


Modernising Construction

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 87 Session 2000-2001: 11 January 2001





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This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the House of Commons in accordance with Section 9 of the Act.

John Bourn National Audit Office
Comptroller and Auditor General 22 December 2000

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foreword

Sir Michael Latham¹

The central message of "Constructing the Team" in 1994 was that the client should be at the core of the construction process. The general route recommended to achieve client satisfaction was through team work and co-operation. One specific method was partnering. Clear guidance for clients and the industry about best practice has since been published by the Construction Industry Board, the Treasury, the Construction Best Practice Programme and others, with very helpful input from the National Audit Office itself.

That message has been strongly reinforced by "Rethinking Construction" in 1998. Sir John Egan's task force showed that effective projects would require a clear process, of which partnering was a vital part. Creative design is important for a fine project, but a well run process, stripping out waste and inefficiency, is necessary to deliver the client's aspiration for an harmonious building or civil engineering project which also actually works.

Partnering has made great strides in recent years. The fastest growth has come in the Housing Association movement and some other parts of the public sector. The response from private commercial clients has been mixed. Some firms have led the way in best practice. Others have preferred traditional procurement routes. Many clients still do not understand that fiercely competitive tenders and accepting the lowest bid do not produce value for money in construction. "Lowest price" tenders may well contain no margin of profit for the contractor, whose commercial response is then to try to claw back the margin which was not in the tender through variations, claims and 'dutch auctioning' of subcontractors and suppliers. Such adversarial approaches have disfigured the construction industry over many years. They have produced high levels of litigation and conflict, low investment, inadequate research and development, negligible margins and low level of esteem of the industry by the public in general and graduates or school leavers in particular.

Partnering turns the process around. It assumes a win-win scenario for all parties. It looks for reasonable margins built up by the whole team on an open book basis. All are signed up to mutual objectives through a charter for the project. All agree on effective decision making procedures. Problems are to be resolved collaboratively by the entire team, not shoved off onto those least able to cope with them. Continuous improvement and benchmarking are crucial. Partnering can be for a specific project or on a longer term strategic basis. It can achieve real cost savings and client satisfaction.

This report by the NAO will be very influential in persuading clients and the construction industry to adopt Egan best practice. There are still too many clients, consultants and constructors who see partnering as an alien or threatening process. They could usefully reflect on how poorly they have been served by traditional methods. If all had been well with the construction industry, there would have been no need for the long stream of reports on its performance since Simon in 1944, nor for the critical findings of the Committee of Public Accounts and the NAO on departmental procurement over many years.

1. Sir Michael Latham was a member of the Committee of Public Accounts from 1983 to 1992. In 1994, he wrote "Constructing the Team", an independent review of construction, commissioned jointly by the Government and the construction industry with support of client bodies.

executive summary

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- 1 This report is about how the procurement and delivery of construction projects in the United Kingdom can be modernised, with benefits for all - the Construction Industry as well as clients. The construction business is worth £65 billion a year, of which direct expenditure by government departments and their agencies accounts for £7.5 billion. Government spending on construction will increase substantially following the spending Review 2000 which has doubled net public investment on infrastructure over the next three years to £19 billion to deliver improved transport, schools and hospitals. This higher level of spending on capital projects increases the urgency of the need for improvements in public sector procurement and management of new construction, refurbishment and repair and maintenance.
- 2 A succession of major studies (**Figure 1**) have highlighted the inefficiencies of traditional methods of procuring and managing major projects - in particular the fallacy of awarding contracts solely on the basis of the lowest price bid only to see the final price for the work increase significantly through contract variations with buildings often completed late (**Figure 2 overleaf**). Experience has shown that acceptance of the lowest price bid does not provide value for money in either the final cost of construction or the through life and operational costs. Relations between the construction industry and government departments have also often been typically characterised by conflict and distrust which have contributed to poor performance.

1 Key Reviews of UK Construction

Constructing the Team - Sir Michael Latham (1994)

Recommended more standardised construction contracts, better guidance on best practice and legislative changes to simplify dispute resolution. Many of the legislative changes were made through the Housing Grants, Construction and Regeneration Act 1996. The report considered that efficiency savings of 30 per cent in construction costs over five years were achievable.

Levene Efficiency Scrutiny (1995)

Recommended that departments should:

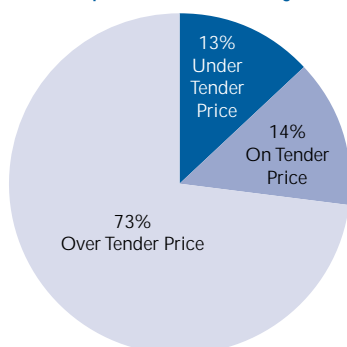
- communicate better with contractors to reduce conflict and disputes;
- increase the training which their staff received in procurement and risk management; and
- establish a single contact point for the construction industry to resolve problems common to a number of departments.

Rethinking Construction - Sir John Egan (1998)

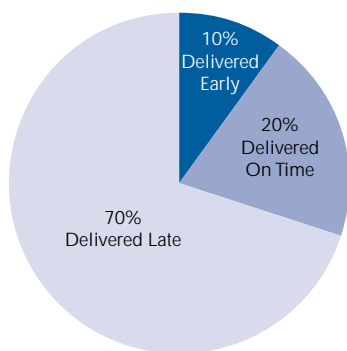
Identified five "drivers" which needed to be in place to secure improvement in construction; four processes that had to be significantly enhanced; and set seven quantified improvement targets, including annual reductions in construction costs and delivery times of 10 per cent and reductions in building defects of 20 per cent a year.

2 Performance of departments' and agencies' construction projects

Cost - 73 per cent were over budget



Time - 70 per cent were delivered late



Source: *Benchmarking the Government Client Stage Two Study December 1999*

- 3 Estimates of the cost of these inefficient practices are inevitably broad brush. But studies have identified the potential for major savings - 30 per cent in the cost of construction. Specifically by industry and its clients adopting a more collaborative approach strongly founded on a competitive process with appropriate risk sharing in which value for money is obtained for all parties through a clear understanding of the project's requirements, transparency as to costs and profits, underpinned by clearly understood rights and obligations, and appropriate incentives. More attention to design and early involvement of the whole construction team could also improve the operational efficiency of completed buildings resulting in potentially greater savings over the whole life of the building.

Responsibilities:

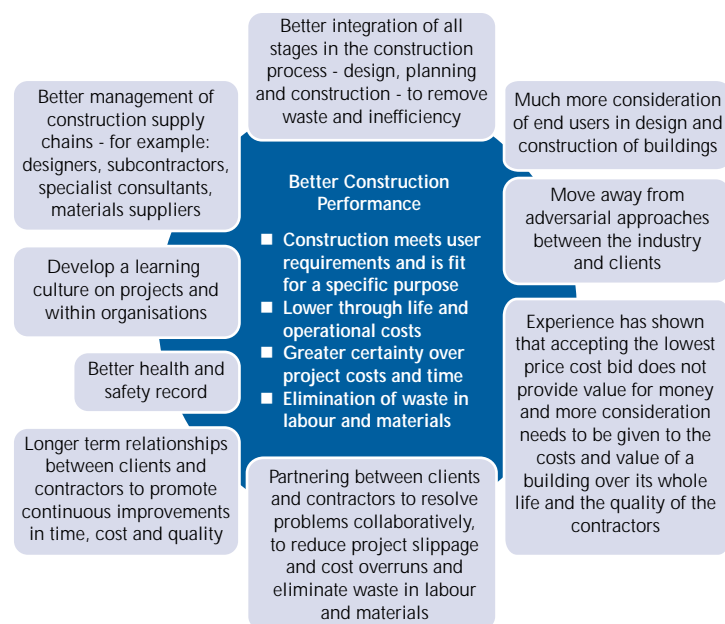
- The Department of the Environment, Transport and the Regions has central responsibility for securing improvements within the industry and its clients.
- The Office of Government Commerce leads the promotion of improvements in the performance of departments and agencies as purchasers of construction services.

- 4 This report is forward looking and highlights good practice being adopted by departments and industry which if applied more widely could achieve sustainable improvements in construction performance achieving better value for money for taxpayers. We show that, through changing their approach to the procurement and management of construction, the larger spending departments and agencies estimate that they will achieve efficiency gains of over £600 million annually and improve the quality of the construction. For industry, we show that the application of best practice has the potential to lead to improved profitability compared with the current industry average of one per cent of turnover.

The challenge - Improving construction performance

- 5 Many reasons are given as to why construction projects are often completed late and significantly over budget - **Figure 3** summarises aspects of the management of construction requiring improvement. But all the more recent reviews agree that a significant contributory factor is the tendency for an adversarial relationship to exist between construction firms, consultants and their clients and between contractors, sub-contractors and suppliers. This is attributed in part to clients placing too much emphasis on lowest price in awarding contracts. As a result some firms have priced work unrealistically low and then sought to recoup their profit margins through contract cost variations arising from, for example design changes, and other claims leading to disputes and litigation.
- 6 There needs to be a greater concentration on achieving a better construction which meets the needs of the end user at lower through life costs. The entire supply chain including clients, professional advisers, contractors, sub-contractors and suppliers of materials must be integrated to manage risk and apply value management and engineering techniques to improve buildability and drive waste out of the process. This process should reduce through life and operational costs, lead to greater certainty of project time and budgeted costs, fewer accidents and more sustainable construction.

3 Better construction performance - What is needed?



Source: National Audit Office analysis of Latham, Levene and Egan Reports

Improving the performance of departments and contractors

(i) Departments

7 The Department of the Environment, Transport and the Regions and the Treasury (from April 2000 the Office of Government Commerce) have taken a number of initiatives to improve construction performance. These include most notably:

- The **Movement for Innovation** and the Housing Forum to promote innovation in the construction industry principally through demonstration projects selected as examples of innovation in construction practice. At 31 July 2000 there were 171 demonstration projects, the lessons from which are being disseminated through conferences, seminars and electronically on the Web.
- **Achieving Excellence Programme** to improve the performance of departments as purchasers of construction services. Key elements include the targets set for departments, agencies and non-departmental public bodies for management, standard practices, integration of supply chains and performance measurement; procurement guidance; and a series of workshops to disseminate the message that departments need to improve their construction procurement and to draw up action plans to do so. All targets must be met by March 2002.

There are also many other organisations and networks - some privately and some publicly funded whose aim is to promote good practice suggesting some duplication. These have succeeded in raising awareness among the different parts of the industry - clients, contractors, consultants, and specialist suppliers - but there is now a need for more co-ordination and better direction of their activities.

8 As well as these initiatives, the Office of Government Commerce, departments and agencies are working to improve their performance as clients of the construction industry in four key areas: different forms of contracting; partnering; the introduction of the gateway process; and performance measurement. The Office of Government Commerce has issued useful guidance on many of these issues and others including sustainability.

4 The three main procurement approaches for central government departments' construction projects

Public Private Partnerships, particularly Private Finance Initiative projects - A supplier is contracted not only to construct a facility such as a road or prison but principally to deliver the services which the facility is intended to provide. Risks associated with providing the service are transferred to those best able to manage them. The outputs which the service is intended to deliver must be clearly defined.

Design and build - A single supplier is responsible for both the design and construction of the facility.

Prime Contracting - Whilst Design and Build makes a single supplier responsible for the design and build of a facility, prime contracting extends this basic concept very substantially. The Prime Contractor will be expected to have a well-established supply chain of reliable suppliers of quality products so encouraging the increased quality and value for money that results from an element of consistency and standardisation. As well as integrating that supply chain into the design process with contributions from key suppliers, the Prime Contractor co-ordinates and project manages all activities throughout the design and construction period to provide a facility which is fit for the specified purpose and which meets predicted through-life costs.

Different forms of contracting

- Traditional forms of contracting - tendering for each key stage in a construction project such as design, selecting the main contractor, appointing subcontractors, and awarding contracts on the basis of lowest price bid does not provide value for money in the longer term. This is because selecting the lowest price contract may result in a building or road that is more expensive to operate unless careful consideration is given to the design and likely quality of the proposed building, the methods which the contractor proposes to use to construct it, and the potential to be innovative to improve value for money. In recognition of this the Office of Government Commerce advises departments to undertake construction projects using one of three routes (Figure 4).
- The different forms of contracting are designed to transfer risk to those best able to manage it; to promote integration and management of all those involved in the construction process and to incentivise them to reduce costs and deliver on time; and to make departments minimise design changes and focus much more on the outputs they expect from the contract in terms of construction which better meets end user requirements. The Office of Government Commerce advises that the traditional procurement route - tendering for the design and construction separately - should be used only if a department can demonstrate that it will provide better value for money than any of the other three types of procurement.

Partnering

- Private sector clients are increasingly establishing long term collaborative relationships or partnering with construction firms for the benefit of both parties - client and supplier. The benefits include client and contractor working together to improve building design, minimise the need for costly design changes, identify ways of driving out inefficiency in the construction process, replicate good practice learned on earlier projects and minimise the risk of costly disputes. In the private sector different forms of partnering have delivered savings of between two per cent (project based partnering) and 30 per cent where strategic partnering is used in the cost of constructing buildings and the cost of partnering - setting it up and monitoring - is assessed as relatively low, adding usually less than one per cent to project costs.
- As emphasised in the research paper, which we commissioned from Professor Norman Fisher and Dr Stuart Green of Reading University (Appendix 4), partnering offers good potential to improve the performance of government departments' construction projects. We found examples of different forms of partnering being used by departments and agencies. For example, project based partnering was used in constructing the Dudley Southern Bypass², longer term relationships with contractors are being developed by the Highways Agency³, and the Ministry of Defence, represented by the Defence Estates Agency⁴, are using partnering to improve the management of all contractors involved in their construction supply chain.
- Partnering does not mean that departments have a cosy relationship with contractors - thus increasing the risk of less value for money and possibly fraud and impropriety. If established reliably, partnering can provide departments with greater assurance that value for money is being achieved. For example, partners should still be appointed competitively, and clear improvement targets should be set. There should be a commitment by both parties to continuous improvement and open book accounting - with departments having access to contractors' records - is key so that departments can have assurance about contractors' costs and efficiency improvements.

