from the Equipment Capability Customer, Defence Logistics Organisation and Defence Procurement Agency and externally. Such reviews are recommended at project initiation, pre-Initial Gate, pre-Main Gate and pre-Introduction into Service to give the Integrated Project Team Leader and the Director Equipment Capability an independent check on the strengths and weaknesses of the project.
<b>Key Supplier Management</b>	A co-ordinated approach to improving the Department's knowledge and understanding of the supplier base.
<b>Requirements Manager</b>	Representative of the Director Equipment Capability residing with the Integrated Project Team to oversee the development and achievement of user requirements as the project progresses.
<b>Resource Accounting and Budgeting</b>	A method of accounting that matches expenditure and income to the periods to which they relate.
<b>Risk register</b>	A method of recording all the risks to delivering a project that have been identified along with the likelihood of each risk occurring, the estimated impact should the risk occur and the mitigation actions.
<b>Shared Data Environment</b>	IT-based repository for sharing data and documentation between all parties to a project.
<b>Work Breakdown Structure</b>	A key planning tool used to define a project in terms of its deliverables while providing a method of breaking those deliverables into meaningful work efforts.