² More detail is provided in Appendix 12

³ More detail is provided in Appendix 7

⁴ More detail is provided in Appendix 6

Gateway process

- Independent reviews at critical points (known as gates) in the procurement process are a major component of private sector best practice. In June 2000 the Office of Government Commerce introduced on a pilot basis "the Gateway process" requiring major procurements including construction to be subject to review at certain key stages, such as agreeing the business need for a project, and before a contract is awarded, by a team sufficiently independent of the project. The purpose is to ensure that the project is justified and that the proposed procurement approach is likely to achieve value for money. The process will be introduced across government in early 2001.

Performance Measurement

- Measuring construction projects' performance is essential for ensuring that planned improvements in cost, time and quality are achieved, comparing achieved performance with that of similar projects, identifying potential for doing things better, and for assessing how contractors compare with other potential suppliers. The Department of the Environment, Transport and the Regions in collaboration with the construction industry has developed a range of Key Performance Indicators covering, for example, the time it takes to complete projects, their costs and quality, client satisfaction and health and safety. The Government Construction Clients Panel and the Office of Government Commerce have developed a series of key performance indicators to measure performance during the life of a project. The system will be introduced across government early in 2001.
- 9 We assessed the impact which the initiatives to improve construction were having on the performance of four organisations - NHS Estates, Defence Estates, the Highways Agency and the Environment Agency - which collectively are responsible for a spend of over £5 billion a year on construction and represent the majority of new works by central government. We found that each were implementing a programme of reforms to improve their procurement and management of construction. As yet, however, it is too early to quantify the benefits being achieved and little information is available but all four organisations predict significant savings in construction costs and improvements in quality (Figure 5).

Contract strategies which incentivise construction firms to perform better; which require departments to consider the individual risk involved with any construction project carefully and place the risk with the party who is best able to manage it; and different forms of partnering between departments and contractors committed to continuous improvement all have considerable potential to improve the quality and cost effective delivery of central government departments' construction. To be successful, however, reliable performance measurement is needed to ensure that planned benefits are achieved and remedial action is taken quickly when performance is less than satisfactory.

5 Estimated improvements achievable in construction performance

Organisation	Estimate
NHS Estates	Ten per cent reduction in construction costs for the NHS as a whole and should release £300 million each year.
Defence Estates	Thirty per cent (approximately £250-300 million improvement in value for money) on the cost of constructing and running buildings annually by 2005.
The Highways Agency	At present little quantifiable information is available other than at individual project level. The Agency envisages, however, that its new strategy will deliver improvements in time, cost and quality. It is currently quantifying the benefits.
The Environment Agency	Thirty per cent (approximately £35 million) in construction costs by 2008-2009.

Source: National Audit Office analysis

(ii) The construction industry

- 10** The Department of the Environment, Transport and the Regions, working with the construction industry, has encouraged a number of initiatives to promote improvements in the performance of construction firms. For example, in response to a challenge from the Department of Environment, Transport and the Regions' Ministers, the Construction Client's Forum (now the Confederation of Construction Clients) has developed the Clients Charter. Clients who sign the Charter commit to three to five year programmes for improving their performance, and to measure both their own performance and that of the projects for which they are client. The Construction Industry Board, representing all sections of the industry, clients as well as suppliers, also develops policies aimed at improving construction performance such as enhancing the quality and skills of the construction workforce.
- 11** We asked 11 large construction firms and 17 specialist contractors and consultants (**Figure 6**) to identify the initiatives they were taking to improve the services which they provided to their customers.

6 Large construction firms, specialist contractors and consultants consulted

Construction firms

- Balfour Beatty PLC
- Jackson Building Ltd
- John Laing
- Kvaerner Construction Ltd
- Alfred McAlpine
- AMEC Plc
- Coulson Group Ltd
- MANSELL plc
- Morrison
- John Doyle Ltd
- Tendring Construction Ltd

Specialist contractors and consultants

- Allford Hall Monaghan Morris
- Amey Plc
- Atelier Ten
- Bennetts Associates Ltd
- Building Design Partnership
- Drake and Scull Engineering
- Edward Cullinan
- Gardiner and Theobald
- Gibb
- Halcrow
- Mace
- Property Tectonics
- Stannah Lifts Ltd
- Terrapin Ltd
- Thorburn Colquhoun
- The Cook and Butler Partnership
- WS Atkins

Specific examples included establishing longer term relationships and partnering arrangements (Balfour Beatty PLC); providing more value to customers with greater consideration of their needs (Alfred McAlpine and Halcrow); better supply management (Terrapin Ltd), learning from promoting good practice (MANSELL plc) and investing in research and development to

identify better ways of reducing the whole life cost such as maintenance of buildings (WS Atkins). There are however a number of factors which could limit improvements in construction performance.

- **Skills of the construction workforce.** Between 1994 and 1998 applications for construction related courses run by Universities for professional staff fell by 26 per cent and both contractors and consultants expressed concern that the industry is becoming increasingly reliant on a less skilled work force. There is also concern that departments' staff are not sufficiently well trained to be intelligent construction clients.
- **Information technology.** There is considerable potential to achieve efficiency improvements by improving the cost effectiveness of construction and by making much greater use of information technology to assist in the design of buildings and streamlining the management of the construction process. Our survey of how the UK compared with construction good practice overseas (Appendix 3) found that the UK was generally behind other countries in the use of information technology in construction.
- **Research and Development.** Investment in research and development in the construction industry is low. In 1999/2000, in an industry with a turnover of £65 billion, £270 million was spent on construction research and development, of this £47 million was funded by central government departments; £147 million by industry; and the remainder by other organisations (Research Councils, Higher Education Funding Council, European Union for example). However, the majority of the industry research is commissioned by the construction materials, components and systems suppliers. The industry's ability to improve and to be innovative could be impeded if it does not invest more in research and development. In Japan the top five construction companies invest one per cent of their turnover in research and development.

Procuring and Managing Construction

- 12 Our examination of construction projects found general recognition by departments and agencies of the importance of procuring and managing construction better and a commitment to improve. The extent to which good practice is being applied was, however, variable and was generally, better understood by those departments and agencies such as NHS Estates, Defence Estates and the Highways Agency which have large on-going construction programmes and dedicated centres of construction management expertise. Smaller Government organisations undertake a construction project only once every few years and as a result many have less experience of current good practice. Our examination identified six essential requirements for all construction projects, once the need for such a project has been established, if value for money is to be achieved (**Figure 7**).

7 Key requirements of procuring and managing construction including maintenance and refurbishment

Requirement

1. **Contractors should be selected on the basis of achieving long term sustainable value for money and not just lowest price.**

The lowest tender price alone will not guarantee value for money over the full life of the building. Consideration also needs to be given to the quality of the design, the proposed method of construction and the likely implications for the costs of operating the completed construction over its whole life and meeting health and safety performance needs.

Illustrated by



Balancing quality and price

In awarding Design and Build contracts, the Highways Agency evaluates tenders on quality and price. The key elements of which are:

- The Agency gives different weightings to quality and price depending on the complexity of the project, for example, for innovative projects the split is 40 per cent on quality and 60 per cent on price (although on some contracts such as framework arrangements a weighting as high as 80 per cent was applied to quality) whereas for repeat projects or where a standard design can be used, the split is 20 per cent on quality and 80 per cent on price.
- For each project, the Highways Agency determines the key quality aspects to be assessed, for example, innovative approaches to solving issues such as embankments on motorways, and promoting health and safety.
- Tenderers have to submit the quality and price elements of their bids in separate envelopes. The quality tenders must be at or above a pre-determined threshold, before the price tender is considered.
- Only contractors who have demonstrated that they can construct roads of the right quality and within budget will be selected.



BENEFITS SECURED

The Highways Agency is able to give greater consideration to the quality of the final construction. It also means that contractors have more incentive to put forward innovative designs and cover longer term aspects such as the whole life costs of roads and environmental impact because they are aware that price will not be the only criterion by which their tender will be judged (further detail is provided in Appendix 7).

Requirement

2. **Construction design should not be a separate process but be integrated with the whole construction process so that the design team can take more responsibility for the implications of their design including cost, quality, buildability and the health and safety of those required to construct, maintain and demolish the building.**

It is at the design stage that most can be done to optimise the value of a building to its end users. This means consulting the end users of the building in developing the design and involving the main contractor and specialist suppliers at an early enough stage to advise on the likely impact of the design on the cost and feasibility of construction and to agree realistic timetables.

Illustrated by



Integrating the design team - Building Down Barriers

Normal construction practice is for an architect to develop the initial building design in isolation. This can sometimes lead to problems of "buildability" - aspects of the design may be difficult to build or may not be cost effective or there may be better solutions. In Building Down Barriers, Defence Estates and their Prime Contractors - Laing and AMEC adopted a different approach to the design of two physical and recreation centres by organising their project on the basis of "supply clusters" centred around aspects of the work such as mechanical and electrical services. All those involved in a "supply cluster" participated in the design development and there was also extensive consultation with end users.



BENEFITS SECURED

The users are very satisfied with the physical and recreation centres which fully meet their specific needs. The involvement of suppliers and specialist contractors in the design also aided buildability with both projects completed early and have resulted in buildings which have lower predicted through life costs than similar buildings which are conventionally built (further detail is provided in Appendix 13).

Requirement

3. **Sufficient time should be given to planning before starting construction. Good planning involves:**

- **Getting the construction sequence right** so as to minimise delays from key building materials not being supplied on time or one part of the construction being completed late or out of sequence.
- **Risk assessment and management** - identifying, assessing and managing project risk from the outset for example, ensuring that key resources are supplied on time, construction is completed on time and health and safety risks to people are effectively controlled.
- **Value management** (assessing the contribution or "value" of each part of the construction process and considering how it can be improved) to drive out waste, inefficiency and unnecessary losses from construction.

Illustrated by



Benefits of planning - Dudley Southern Bypass

Considerable effort went into planning this project and no works were carried out until the team was satisfied that it knew the site conditions, the likely risks to the project and had adequate plans in place.



BENEFITS SECURED

The project was completed five months ahead of schedule and within the target cost and the budget agreed with Department of the Environment, Transport and the Regions. There are no outstanding claims on the project and the final account was in July 2000. These results were achieved despite a major enhancement to the scheme with the decision, taken after the start of the project, to construct a new Metro line parallel to a section of the road. The team altered its plans to take account of this in constructing the road. This work is estimated to have saved over £3 million on the cost of the Metro line (further detail is provided in Appendix 12).

Requirement

4. **Reliable project management needs to be in place. The characteristics of good project management are:**

- **Comprehensive understanding** of the key stages in construction critical to its success.
- **Detailed knowledge of risks** associated with the project and reliable contingency arrangements to manage them.
- **Regular monitoring** of key milestones.
- **Effective communication** and co-ordination of all those involved in the construction supply chain.

Illustrated by**Good project management**

Kingston Hospital and its contractor Terrapin relied upon good project management to ensure the successful completion of a surgical block within twenty weeks. This required: meticulous planning and co-ordination of the key stages of construction to ensure there were no delays to the timetable; quick and efficient information flows around all team members so that all parties had access to the information needed to carry out their tasks and decisions could be made quickly; clear allocation of responsibilities, but with joint problem solving where necessary; and daily site meetings to monitor progress and identify problems.

**BENEFITS SECURED**

Good project management meant that the project team was able to cope with unexpected problems, such as the discovery that site information was not accurate with previously unidentified underground services passing underneath the site. Whilst this caused a two week delay initially, the project was completed within the required timescale of twenty weeks (further detail is provided in Appendix 10).

Requirement

5. **The performance of construction projects should be measured to assess whether cost, time and quality requirements are being met and to learn and disseminate lessons for future projects.**

Illustrated by**Measuring performance**

Defence Estates is measuring construction performance in two ways:

- **External Benchmarking**

Defence Estates assess the performance of the Ministry of Defence against other major purchasers of construction through participation in a number of benchmarking initiatives - the Government Clients Construction Panel, the European Construction Institute, the Business Excellence Model and the Major Contractors Group.

- **A framework for performance measurement**

Including **core** performance measures which compare Defence projects' performance with that of the construction industry as a whole covering time to complete projects, average cost, number of defects, accident frequency, and customer satisfaction; **secondary** measures which compare different Defence Estates' projects covering the number of changes to project requirements, final cost against initial estimate, and end user satisfaction; and **tertiary** measures which are project specific and cover the achievement of targets to improve the performance of the project for example building cost reductions, and lower maintenance and operating costs, (further detail is provided in Appendix 6).

Requirement

6. **Contractors should be remunerated in a way that incentivises them to deliver good quality construction on time and to budget.**

How contractors are remunerated will influence their performance. Careful judgement is needed to ensure that contractors have sufficient financial incentives to perform well while departments need to be confident that value for money is being achieved.

Illustrated by**ENVIRONMENT AGENCY****Agreeing a target price - The Environment Agency Beach Management Project**

The Environment Agency has contracted with three major dredging companies to provide all its beach defence works on the south and east coasts for five years. Instead of setting a fixed price for the work, the Environment Agency, after detailed negotiations on costs, agreed a target price for each package of work incorporating year on year improvements. The contractor is incentivised to perform better than the target price by receiving an equitable share of any savings or by paying part of any costs over the target price.

**BENEFITS SECURED**

The five year contract is not yet complete but the Agency has seen substantial cost improvements on historic benchmark costs and is on target to make the planned savings of 15 per cent within the five years (further detail is provided in Appendix 8).

Recommendations

- 13 We make the following recommendations to four key groups: the Department of the Environment, Transport and the Regions, the Office of Government Commerce, line departments commissioning construction projects and the Construction Industry itself:

The Department of the Environment, Transport and the Regions

- **Provide more co-ordinated direction to initiatives to promote better performance by the construction industry.** The Department has promoted several initiatives, including disseminating good practice, which have been successful in winning the support of the construction industry to change their working practices to improve their performance. There is, however, evidence of some duplication in these initiatives and those of the many industry bodies promoting improvements. It may be that it is necessary to communicate with such a large, diverse industry in many ways but some members of the construction industry reported to us a sense of confusion about the best source of assistance and where to devote their time to facilitate the most improvement in their company or organisation. It is essential that all the sectors of industry know what they need to do to improve and how and where to get advice to do so. The Construction Industry Board now has responsibility for providing strategic leadership to the improvement programme as part of its expanded remit and in working with the Department it should as a priority give more co-ordinated direction to the industry improvement programme.
- **Uses its influence as a member of the Movement for Innovation Board to ensure that demonstration projects are truly innovative.** Demonstration projects as part of the Movement for Innovation programme have been an efficient way of alerting the construction industry to good practice and innovation. To promote widespread interest the Movement for Innovation team initially accepted all suggestions for demonstration projects put forward by the industry. Not all projects however were truly innovative. The Movement for Innovation Board is tightening the criteria but in the future should ensure that not only are the projects truly innovative but that they can also measure their performance.

- **Develop more sophisticated performance measures.** The Department working with the construction industry has developed and promoted key performance indicators to measure construction performance. These measures have been generally successful in raising firms' awareness of the need to assess their performance in delivering construction services to clients and to benchmark their performance against other suppliers. These measures are an important first step but now require further development. For example, indicators are needed to measure:

- **the operational - through life - running costs of completed buildings** to determine whether efficiency improvements which the original design was intended to deliver were achieved and to learn lessons for the future;
- **the cost effectiveness of the construction process** such as labour productivity on site, extent of wasted materials, and the amount of construction work that has to be redone;
- **quality of the completed construction** and whether it is truly fit for the purpose designed and if not what are the lessons for the future; and
- **health and safety indicators** that are measures of success rather than just failure.

The Office of Government Commerce

- **Disseminate good practice more widely.** The large purchasers of construction such as NHS Estates, the Ministry of Defence and the Highways Agency accept the need to improve their procurement and management of construction and have action underway. Other departments and agencies may only have a construction project every few years but most will have an on-going repair and maintenance programme. Many departments also fund building projects indirectly through grants, for example, the Department for Culture, Media and Sport covers a number of bodies which distribute funds for capital projects such as the Sports Council and Arts Council. The extent to which these smaller organisations and those receiving funding indirectly understand and apply good construction practice is variable. It is important that the Office of Government Commerce's initiatives to promote good practice reach these bodies.

Line Departments

- **Actively measure improvements in construction performance.** Successive independent reviews have emphasised the considerable potential to improve the quality of construction and to reduce costs. Sir John Egan's Report Rethinking Construction estimated that a reduction of 10 per cent per year in construction costs was achievable. Based on departments and agencies' expenditure on construction in 1999-2000 this is some £750 million. These are, however, only construction cost savings - the savings in the cost of running a building over its whole life are likely to be greater if designs placed more emphasis on improving the operational efficiency of completed constructions.
- Improvements will be achieved only if **(i)** the good practice initiatives promoted by the Department of the Environment, Transport and the Regions and the Office of Government Commerce are actively and widely implemented by departments; **(ii)** departments have reliable systems for monitoring and measuring the achievement of these benefits and in particular costs savings. In the Annex to this executive summary we have set out some key questions which departments need to consider in order to quantify improvements in construction performance; and **(iii)** departments and agencies also have a role to play in ensuring that good practice initiatives are disseminated internally and implemented.
- **Train more staff to be effective construction clients.** Procuring and managing construction requires expert and specialist skills as reflected in the Treasury's Procurement Guidance number 1 which sets out the role and skills requirements of project sponsors. The Office of Government Commerce has developed a training programme for project sponsors - those who represent the department as client in all relations with contractors. By January 2000, 100 out of approximately 950 project sponsors had attended the training. Departments should ensure that all staff involved in procuring and managing construction attend appropriate training.

The Construction Industry

- **Make greater use of innovation to improve public sector construction.** The construction industry including consultant architects, engineers, quality surveyors and project managers, has much to gain from the initiatives underway to improve how departments procure and manage construction. Remuneration on the basis of a target price with opportunities to share in efficiency gains; greater responsibility for building design; longer term relationships; and partnering with a commitment to continuous improvement if implemented widely by government departments will provide contractors with opportunities to earn a reasonable return from government construction projects and should make it easier for them to estimate final costs. The construction industry for its part should continue to support and promote initiatives to improve its performance. And in particular make greater use of innovation drawing on their private sector experience to improve the quality and cost effectiveness of public sector buildings.

Annex

Key questions for line departments and agencies to consider in quantifying improvements in construction performance

- 1 A number of independent reviews have emphasised the considerable potential to improve the performance of government departments' construction projects and to reduce construction costs by 10 per cent. For this to be achieved departments need to consider cost savings and quality improvements at a very early stage in a construction project and to monitor and measure their achievement. To do so departments need to consider the following questions:

In assessing the need for construction

- Is there a need for the project at all?
- How should the need be fulfilled, for example a new construction, refurbishment of an existing structure or renting?
- How does the cost of the proposed building compare with the cost of other buildings constructed for a similar purpose?
- If the cost of the proposal is more, how is this justified?

In assessing the procurement strategy

- Has the most appropriate procurement strategy been chosen - public private partnership, design and build, prime contracting or traditional?

In assessing the likely operational running costs of the proposed construction

- What are the likely - whole life - running, maintenance and other support costs of operating the proposed building including disposal costs (a quantified estimate should be prepared)?
- How do the proposed running costs compare with costs for existing buildings and other comparable constructions. If costs are higher how are they justified?
- Has the whole design and construction team been assembled before the design is well developed?
- Is supply chain integration being achieved from the outset of the design process?
- Has the design given sufficient consideration to optimising the operational efficiency and effectiveness of the completed construction and have these improvements been quantified?

In assessing the contract strategy

- Have efficiency and cost improvement targets been agreed with the contractor and quantified?
- Have incentives been included in the contract to encourage contractors to perform well?
- Have the benefits to be delivered been quantified before incentive payments will be paid?

In assessing the proposed method of construction

- Have appropriate techniques been used such as value management and value engineering⁵ to determine whether the potential for waste and inefficiency has been minimised in the method of construction?
- Have efficiency improvements, to be delivered by the construction process, been quantified?

A baseline is needed against which to measure achieved performance

- 2 In demonstrating the achievement of improvements in construction, performance at baseline cost should be set for the following:
 - Total investment required to complete construction - fit for purpose.
 - Cost of the construction - the building process.
 - Whole life running costs of the completed building.

Baseline costs should be validated through comparisons with external benchmarks

- 3 Building costs should be justified, through benchmarking with some external comparator on historic data on existing building costs and performance, to demonstrate the value for money which the new project will deliver.

Achievement of improvements should be carefully monitored, measured and publicised

- 4 Having set cost reduction, efficiency and quality improvement targets, these need to be monitored regularly. If progress in meeting these targets is not as planned remedial action should be taken. Performance in achieving the targets should be quantified and reported to senior management.

Summary

Baseline costs	Action needed to validate them	When to measure
Total investment required to complete the building fit for purpose.	Benchmarking with existing and comparable buildings.	Baseline cost should be set when the need for construction is agreed and revised once a firm contract is in place. Final cost should be compared with baseline.
The cost of the construction process.	Assurance that techniques such as value engineering have been used to drive out waste and inefficiency.	Baseline should be agreed before construction begins, monitored and final cost compared with baseline and reported to senior management.
Whole life running cost of the completed building.	Comparisons with performance of existing buildings and industry norms.	Baseline should be set in agreeing the building design and monitored once the building is operational to ensure the improvements are realised.

⁵ Value management or engineering - The assessment of the contribution or 'value' of each part of the construction process and considering how it can be improved to drive out waste and inefficiency from construction.

Part 1

The Challenge - Improving construction performance

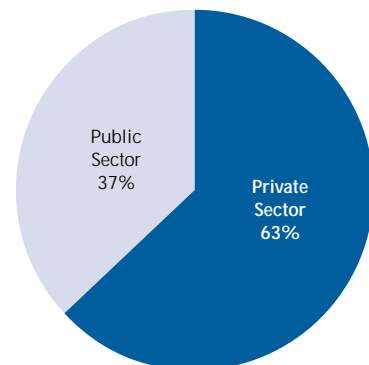
- 1.1 The UK construction industry is a significant contributor to the national economy accounting for 8 per cent of gross domestic product and employing 1.9 million people (**Figure 8**). Government departments and agencies can have a major influence on the construction industry as sponsor, regulator and purchaser of building projects ranging in size from £10,000 (typically repair works for example, small flood defence projects) to £500 million (the British Library). Some 37 per cent of the industry's turnover is funded by the public sector which collectively makes it one of the largest clients. This client base consists of central government (expenditure in 1999-2000 was some £7.5 billion) and local government (expenditure in 1999-2000 was some £11 billion) and other bodies funded either entirely by government or in receipt of capital grants; for example, recipients of lottery grants.
- 1.2 This report looks at recent measures to improve the delivery of construction services - both new building projects and repairs and maintenance. It examines specifically the progress made by the Department of Environment, Transport and the Regions' and the Treasury's (now the Office of Government Commerce) initiatives in encouraging:
- Departments and agencies to improve the way they procure and manage construction projects; and
 - the UK construction industry to innovate and be more effective in providing construction services.
- 1.3 This part of the report outlines **(i)** the challenge faced by the industry and government departments as clients; **(ii)** how the Department of Environment, Transport and the Regions and the Office of Government Commerce have sought to promote improvements in the way that the industry and clients operate; **(iii)** what has been achieved and what more needs to be done; and **(iv)** how we approached the study.

8 Key facts about the construction industry

	1999
Total output value	£65 billion
Contribution to Gross domestic product	8 per cent
Number of employees	1.9 million
Of which self employed:	500,000
Total number of firms in the sector	163,236
Of which	95% have 1-13 employees
	4% have 14-79 employees
	1% have over 80 employees

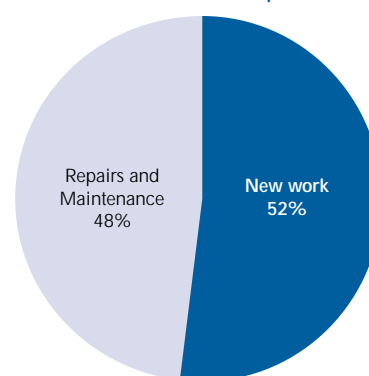
The construction industry plays a major part in the national economy but is highly fragmented.

Construction Market 1999



The public sector accounts for 37% of the construction industry's business.

Construction Market output 1999



This shows the composition of construction output between new work and repairs and maintenance.

Source: Department of the Environment, Transport and the Regions

(i) The Challenge

1.4 Successive independent reviews of construction in the UK have emphasised the need to improve the culture, attitudes and working practices which have existed in the industry for a long time. These reviews (see below) have identified the need for a number of fundamental changes in the way construction services are procured and delivered to improve value for money (**Figure 9**). The chronology of these reviews and subsequent Government initiatives is given at **Figure 10**.

9 Aspects of the construction process requiring improvement

- Much more consideration of end users in the design and construction of buildings, including future needs. If flexibility is required it must be assessed as part of the value for money evaluation of options and taken into account in designs.
- Better integration of the various stages in the construction process - design, planning, construction, and completion to remove waste and inefficiency.
- Partnering between clients, contractors and consultants to resolve problems collaboratively, reduce project slippage and cost overruns, promote innovation and improve quality.
- Longer term relationships between clients and contractors to promote continuous improvement in the cost and quality of final products.
- Recognition that accepting lowest tender price for the initial capital costs does not give value for money and more consideration needs to be given to the costs of a building over its whole life.
- Better integration of the construction supply chain for example, architects, surveyors, contractors, building suppliers.
- Move away from adversarial approaches between the industry and clients which have produced high levels of litigation.
- Greater use of prefabrication and standardised building components in construction to improve quality and cost effectiveness.

Source: National Audit Office analysis of Latham, Levene and Egan Reports

10 Chronology of key reports and initiatives in construction

1994	Constructing the Team - Sir Michael Latham's broad examination of the industry concluded that the industry's traditional methods of procurement and contract management and its adversarial culture caused inefficiency and ineffectiveness. He concluded that addressing these issues had the potential for saving 30 per cent over 5 years.
1995	Construction Industry Board formed as a consequence of the Latham review to drive performance improvement through partnership between industry, Government and clients and to be a strategic forum for the industry.
1996	Levene Efficiency Scrutiny into Construction Procurement by Government concluded that Government bodies were partly to blame for the poor performance of the industry and made recommendations to improve the structure and management of construction projects and the skill level of Government clients.
1997	Construction (Design and Management) Regulations 1994 came into force setting out a clear framework for addressing health and safety issues in the construction process. The Regulations apply to everyone in the construction supply chain - clients, architects, engineers, surveyors, designers and contractors.
1997	Government Construction Clients Panel was established by the Treasury to improve Government client performance and to provide a single collective voice for Government construction clients on cross-departmental aspects of procurement.
1998	Building Down Barriers project launched to assess and demonstrate the benefits of supply chain integration.
1998	The Pilot Benchmarking study published in October, was the first attempt to benchmark performance across central Government and provided quantitative evidence of the need to improve.
1998	Construction Best Practice Programme established by the Department of Environment, Transport and the Regions to communicate existing good practice within the industry.
1998	Construction Task Force headed by Sir John Egan was set up to advise the Deputy Prime Minister from the client's perspective on the opportunities to improve the efficiency and quality of delivery of construction, to reinforce the impetus for change and to make industry more responsive to customer needs. The Task Force produced the report " Rethinking Construction. "
1998	Movement for Innovation launched to bring together and facilitate the exchange of knowledge between those in the industry and its clients who are committed to the principles of "Rethinking Construction."
1998	Housing Forum launched in response to "Rethinking Construction" to take forward specific improvement initiatives in the housebuilding sector.
1998	' Constructing the Best Government Client ' was commissioned by the Government Construction Clients Panel and compared Government performance with best practice in the UK and abroad.
1999	Achieving Excellence launched by the Government Construction Client Panel, which set targets and an action plan for implementing "Rethinking Construction" targets in Government.
1999	Commission for Architecture and the Built Environment set up by the Department of Culture, Media and Sport to promote high quality design and architecture and to raise the standard of the built environment generally.
1999	Local Government Task Force launched to promote the principles of "Rethinking Construction" in local authorities.
2000 ¹	Construction Industry Board Root and Branch Review recommended the establishment of a new body "to add value through pan-industry strategic leadership to realise an efficient and successful construction industry that fully meets clients' needs and expectations."
2000	Government Construction Client Panel published <i>Achieving Sustainability in Construction Procurement</i> setting out an action plan to promote sustainable construction that is achieving less waste in construction and contributing to less pollution, better environmental management, and improved health and safety, for example.

Note: 1. A number of other relevant reports were published in 2000 including *Building a Better Quality of Life: A strategy for more sustainable construction*; *A Commitment to People: our biggest asset*; *A Vision Shared: The Movement for Innovation second anniversary report*; *The Housing Demonstration Projects Report: Improving through measurement*; *Rethinking Construction: Twenty good ideas for rethinking refurbishment repairs and maintenance*; *Better Public Buildings: a proud legacy for the future*.

Source: National Audit Office analysis

11 Key Recommendations of Constructing the Team - Sir Michael Latham and the Levene Efficiency Scrutiny

Constructing the Team - Sir Michael Latham (1994)

- The Department of the Environment, Transport and the Regions to take lead responsibility for the sponsorship and regulation of the construction industry.
- Legislative changes to simplify dispute resolution and ensure prompt payment - many of these were made through the Housing Grants, Construction and Regeneration Act 1996.
- The establishment of a single organisation to bring together all sections of the industry and clients, - resulted in the establishment of the Construction Industry Board which was set up to implement, monitor and review the recommendations from the report. It was the first organisation to have membership from all sectors of the industry and clients. The formation of a separate group representing clients was also a report recommendation and led to the Construction Clients Forum.
- The publication of a wide variety of guidance, checklists and codes on best practice in various aspects of the procurement, design and construction processes - the Construction Industry Board and other bodies have done this.
- The establishment of a single central public sector register of consultants and contractors - this has resulted in the establishment of ConstructionLine - a central qualification database of contractors and consultants run by a public/private partnership with a Government steering group.
- The need for more standardisation and effective forms of contract, which address issues of clarity, fairness, roles and responsibilities, allocation of risks, dispute resolution and payment - this has resulted in the redrafting of the main forms of contract such as "Government Contract (work)".

Levene Efficiency Scrutiny into Construction Procurement by Government (1995)

The scrutiny made a number of recommendations to improve the procurement and management of construction projects. These include better communication with the construction industry to reduce conflict; adoption of a more commercial approach; negotiation of deals justified on value for money grounds; and increased training of civil servants on procurement and risk management. Treasury (now the Office of Government Commerce) assumed responsibility for co-ordinating construction procurement policy across government.

Source: National Audit Office analysis of the Latham and Levene Reports

1.5 The three most significant recent reviews are:

- **Constructing the Team - Sir Michael Latham (1994).** This report sought the views of contractors and key private and public sector clients. It proposed a clear action plan with timescales and nominated people to implement its recommendations. It concluded that if its recommendations were implemented, there was the potential to achieve efficiency savings of 30 per cent over five years in total construction costs. It asserted that implementation must begin with the client and recommended that the Government commit itself to becoming a best practice client (see [Figure 11](#)).

n The Levene Efficiency Scrutiny into Construction Procurement by Government (1995). Following the Latham Report, the Cabinet Office initiated an Efficiency Scrutiny into Government procurement of construction which concluded that departments and agencies were partly to blame for the poor performance of the industry. The scrutiny found that departments: were often unrealistic about budgets or timetables; had an over simplistic view of competition; often failed to understand and manage risks; and were not organised so that industry had a single contact with whom they could discuss and resolve common problems across a number of departments and agencies (see [Figure 11](#)).

- **Rethinking Construction - Sir John Egan (1998).** By 1997, the recommendations of the Latham report had been largely implemented either as a whole or in part. But progress in achieving improvement in the performance of the construction industry was perceived to be slow by private sector clients and government departments. As a result a number of new initiatives were put in train, the most significant of which was the establishment of the Construction Task Force led by Sir John Egan. The task force's remit was "to advise the Deputy Prime Minister from the clients' perspective on the opportunities to improve the efficiency and quality of delivery of UK construction, to reinforce the impetus for change and to make the industry more responsive to customers needs". The task force's report saw a need for "a change of style, culture and process". To this end, it identified five "drivers" which needed to be in place to secure improvement in the construction industry; four key processes which had to be significantly enhanced; and set seven quantified targets for the level of improvements to be achieved ([Figure 12](#)). These targets included annual reductions in construction costs and delivery times of 10 per cent and reductions in building defects of 20 per cent a year.

1.6 These reports and consequent work by departments and industry bodies have identified a number of fundamental barriers which need to be overcome if construction performance is to improve and become more cost effective. These include addressing cultural issues such as the lack of respect shown towards those who work in the industry as demonstrated by its poor safety record and inability to recruit and retain good quality staff. There is a lack of a culture of learning from previous projects or construction industry best practice, which is reinforced by a culture of blame, and little investment in research and development. Barriers related to the procurement and management of individual projects are detailed in [Figure 13 \(page 22\)](#). The Government is committed to tackling these barriers to improve both the performance of the construction industry and to encourage departments to improve their procurement and management of construction projects.

- 12** The key elements and processes which the Egan Report - Rethinking Construction (1998) recommended need to be in place to secure significant improvement in construction performance

Five key drivers which need to be in place to achieve better construction

1. Committed leadership
2. Focus on the customer
3. Integration of process & team around the project
4. A quality driven agenda
5. Commitment to people

Four key projected processes needed to achieve change

1. **Partnering the Supply Chain**
Develop long term relationships based on continuous improvement with a supply chain
2. **Components and Parts**
Sustained programme of improvement for the production and delivery of components
3. **Focus on End Products**
Integration and focus on construction process on meeting the needs of the end user
4. **Construction Process**
Elimination of waste

Seven annual targets which are capable of being achieved in improving the performance of construction projects

1. Reduce capital costs by 10%
2. Reduce construction time by 10%
3. Reduce defects by 20%
4. Reduce accidents by 20%
5. Increase predictability of projected cost and time estimates by 10%
6. Increase productivity by 10%
7. Increase turnover and profits by 10%

Source: *Movement for Innovation*

13 Major Barriers to improving construction performance

Clients	Designers	Contractors	Sub contractors and specialist suppliers
Procurement			
<ul style="list-style-type: none"> Contractors selected on lowest price rather than quality 	<ul style="list-style-type: none"> Underbid to get work leading to poor designs with need for reworking on construction 	<ul style="list-style-type: none"> Underbid to get work, relying on poor specifications, client changes and cost variations to make profit 	<ul style="list-style-type: none"> Underbidding or prices are forced down by dutch auctions
Briefing and Specification			
<ul style="list-style-type: none"> Poor briefing and definition of requirements with insufficient focus on user needs and the functionality of the construction Lack of focus on the business case with the associated right brief and budget Use of prescriptive specifications which stifles innovation and restricts the scope for value for money 	<ul style="list-style-type: none"> Insufficient weight given to users' needs and fitness for purpose of the construction 	<ul style="list-style-type: none"> Reluctance to point out weaknesses in specifications 	
Design and planning			
<ul style="list-style-type: none"> Limited awareness of potential available solutions 	<ul style="list-style-type: none"> Little integration of design teams or of the integration of the design and construction processes Design often adds to the inefficiency of the construction process and accidents 	<ul style="list-style-type: none"> Contractors not involved in the design process Poor planning leads to inefficient and wasteful processes and accidents 	<ul style="list-style-type: none"> Processes are such that specialist contractors and suppliers cannot contribute their experience and knowledge to designs
<ul style="list-style-type: none"> Limited understanding of value management Limited understanding of the benefits and uses of prefabrication and standardisation Appointing designers separately from the rest of the team Making late variations to requirements 	<ul style="list-style-type: none"> Limited use of value management Reluctance to use prefabrication and standardisation 	<ul style="list-style-type: none"> Limited use of value management Limited use of prefabrication and standardisation 	<ul style="list-style-type: none"> Little involvement in value management
Project Management			
<ul style="list-style-type: none"> Poor project management skills Tendency to pass risk on rather than identify it, allocate it appropriately and manage it. Reliance on contracts to resolve problems with adversarial relationships 	<ul style="list-style-type: none"> Resistance to the integration of the supply chain. Limited understanding of risk management Limited understanding of the true cost of construction components and processes 	<ul style="list-style-type: none"> Limited project management skills with a stronger emphasis on crisis management Limited identification and management of risk Reliance on contracts to resolve problems with adversarial relationships Late payment to subcontractors and suppliers Limited understanding of the true cost of construction components and processes 	<ul style="list-style-type: none"> Poor cashflow because of late payments

Source: National Audit Office analysis

- 1.7 In addition successive reports by the Committee of Public Accounts have recommended ways in which the delivery of central government construction projects could be improved (Figure 14).

(ii) Initiatives to improve the way that the construction industry and their clients operate

- 1.8 The Department of Environment, Transport and Regions has central responsibility for promoting improvements within the industry and its clients. The Treasury (and latterly the Office of Government Commerce) leads the promotion of improvements in the performance of departments and agencies as purchasers of construction services (Figure 15, page 24). Both have taken a range of initiatives to promote improvements.

Department of the Environment Transport and the Regions

- 1.9 The Department has launched several initiatives aimed at different sectors of the construction industry and its clients.

- **Constructionline** was launched in July 1998 as a public-private partnership to provide a qualification service with contractors and consultants assessed against financial, technical and managerial criteria set by Department of the Environment, Transport and the Regions. Suppliers who satisfy the criteria are placed on a list which public sector clients can access. In principle this should reduce the process costs of selecting suppliers for both clients and industry, but there is a tension between the demands of clients who tend to ask for an increasing variety of detailed information, and more rigorous independent assessment, and suppliers who are concerned that the detail required and the assessment procedure should not become too burdensome. Further negotiations are required on the development of the system before its use becomes widespread in the public sector.
- **Movement for Innovation.** This was established in November 1998 to promote innovation in the construction industry and to share good practice. The Movement is funded by the Department and cost £550,000 in 1999-2000. The construction industry has provided some team and Board members. It encourages contractors and clients to put forward examples of good construction practice known as Demonstration Projects focusing in particular on ways of achieving the Egan Targets (Figure 12). At 31 July 2000, there were 171 Demonstration Projects, the lessons from which are being disseminated through conferences and seminars. Details are also available electronically on the Web.

14 Lessons on the procurement and management of construction identified in previous Committee of Public Accounts' reports

On identifying the need

- Decisions to spend large sums of taxpayers' money should be based on reliable investment appraisals.¹
- Public bodies should undertake comprehensive assessments of the need for new building projects before the decision to proceed is taken.²

Procurement

- Tendering arrangements, whilst being equitable, should enable contractors to put forward bids that will provide value for money for the taxpayer.¹
- There is a need for unambiguous contract arrangements which attribute responsibility clearly.³

Design and planning

- Techniques such as whole - life costing and value engineering should be used.²
- Specifications of complex systems should be established early during design.³

Project management

- Departments should ensure that construction projects have:
 - a budget covering the whole of the project at the outset and strong budgetary control throughout the project;
 - uncomplicated project management structures;
 - clear roles and responsibilities among the various parties, one of whom should decide on time, cost and quality issues;
 - vigorous quality assurance systems which operate as construction progresses.³
 - Departments need contractors to complete projects to the required time, cost and quality. Risks cannot be simply contracted out, to an extent they must also be identified and managed by the department.¹

Payment

- Departments should have fee arrangements which provide a financial incentive to complete projects on time, to quality and within budget.³

Evaluation

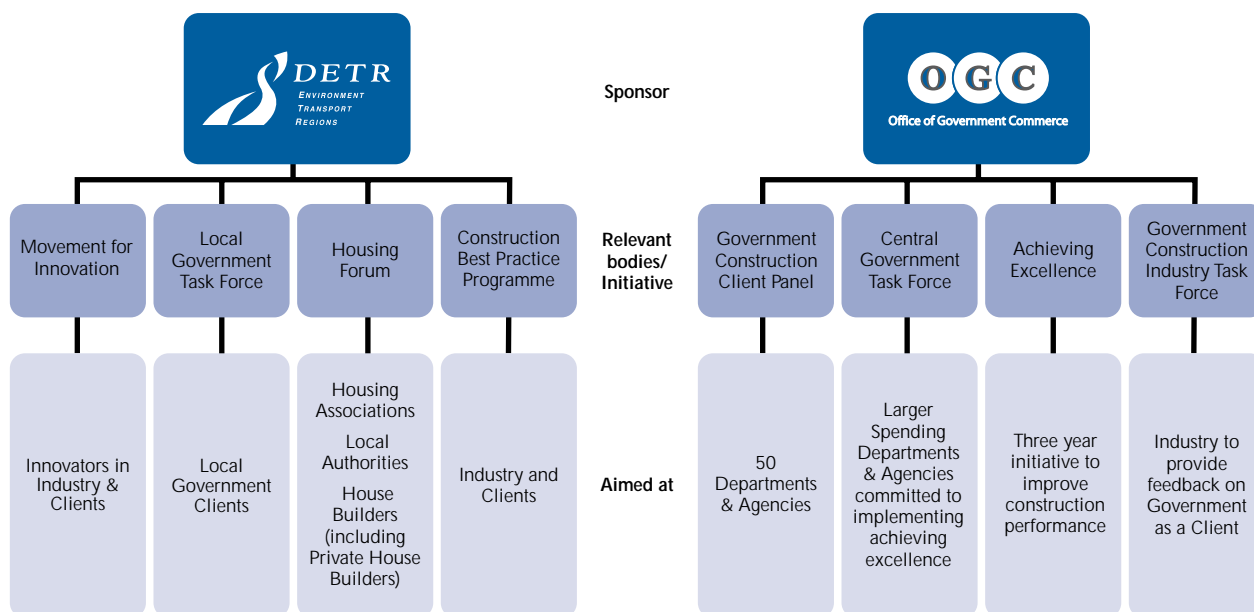
- Performance review is an essential part of effective project management. Evaluations on completion of a project should look at whether the original assumptions have been borne out in reality, identify any lessons for the future and check whether the project has yielded the expected benefits.¹

Client Skills

- Project sponsors are key to successful and cost effective management of capital works projects. As a minimum, project sponsors need to understand the essentials of construction to ensure that contractors do their job and to be able to identify opportunities for using techniques to reduce costs.¹
- Continuity of key staff on major projects is essential.¹

- Sources: 1. Committee of Public Accounts Forty - first report 1994-95, Ministry of Defence: Management of Capital Works Programme
2. Committee of Public Accounts Fortieth report 1997-98, The Management of Building Projects at English Higher Education Institutions
3. Committee of Public Accounts Second report 1996-97: Progress in Completing the New British Library

15 Department of the Environment, Transport and the Regions and Office of Government Commerce initiatives to improve performance in the construction industry and clients



Source: National Audit Office analysis

- **Construction Best Practice Programme** was established in February 1998 and cost £2 million in 1999-2000. The programme is intended to raise awareness across the industry of the need to change, identify good practice and disseminates this information to enable organisations to take action. Its services include a help desk which companies can contact, a Web site to disseminate good practice, and a company visit scheme - 40 host companies have undertaken to share their good practice with others.
- **Housing Forum.** This was launched in December 1998 to take forward improvement initiatives directed at the house building sector and costs annually about £½ million. Its activities include demonstration projects to promote good practice, a benchmarking club, and a series of working groups to explore current issues such as sustainability of buildings, customer satisfaction and refurbishment.
- **Local Government Task Force.** Launched in October 1999, it is intended to promote the principles of good practice set out in Sir John Egan's report "Rethinking Construction to Local Authorities".

In addition, the Department spent £23 million in 1999-2000 on research and development to promote improvements in construction. Much of this expenditure is in collaboration with the construction industry to fund benchmarking, value management and process mapping to improve construction performance. More detail on these initiatives is provided in Appendix 2.

Office of Government Commerce

1.10 The Office of Government Commerce was established in April 2000 and assumed responsibility from the Treasury for leading the Government's initiative to improve departments' and agencies' performance as purchasers of construction services and for disseminating good practice guidance to help achieve this. Key initiatives are:

- The **Achieving Excellence Programme**, launched in March 1999, to improve the performance of departments, agencies and non departmental bodies as purchasers of construction services, to create a market force, which will require the industry to improve its performance. Key elements of the programme include an Action Plan which makes clear the processes Government clients should implement including the use of risk management, output/performance based specifications, life costing, performance indicators, post project implementation reviews, team working and partnering principles. The target date for full implementation is March 2002. The programme has included a series of workshops to disseminate the message, and a requirement for government bodies to provide an action plan.
- The **Government Construction Client Panel** has a membership of 50 and an active core of 20 departments and is intended to ensure that all departments and agencies apply management approaches to become and remain best practice construction clients. The panel seeks to do this by

16 The main three procurement routes recommended by the Office of Government Commerce for central government departments' construction projects

Procurement Route

Public - Private Partnerships, particularly Private Finance Initiative projects.

A supplier is contracted not only to construct a facility such as a road or prison, but also to deliver the services which the facility is intended to provide. Risks associated with providing the service are transferred to those best able to manage them. The outputs which the service is intended to deliver must be clearly defined.

Design and Build

A single supplier is responsible for both the design and construction of the facility. Clients have to specify the type of building they require in terms of the outputs and services it is intended to deliver and the contractor proposes the best design to meet this.

Prime Contracting

Whilst Design and Build makes a single supplier responsible for the design and construction of a facility, Prime Contracting extends this basic concept very substantially. The Prime Contractor will be expected to have a well - established relationship with a supply chain of reliable suppliers of quality products so encouraging the increased quality and value for money that results from an element of consistency and standardisation. As well as integrating that supply chain into the design process with contributions from key suppliers, the Prime Contractor co-ordinates and project manages throughout the design and construction period to provide a facility which is fit for the specified purpose, and meets its predicted through-life costs.

Benefits

- The use of private sector management and business skills incentivised by having private finance at risk.
- The transfer of risks to those best able to manage them.
- New and innovative approaches including solutions which do not necessarily require a construction project.
- A focus on customer requirements.

- Innovation in meeting the output specification is promoted.
- It creates the opportunities for standardisation of design and building components.
- It allows the integration of the design and construction process.
- The risk of design failure is transferred to the contractor.
- There is greater price certainty.

- Innovative solutions are promoted.
- Integration of design and construction process.
- Permits continuous improvement targets to be set.
- Allows waste to be eliminated from the process by the use of value engineering and risk management techniques.

Source: Office of Government Commerce and the National Audit Office

meeting regularly to exchange views on experience and good practice.

- The **Central Government Task Force** consists of a small core of larger spending (covering 75 per cent of central Government expenditure) departments and agencies who are committed to implementing "Achieving Excellence" in their own organisations and monitors progress across central government departments.
- The **Government Construction Industry Task Force** provide industry feedback on Government's proposals for improving its performance as a client.
- The **Sustainability Action Plan** published in June 2000, by the Government Construction Clients' Panel, sets targets at group and individual organisational level for implementation of action plans by March 2003 to introduce measures including evaluation of sustainability issues, whole life cost assessment and measurement of energy consumption.

1.11 The Office of Commerce now expects departments and agencies to procure construction projects using one of three routes (**Figure 16**). Traditional procurement - that is tendering for each key stage such as design, appointing quantity surveyors, selecting the main contractor and appointing subcontractors and awarding all contracts mainly on the basis of the lowest tender - should be used only if a department or agency can demonstrate that it will provide better value for money than any of the other three types of procurement.

1.12 Each of these procurement approaches still require suppliers to be appointed competitively.

(iii) What has been achieved so far in improving construction performance and further progress needed

1.13 All of the above initiatives are having an impact in improving construction performance:

- The Movement for Innovation has generated 171 demonstration projects, which have resulted in 31 case histories by May 2000, with up to twenty due to be published in the autumn 2000. Working in partnership with the Department of Environment, Transport and the Regions, the Construction Best Practice Programme and the Construction Industry Board (paragraph 2.18) it has also developed and disseminated the key performance indicators which are helping to raise awareness in the industry about the need to measure performance.
- The Construction Best Practice Programme estimates that it has reached 9 per cent of the working population in the industry through its programme of seminars and workshops and the provision of information.

- The Housing Forum has approved 56 demonstration projects in the housing sector which have a total construction value of £320 million.
 - Departments estimate that they have made good progress in meeting the Achieving Excellence Programme targets (see [Figure 17](#)).
- 1.14 It is, as yet, difficult to determine whether the improvements in process and growing awareness of best practice have started to deliver the improvements in value for money as recommended by Sir John Egan's report "Rethinking Construction" across the spectrum of industry and clients. However, from initial results, the demonstration projects are showing significant improvements in measured performance compared to the industry average, many cases broadly matching the targets in "Rethinking Construction".
- 1.15 The Department of Environment, Transport, and the Regions, the Office of Government Commerce and the construction industry generally, however, all accept that further progress is needed in a number of areas.
- **Promoting improvements in construction performance.** The initiatives launched by the Department of Environment, Transport and the Regions have been successful in raising awareness and winning broad support among the construction industry and its clients for the need for change. There are, however, many other organisations and networks - some privately and some publicly funded - whose aim is to promote improvements ([Figure 18](#)). Our discussions with the industry and clients indicated that this has caused confusion about the respective roles of the organisations, the messages they give and makes it difficult for the target audience to decide where best to devote its energy and resources. This suggests that there is potential for more co-ordination and direction.
 - **Disseminating and applying the lessons.** Defence Estates, the Highways Agency, NHS Estates and the Environment Agency as well as introducing improvements in their own organisations, are also contributing to the wider movement for change by: submitting demonstration projects to the Movement for Innovation; and providing senior staff members to sit on the Board of bodies such as Movement for Innovation. They have also made efforts to disseminate the lessons they have learnt through their work. For example, Defence Estates contributed to the production of a handbook on supply chain management based on the Building Down Barriers project, published Prime Contracting Terms and Conditions and has also run training courses. NHS Estates has hosted seminars and produced a CD-ROM on its work on design. The Highways Agency has contributed knowledge and funds to research projects with the Construction Industry Research and Information Association (CIRIA). Other departments and agencies, generally smaller purchasers of construction, are less advanced in applying better construction procurement practices.
 - **Construction funded indirectly.** Many departments also fund building projects indirectly through grants, for instance the Department for Education and Employment and the Department for Culture, Media and Sport cover a number of bodies which distribute funds for capital projects such as the Sports Council and Arts Council. There is a need to ensure that the guidance on the use of these funds reflects the best practice aimed at achieving the improvements envisaged in "Rethinking Construction". The Office of Government Commerce has started discussions with these departments on how they can contribute to improving procurement practices among grant

17 Progress by departments and agencies in implementing Achieving Excellence

Departments are on course for achieving the Achieving Excellence targets

Objective	Target percentage of departments	Achievement at March 2000
Standardisation		
Departments will apply standard practices such as the award of contracts on value for money criteria not the lowest price; output based specification; and use of risk and value management	50% by March 2000	50%
Integration		
Departments should:		
review and reduce project and financial approval chains	70% by March 2001	56%
apply team working/partnering principles	50% by March 2000	56%
use procurement strategies based on integrated supply chain relationships	50% by March 2000	50%
Measurement		
Suppliers should:		
be satisfied with departments as clients	70% by March 2001 90% by March 2002	71%

Source: Office of Government Commerce

recipients. The Department for Culture, Media and Sport has also established a group to maximise value for money from construction projects where third party procurers or heritage sites are involved.

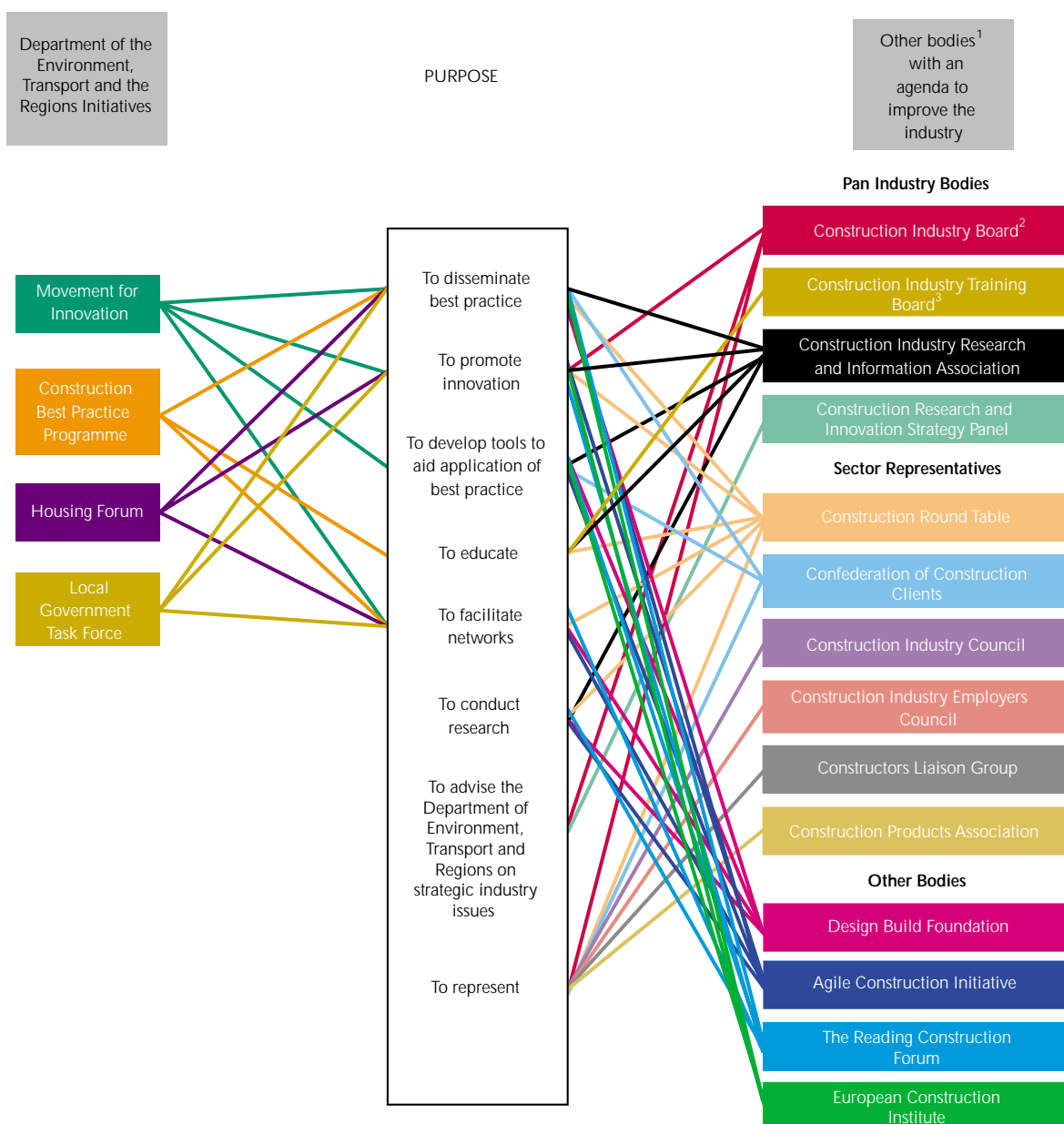
- **Repairs and maintenance.** Not all departments and agencies regularly have major construction projects underway, but all incur expenditure on repairs and maintenance (in 1999-2000 public sector expenditure was some £18.5 billion)⁶. The drive to improve construction performance applies equally

to repairs and maintenance. For example, to ensure that best practice is extended into this area, Defence Estates is developing a contract for **one stop shops** where a Prime Contractor will deliver all property maintenance as well as capital works within a region.

- **Recruitment and Retention.** The Construction Industry Training Board's Business Plan for 1999-2000 reports that the increase in construction output in recent years has increased the need for new

18 Bodies concerned with promoting improvements within the construction industry

There are many bodies working to improve practice in the construction industry with increased potential for confusion amongst members of construction and clients.



- Notes:
1. Private sector bodies.
 2. These are bodies with part funding from the Department of the Environment, Transport and the Regions.
 3. The sponsor department for the Construction Industry Training Board is the Department for Education and Employment. It is funded primarily by a levy on the industry.

recruits into the industry. Even without this increase, the industry would need to recruit over 300,000 people in the next five years just to replace those leaving the industry. The companies and industry commentators we spoke to voiced concern that the industry is unable to recruit good quality people due to its poor image in terms of security of employment, safety, pay and conditions of work. As a result the industry is becoming increasingly reliant upon a less skilled workforce.

- **Education and training.** Our discussions with 11 construction firms and 17 specialist contractors and consultants indicated that they were concerned that the construction industry was unlikely to have sufficient appropriate skills covering all disciplines to implement improvements such as integrating the design and construction process. Between 1994 and 1998 applications for construction related courses⁷ run by Universities for professional staff fell by 26 per cent and there is concern that the industry is becoming increasingly reliant on a less skilled workforce.
- **Information Technology** is not used widely in the construction industry and rarely in an integrated way for example, from tender stage through design and construction (including computer assisted building design) with full electronic communications between the client, design team and operational staff. There are no common information technology standards across the industry.
- **Cultural change.** It is important that good construction procurement practice is accepted and applied at all levels in government organisations. To achieve this the Office of Government Commerce recognise the importance of all staff involved in some aspect of construction receiving appropriate training. As a first step, the Office has issued guidance and developed a training programme for project sponsors - those who represent the organisation as client in all relations with contractors - by January 2000 100 out of approximately 950 project sponsors had attended this training.

1.16 In order to assess how the UK compared with good practice overseas we commissioned Davis Langdon Consultancy to carry out a survey of recent construction industry initiatives in seven countries (Appendix 3). Key common issues include the importance of meeting client needs, the need to integrate design and construction and the value of measuring and benchmarking to improve performance. The role of Government in promoting best practice, especially for public sector construction, is prominent in all countries. The survey suggests that the UK is slightly ahead in the development and implementation of initiatives to

improve the procurement and management of construction projects. Singapore appears to be ahead in quality assessment systems and Finland in the promotion of the use of information technology in the construction industry.

1.17 Against this background we examined how supplier and client performance is being improved, focusing, in particular, on the use of different forms of partnership (Part 2); and how departments and agencies are improving their procurement and the management of construction projects (Part 3). Our aim throughout the study was to be forward looking and to identify good practice and the lessons learned which can be more widely applied to improve value for money.

(iv) How we approached the study

In carrying out the study we:

- consulted a large number of key players in the construction industry including Sir Michael Latham and Sir John Egan, large and medium sized contractors, professional institutes, consultants and industry commentators (Appendix 14);
- examined progress made by four government organisations in implementing changes to construction procurement - Defence Estates, NHS Estates, The Highways Agency, and The Environment Agency (Appendices 5 to 8);
- examined five Movement for Innovation (paragraph 1.9) demonstration projects - Anglian Water; NHS - Kingston Hospital; Notley Green Primary school; Dudley Southern by pass; and Defence Estates - Building Down Barriers. These were chosen as examples where the organisations or project teams had applied good practice with potential for wider application (Appendices 9 to 13);
- Commissioned Professor Norman Fisher and Dr Stuart Green of the Department of Construction, Management and Engineering, University of Reading to produce a paper on Partnering in the UK Construction Industry (Appendix 4); and
- established an expert panel to advise on the study and its findings. The panel comprised Malcolm Dodds, Reading Construction Forum; Professor Norman Fisher, Reading University; Professor Andrew Graves, University of Bath; and Mark Smalley of the Warwick Manufacturing Group.

More detail on the methodology is provided in Appendix 1

Part 2

Improving Client and Supplier Performance

2.1 The reviews by Sir Michael Latham "Constructing the Team" and Sir John Egan "Rethinking Construction" (paragraph 1.5) emphasised that the significant potential to improve construction performance would only be realised if both the industry and departments changed their approaches and working practices. This part of the report examines (i) progress in establishing partnering arrangements between departments and construction suppliers as one means of promoting better value for money; (ii) initiatives taken by NHS Estates, Defence Estates, the Highways Agency and the Environment Agency, who collectively have responsibility for an estate valued at £160 billion and annual expenditure on capital works and maintenance in the region of £6 billion, to improve their performance; and (iii) initiatives to promote better performance by construction firms.

(i) Partnering

2.2 Successive independent reviews have concluded that a key factor explaining why construction projects are often late, significantly over budget, and do not always meet end users' requirements is the tendency for an adversarial relationship to exist between contractors, sub-contractors, suppliers and their clients. This is attributed in part to departments placing too much emphasis on lowest price in awarding construction contracts. As a result some firms have priced their work unrealistically low on the assumption that they would be able to recoup their profit margins through contract cost variations and claims leading to disputes and litigation. One solution to this which is increasingly employed by private sector clients is to establish longer term collaborative relationships and partnering arrangements with construction firms for the benefit of both parties.

2.3 Partnering is a management technique embracing a range of practices designed to promote more co-operative working between contracting parties (Figure 19 overleaf sets out the typical parties involved in a construction project). The objective is to align and unite the parties

with a shared goal of completing the scope of work in a cost effective and timely manner which is mutually beneficial. Partnering usually takes two forms:

- **Project partnering** involves the main contractor and the client organisation working together on a single project usually after the contract for the project has been awarded.
- **Strategic partnering** involves the main contractor and the client organisation working together on a series of construction projects to promote continuous improvement. Independent research⁸ has found that strategic partnering has delivered savings of up to 30 per cent in the cost of constructing buildings and project specific partnering savings of between 2 to 10 per cent. A number of private sector client organisations such as Rover plc have adopted collaborative and longer term partnerships for some time and have realised major improvements. For example, 95 per cent of projects now achieve target cost or below and over half achieve net cost savings; under the old arrangements 50 per cent of projects exceeded budgets. The cost of partnering - setting it up and monitoring performance - is assessed as relatively low, adding usually less than one per cent to project costs.

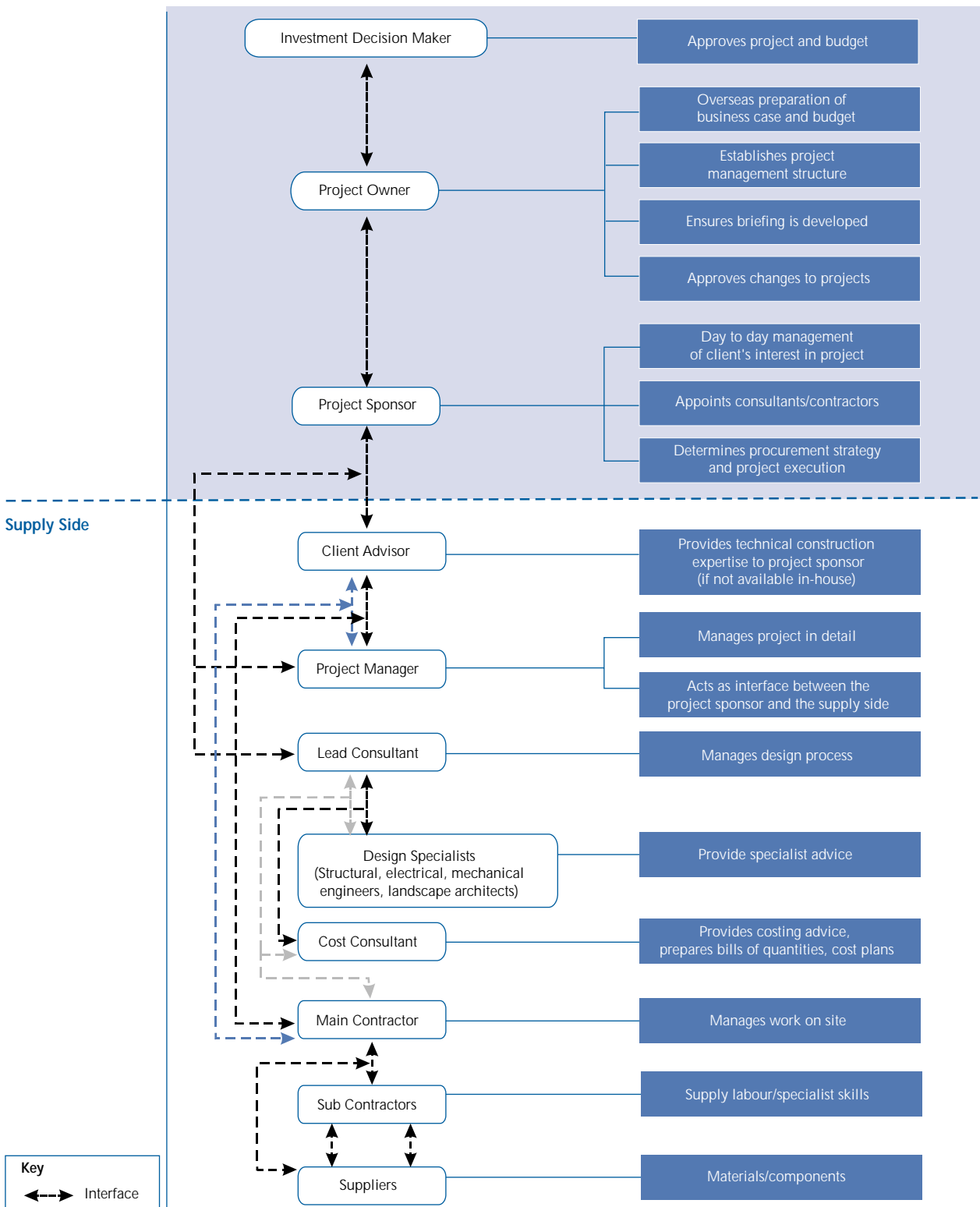
2.4 Partnering does not mean that departments or agencies should have a cosy relationship with contractors, thus increasing the risk of impropriety and malpractice. Conversely, if established reliably, partnering should provide departments with greater assurance that value for money is being achieved for the following reasons:

- **Competition still applies.** Partners are still appointed competitively, adopting any of the procurement routes recommended by the Office of Government Commerce (Figure 16): for example, design and build with the supplier responsible for both design and construction, and prime contracting with one contractor taking responsibility for managing all the other contractors in the supply chain. The Private Finance Initiative approach is probably the most

19 Parties involved in a typical Construction Project

Client

Responsibilities



Source: National Audit Office analysis

integrated form of partnership with risks being allocated to those best able to manage them and contractors not only constructing facilities but also delivering the service they were built to provide.

- **Clear targets have to be agreed.** Clearly measurable targets for improving building quality, delivery times and achieving cost reductions have to be agreed between the client and the contractor and arrangements for sharing efficiency gains - so that both parties to the partnership benefit - and in particular that contractors are incentivised to come up with innovative, cost effective design solutions.

- **Open books accounting is needed.** Contractors have much to gain from partnering arrangements - better communication and sharing of information means that they should have greater certainty over final costs and profit levels; there are likely to be opportunities to improve profit margins through meeting efficiency targets and sharing cost improvements with clients; and there should be reductions in litigation costs because of fewer disputes. In return, departments as clients need greater assurance as to the level of costs which contractors incur and the efficiency savings which they achieve and pass on to departments. To do so, an open accounting policy should be agreed so that departments have reasonable access to contractors' financial records and cost information to have confidence in reported improvements in efficiency and performance.

- **There is commitment to continuous improvement.** Both departments and contractors have to be committed to a continuous programme to deliver measurable improvements in value for money and quality. The objectives of such a programme need to be defined and agreed from the outset. One approach adopted by many organisations is to agree a **partnering charter** which typically identifies the common goals for success; sets out a common resolution ladder for reaching decisions and solving problems; defines the targets to demonstrate continuous measurable improvements in performance; and sets out the "gain share and pain share" arrangements (incentives) where these are not included within the formal contract. The partnering arrangement and charter do not replace the need for a formal legally binding contract.

2.5 Different forms of partnering and collaborative working are being used by departments and agencies and we found three examples during our examination. The approaches adopted and the benefits secured are briefly summarised in [Figure 20](#).

2.6 In all of the three examples the organisations took account of the need to ensure proper propriety and value for money in the use of taxpayers' money. All of the contractors were appointed through open competition

Partnering can promote better value for money by encouraging clients and contractors to work together to:

- improve building design so that the completed building is more efficient to run;
- minimise the need for costly design changes.
- identify ways of driving out waste and inefficiency in the construction process;
- incentivise contractors to deliver tangible improvements in costs, time taken to complete a building and the quality of the construction;
- replicate good practice from earlier projects;
- minimise the risk of disputes resulting in costly and lengthy litigation by avoiding an adversarial relationship between client and contractors; and
- integrate the Supply Chain.

and complied with European Commission procurement directives.

2.7 Partnering in different forms has potential to improve the value for money of construction and is likely to be most appropriate in the following circumstances:

- on complex projects where user requirements are difficult to specify;
- for organisations wanting similar facilities repeated over time giving scope for continuous improvements in cost and quality;
- for projects where construction conditions are uncertain, solutions are difficult to foresee and joint problem solving is necessary, for example where the land is badly contaminated;
- for individual projects or series of projects where there are known opportunities to drive out waste and inefficiency from the construction process.

As highlighted, however, by Professor Norman Fisher and Dr Stuart Green of Reading University in the paper which we commissioned them to produce on partnering and the UK construction industry (Appendix 4), for partnering to be successful and contribute to improvements in construction performance, greater trust needs to develop between departments and construction firms, with both having confidence in the benefits of collaboration.

Partnering offers good potential to improve the value for money of construction. To be successful, however, all parties - departments and the whole Supply Chain must be fully committed to making the relationship work. Continuous and reliable monitoring should take place to ensure that the partnering relationship is achieving its objectives and those of the project, and that probity and propriety are not put at risk.

20 Different forms of partnering and collaborative working

Project based partnering - Dudley Southern Bypass - value of £16.7 million

To build the Dudley Southern Bypass Road, Dudley Metropolitan Borough Council and its main contractor Kvaerner agreed to overlay their formal contract with a partnering arrangement. Both parties agreed that the risks involved with the construction made disputes and subsequent litigation likely if traditional methods of working were followed. The key features of the partnering arrangement were: establishment of a joint project team with a common identity reinforced through mechanisms such as a project logo, co-location of Dudley Metropolitan Borough Council and Kvaerner staff in one open plan site office; professionally facilitated partnering workshops to help establish effective working relationships between the two parties at site level; collaboration on risk management, joint problem solving and open book accounting.



BENEFITS SECURED

The project was completed five months ahead of schedule and within the target cost of £16.7 million. There are no outstanding claims on the project. One of the first tasks carried out under the partnering agreement was a value engineering exercise to develop a realistic target price which included a 50/50 split for Kvaerner and Dudley to share any efficiency gains or increase in costs. The road was constructed for less than the target price and efficiency gains were shared with the contractor; £2.4 million was divided with £1.2 million going towards the cost of a Metro Line being constructed parallel to a section of the road (further detail is provided in Appendix 12).

Establishing longer term relationships - The Highways Agency road maintenance with a value of £765 million.

In 1996, the Highways Agency started letting maintenance contracts for 24 maintenance areas. For each area the Agency has contracts with an agent who manages and oversees all maintenance projects with a value of less than £1 million, and a contractor who carries out maintenance work up to a maximum value of £100,000. These contracts currently run for three year periods with options to extend by one or two years respectively. The Highways Agency is looking at developing collaborative working further by extending the length of the contracts and developing the respective roles of the agent and contractor. The Agency is consulting the industry about two main proposals: the managing agent and contractor to form a partnering arrangement or one entity performing both functions akin to a private finance deal.



BENEFITS SECURED

The Highways Agency expects to see major benefits from working in this way such as improved quality of road, reduced costs and better predictability of project delivery times. As yet the Highways Agency has not set targets for quality improvements and cost reductions (further detail is provided in Appendix 7).

Integrating the supply chain - The Ministry of Defence - in excess of £1 billion spent on construction each year.

The Ministry of Defence is using Prime Contracting as its preferred procurement route where Private Finance is not appropriate. The Prime Contractor will be expected to have a well-established supply chain, and to integrate that supply chain into the design process, and co-ordinate and project manage all their activities throughout the design and construction period.

There are two types of Prime Contracts. The first covers capital works for large and complex projects with the contractor designing and constructing the building and maintaining it for at least three years to prove its through life cost predictions. The second type is for **One Stop Shops** where one prime contractor will deliver all property maintenance and capital works for all three armed services in a region. **One Stop Shop** contracts will run for five to seven years with an option to extend to ten.



BENEFITS SECURED

Defence Estates estimates that where Prime Contracting is used they expect to achieve value for money improvements of 30 per cent in the cost of construction and in their operational running costs by 2005 (further detail is provided in Appendix 6).

Source: National Audit Office

(ii) Improving the performance of departments and agencies

2.8 NHS Estates, the Ministry of Defence, the Highways Agency and the Environment Agency account for the majority of new construction works by central government. For example, the NHS has the largest property portfolio in Europe ranging from Victorian to contemporary with a replacement value of around £72 billion. The Ministry of Defence's estate accounts for one per cent of the UK's landmass with assets worth £14 billion, and in excess of £1 billion a year is spent on construction procurement. Sustainable improvements in central government construction will largely depend on how these key organisations develop their procurement and management of construction in line with current best practice. The influence of these organisations is more far reaching, however, because smaller departments and agencies that may have a construction project only once every couple of years often look to them as a source of good practice.

2.9 NHS Estates, Defence Estates, the Highways Agency and the Environment Agency have all taken initiatives to improve their performance as purchasers and managers of construction (these initiatives are summarised in **Figure 21** with more detail in Appendices 5-8). Each organisation has broadly the same objectives to:

- improve the quality of completed construction projects with much more emphasis on getting designs right so that constructions projects better meet the needs of the end users, have fewer defects, and are more cost effective to operate and maintain over their whole operational life;
- adopt contract strategies that are more likely to promote improvements in contractors' performance to provide better predictability of final costs and completion dates;
- improve the professionalism of all those involved in purchasing and managing construction so that good practice is more widely accepted and applied in each organisation's dealings with the construction industry; and
- adopt more innovative approaches such as prefabrication of construction and greater standardisation of building components to improve value for money and the speed of construction.

21 Initiatives taken by NHS Estates, Defence Estates, The Highways Agency and The Environment Agency to improve construction performance

Organisation	Value of Estate Total annual spend on construction	Initiatives to improve performance as a client	Impact of these initiatives on suppliers
NHS Estates Value of estate: £72 billion Annual expenditure on construction: £3 billion (Further detail is provided in Appendix 5)		<p>The NHS as best practice client NHS Estates will improve the client performance of NHS Trusts by providing them with training, guidance and help through specialist procurement teams at NHS Estates.</p> <p>Design quality A programme of research, development and dissemination of best practice will increase NHS Estates' understanding of the impact of design on patients' well being and hospital efficiency, which will be used in specifications.</p> <p>Benchmarking and performance management both externally with other government bodies with similar roles and internally between regions and trusts.</p> <p>Partnering - NHS Procure 21 will identify and appoint regional principal supply chain partners with whom the NHS will place work between certain value thresholds.</p>	<p>Industry will be expected to improve their performance, as NHS Estates will be a better informed and more highly skilled client with regional and national benchmarks.</p> <p>Suppliers working with NHS Estates as principal supply chain partners will need strong supply chains to secure and deliver NHS work.</p> <p>There will be greater predictability of work for chosen partners, allowing them to plan their resources better and to invest in staff training and development of best practice and innovative approaches.</p> <p>Selected suppliers will develop a deeper understanding of how their design and buildings impact on the end user, thus increasing the value they can add to other clients.</p>
Defence Estates Value of estate: £14 billion Annual expenditure on construction: £1.5 billion (Further detail is provided in Appendix 6)		<p>Prime Contracting involves the appointment through competition of a Prime Contractor with a well established supply chain of reliable suppliers of quality products. The Prime Contractor is responsible for integrating the supply chain into the design process, and co-ordinating and project managing their activities throughout design and construction to provide a facility which is fit for the specified purpose, and which meets predicted through life costs.</p>	<p>Potential Prime Contractors will need strong supply chains to secure and deliver Ministry of Defence work.</p> <p>Smaller contractors, with whom the Ministry of Defence contracts directly at present, are likely to become part of the supply chain of the prime contractor.</p> <p>Contracts will be greater in value and more long term, thus providing the supply chain with a greater continuity of work.</p> <p>Payment arrangements will ensure better cashflow for those in the supply chain.</p> <p>An incentive pricing mechanism will provide suppliers with the opportunity to earn higher profit as a result of increased efficiency and innovation.</p> <p>Emphasis on understanding and reducing costs will have benefits throughout the supply chain as companies learn from their work with the Ministry of Defence and apply the lessons more widely.</p>
The Highways Agency Value of estate: £65 billion Annual expenditure on construction: £1.2 billion (Further detail is provided in Appendix 7)		<p>Paving the Way The Agency intends to develop its maintenance contracts to combine the roles of the managing agent and contractor - either through a partnering arrangement or by forming one entity to perform both functions in something akin to a Private Finance Initiative deal.</p> <p>Developing and using contracts which provide a greater certainty of outturn and more flexibility. The Agency is increasingly using design build contracts, output specifications and incentive payments in its contracts to ensure contractors innovate and provide value for money.</p> <p>Partnering The Agency is adopting a collaborative approach to delivering projects to agreed common objectives.</p> <p>Framework arrangements The Agency has a number of framework contracts in place covering road and bridge maintenance works and also consultancy services. These allow partnering arrangements to be developed over a longer period of time.</p>	<p>Earlier involvement in contracts and output specifications give contractors the opportunity to make designs more buildable and to manage risk better, thus enabling successful and profitable work.</p> <p>Payment arrangements will improve cashflow and companies' financial position.</p> <p>Term maintenance contracts and framework arrangements will provide opportunities for longer term contracts with greater value, thus providing greater continuity of work.</p> <p>Collaborative working produces a more positive culture and more innovative approaches to problem solving, thus providing a better working environment for employees.</p>

21 Initiatives taken by NHS Estates, Defence Estates, The Highways Agency and the Environment Agency to improve construction performance *continued*

Organisation	Value of Estate Total annual spend on construction	Initiatives to improve performance as a client	Impact of these initiatives on suppliers
The Environment Agency (Further detail is provided in Appendix 8)	Value of estate: £1.6 billion Annual expenditure on construction: £145 million	<p>New procurement strategy The Agency launched a new procurement strategy for engineering works to achieve the following aims:</p> <ul style="list-style-type: none"> ■ To deliver best value for money to its customers; ■ To be at the leading edge of technology, innovation and business best practice; and ■ To champion environmental best practice. <p>The Agency has increased the value of its projects by combining similar projects or work within a region. It has also reduced the number of consultancy suppliers from 46 to 4.</p> <p>The Agency now has in place a national team responsible for the procurement and project management of capital projects to deliver new ways of working and to provide consistency in processes and relationships with suppliers.</p>	<p>Suppliers should be better informed about the Agency's needs through supplier conferences and regular industry bulletins.</p> <p>Projects will be of higher value and for longer periods. This will allow suppliers to learn from one part of the work to the next and to agree targets for improvements to both cost and quality. Suppliers should make higher margins and cover both fair profits and overheads. They will have greater certainty of work enabling them to invest some of its profits in development work.</p> <p>The Environment Agency will use fewer suppliers. Those suppliers used will be able to develop a better understanding of the Agency's needs and to produce more innovative solutions to those needs.</p> <p>Suppliers will receive a more consistent approach from a better informed and trained client. Suppliers' profitability on agency work is now also linked to the achievement of the Agency's target.</p>

Source: National Audit Office examination of initiatives taken by the NHS Estates, Defence Estates, The Highways Agency and the Environment Agency.

22 Initiatives taken by Anglian Water to improve its performance as a purchaser and manager of construction services

Action taken

Anglian Water has rationalised its operations, centralising engineering services, procurement and project management in one location to improve the effectiveness of its procurement and management of construction. It has piloted new ways of working with contractors, experimenting with different ways of partnering. It has also adopted a policy of strategic sourcing of its construction work and has, thereby, reduced its supplier base to nine (from 250 suppliers), six contractors, two design consultants and one cost consultant.



BENEFITS SECURED

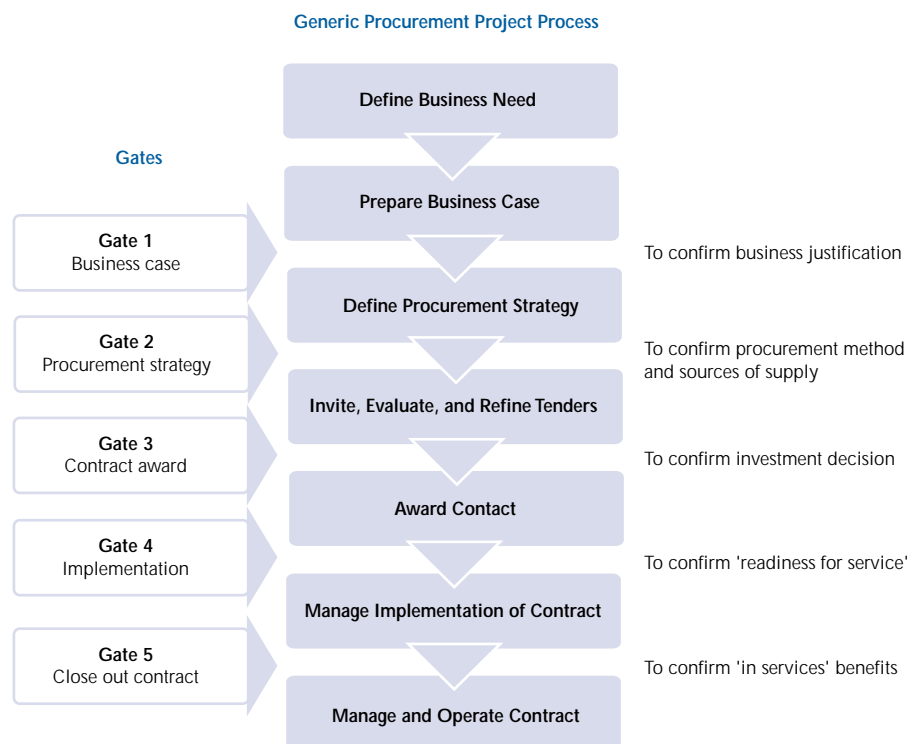
Anglian Water expects to reduce its capital costs of construction by 20 per cent by the end of 2000 -2001 and to reduce its management costs by 20 per cent by 1999-2000, as well as achieving improvements in the quality of its construction projects with better delivery to time. As yet, these benefits have not been realised. Recent pilot projects involving partnering have, however, achieved over 20 per cent cost reductions and have been completed ahead of schedule (further details are provided in Appendix 9).

Source: National Audit Office analysis

2.10 As yet it is too early to evaluate the impact of these initiatives to improve construction performance but some of the organisations have quantified the impact they are seeking to achieve.

- **NHS Estates** estimates that the 10 per cent reduction in construction costs recommended by Sir John Egan in "Rethinking Construction" (paragraph 1.5) is achievable for the NHS as whole and should release £300 million each year. NHS Estates also expects that projects procured through its initiative - NHS Procure 21, which advocates partnering in managing the construction supply chain, will be delivered on time and to cost and will provide better patient facilities (Appendix 5).
- **Ministry of Defence** estimate that where Prime Contracting is used they expect to demonstrate value for money improvements of 30 per cent (approximately £250 million to £300 million) in the cost of constructing and running buildings by 2005 (Appendix 6).
- **The Highways Agency** has begun a continuous programme of improving its procurement and delivery of construction projects. It envisages that its new strategy will allow better predictability of project outturn costs and time, and achieve quality improvements. At present, there is little quantifiable information other than at individual project level to demonstrate conclusively the benefits of these changes. This is because many traditionally procured projects are still running and others procured under the new arrangements are not yet

23 The Gateway Process



Source: Office of Government Commerce

complete. The Agency is continuing to monitor the outcomes of its work and to benchmark its success internally and with other construction procurers. A number of completed projects do demonstrate the benefits of the new methods. The Newbury Bypass cost £105 million compared with a tender price of £70 million. However, £25 million was accounted for by security costs made necessary by disruption from protestors; the works costs of £80 million were 14 per cent more than the tender price, compared with 40 per cent achieved on other recent projects (Appendix 7).

- The **Environment Agency** launched its new procurement strategy for engineering works which is intended to improve its working relationship with suppliers. The Agency has set in 2008-09 cost saving targets for ten years (1999-00 to 2008-2009) amounting to £35.5 million, some 29 per cent of 1998-99 expenditure on engineering work of £121 million (Appendix 8).

2.11 All of the initiatives being taken by each of these organisations reflect the approaches being adopted by private sector organisations to improve their procurement and management of construction. For example, **Figure 22** (previous page) summarises the initiatives being taken by Anglian Water. The extent to which the improvements being implemented by the four government organisations will result in sustainable long term improvements in the cost effective delivery of construction projects will depend, however, on three

factors. Firstly, ensuring that the changes being implemented in line with good practice are clearly understood by all staff involved in construction and that they have the skills to apply them and that they are committed to doing so. Secondly, that reliable mechanisms are in place to monitor the achievement of the planned benefits both in terms of cost and quality, and where necessary remedial action is taken where achievement is less than expected. Thirdly, that there is consistent and ongoing support of Government and management boards with the acknowledgement that in introducing such substantial change there can be occasional setbacks.

2.12 **Gateway Process** The Office of Government has also introduced a new initiative known as the "Gateway Process" to promote a more formal and disciplined approach to the management of projects - major procurement, construction and information technology including Private Finance Initiative deals - to help avoid cost and time overruns (**Figure 23**). This is in response to a general concern that existing implementation of procurement best practice across government departments is very variable.

2.13 Well informed independent reviews by stakeholders at critical project points (gates), and covering the full project life cycle, are a major component of external best practice. Private sector experience suggests that such intervention, especially early on, is highly effective in influencing project success. This should not interfere with

the normal procurement process, but should ensure that all necessary information is in place at the right time and that independent peer views are taken into account.

2.14 The Office of Government Commerce envisage five mandatory "Gateways" in a procurement. First at the point at which the business need is understood and major issues in implementation are known, before any announcements in the Official Journal of the European Community. The second will confirm the procurement method and sources of supply. The third will confirm the investment decision. The fourth will take place when the programme is fully developed and ready for service but not yet operationally in service. The fifth review will confirm the benefits achieved when the contract is in operation. Reviews are intended to take no more than five days with a maximum of eight days for the most complex projects.

2.15 For all relevant procurements, and at each "Gate", a group review team will appraise the project against specific criteria, for example, sound business case, clearly defined outputs, proper consideration of options. For large complex programmes this team will be led by a senior civil servant who has no vested interest in the outcome of the review. The leader will recommend a course of action to a project sponsor, normally appointed at management board level.

2.16 At each Gate the project sponsor will be provided with a checklist showing what should be achieved before authorising the continuation of the project. When a review is not successful the matter will be brought to the attention of the relevant Permanent Secretary and the Chief Executive of the Office of Government Commerce who should agree the action, if any, to be taken. Departmental Accounting Officers will retain final responsibility for deciding whether to pursue projects which fail a mandatory gate review. The Office of Government Commerce has piloted the Gateway process on a number of major procurement projects including construction and will roll the process out in early 2001.

NHS Estates, Defence Estates, the Highways Agency, the Environment Agency and the Office of Government Commerce have all taken initiatives to improve the procurement of construction. These initiatives have strong potential, if comprehensively and consistently applied to improve significantly the value for money of central government construction, including achieving the annual 10 per cent reduction in construction costs recommended in the Egan Report "Rethinking Construction".

(iii) Improving the performance of the construction industry

2.17 Improvements in the way departments and agencies purchase and manage projects need also to be matched by improvements in the performance of the construction industry focusing in particular on:

- better delivery by construction firms to cost, time and quality requirements;
- developing practical methods of measuring whole life performance;
- improved management and control of health and safety risks;
- more effective supply chain - subcontractors, consultants and specialist advisers, materials suppliers - management;
- better use of innovation to improve design and the construction process; and
- improving the skills of the industry's workforce.

2.18 As significant purchasers of construction services departments and agencies can collectively and individually bring influence to bear on the construction industry to improve its performance. The Department of the Environment, Transport and the Regions (paragraph 1.9) has promoted several initiatives to do this. In addition, the construction industry has through various representative bodies promoted a programme of improvements. The two most recent initiatives are:

- **Construction Client's Charter.** This was proposed in July 1999 by the Deputy Prime Minister and is intended to represent the interests of construction industry clients collectively by encouraging clients to improve value from their construction projects by committing to three to five years programmes of improvement and culture change and to measuring both their own performance as clients and the performance of their projects. The Confederation of Construction Clients, including private and public sector membership, is the driving force behind the initiative. Key performance indicators are being developed to measure progress in achieving the objectives of the Charter.

Aims of the Construction Client's Charter

- Driving a continuous improvement culture.
- Better long term relationships with suppliers giving increased reliability.
- Joint identification of risk and how to handle it.
- Promoting a collaborative approach to design, with fewer design changes.
- Improved client performance through data sharing and networking.

- **Construction Industry Board.** This was established following the Latham Report in February 1995 as a single organisation to represent all sectors of the construction industry - clients as well as suppliers - to monitor the implementation of the Latham Report's recommendations. During the course of this study the Construction Industry Board reviewed its role and responsibilities and in June 2000 its remit was changed to develop policies that would lead to improvements in the performance of construction firms, notably in the quality and skills of the construction work force, the efficiency and profitability of firms, the quality of their construction and in the value for money which clients receive. The Board intends to achieve these objectives by working closely with three organisations:

Construction Research and Innovation Strategy Panel	
A joint industry and Government panel which seeks to improve the industry's competitiveness through research and development by identifying priorities and informing those who fund research.	to identify best construction practice
Movement for Innovation	
A Department of the Environment, Transport and the Regions sponsored initiative with industry to promote innovation by monitoring and disseminating lessons from demonstration projects and providing networks for the sharing of best practice.	to demonstrate and test new practice
Construction Best Practice Programme	
A Department of the Environment, Transport and the Regions' funded programme to raise awareness of best practice and to equip construction companies and clients with the knowledge and skills to implement change.	to disseminate proven best practice

2.19 In consulting construction firms about how they were seeking to improve their performance we identified six examples of good practice which might be more widely applied by the industry (Figure 24 - see next page).

24 Examples of initiatives taken by construction firms to improve their performance

Establishing longer term relationships with clients - Balfour Beatty Plc

Balfour Beatty Plc's experience is that traditional procurement routes, whereby construction contracts are awarded on the basis of the lowest price, can result in construction firms submitting unrealistically low bids. Subsequently contractors can come under pressure to cut corners to reduce costs so as to maintain profit margins and/or to find reasons to increase the price. Balfour Beatty Plc's policy is to avoid this by entering into long term collaborative arrangements with its clients whenever possible. Of Balfour Beatty's annual UK building construction turnover of £450 million, £180 million now comes from non-traditionally let contracts, £170 million through traditional routes with the remainder from refurbishment and maintenance work.

Action taken

The Woolgate Exchange development is a good example of how Balfour Beatty is establishing longer term relationships with its clients. Balfour Beatty won a two stage tender process for the £70 million building to provide a pre-construction service and manage the design team. Originally the client - Metropolitan Estates Property Company (MEPC) intended to tender separately the implementation of the design. However, the relationship developed between Balfour Beatty and MEPC, and it was agreed that Balfour Beatty should undertake the construction. Both Balfour Beatty and MEPC made a significant investment in the project upfront, with £1 million spent before construction started. They both agreed a cost plan beforehand, with a maximum price beyond which Balfour Beatty would bear the loss and a target price, with a gain/pain sharing mechanism. Subsequently, Balfour Beatty has won other work from this client, who now benchmarks the company's performance between different jobs, for example on the basis of cost per square metre.



BENEFITS SECURED

As a result of establishing a longer term relationship, Balfour Beatty has worked with the Metropolitan Estates Property Company for two years with an overspend on the project of less than one per cent and a variation from the predicted completion date of less than one per cent.

Providing more value to the customer - Alfred McAlpine

In the early 1990's, Alfred McAlpine's building division was running at a loss and suffered from poor commercial relationships with both its suppliers and clients.

Action taken

Alfred McAlpine has moved away from the traditional lump sum tender market towards providing a complete service for its clients, with clients stating what they require in terms of outcomes and McAlpine involved in all elements of the process to determine how these outcomes might be met. This allows McAlpine to add more value to the construction process. For example, a client may require the provision of a number of hotel bed spaces in a particular city with the cost agreed on the basis of a total cost per bedroom. Alfred McAlpine would be involved from very early on in the process, in activities such as looking for a site and design, as well as the building work which McAlpine does itself to control cost, quality and time.



BENEFITS SECURED

The newly formed special projects business now makes a net profit in excess of 6 per cent, well above the industry average. The business has improved productivity from a significant loss-making turnover of £280 million based on 900 employees to a profit - generating turnover of £140 million based on 240 employees.

Increasing customer focus in a technical environment - Halcrow

Halcrow is an engineering consultancy with a turnover of £150 million, which plans, designs and supervises the development of infrastructure projects world-wide. It has identified that future success depends on increasing customer focus.

Action taken

Halcrow's board has made clear in an internal strategy document circulated to all staff, the link between achieving its commercial objectives and understanding customer needs and developing long term relationships with them. It also monitors all current activities against the "Rethinking Construction" principles and targets (figure 12), and uses cross-functional systems such as its intelligence unit to identify training needs and develop programmes to meet them.



BENEFITS SECURED

Halcrow is making its staff more business-purpose and customer focused whilst retaining its technical strengths. This has helped it to secure long term contracts with more sophisticated and demanding clients such as British Airports Authority, the Highways Agency and Anglian Water.

Investing in research and development - WS Atkins

The ability of suppliers and clients to make intelligent decisions before and during construction to minimise whole life costs is hampered by the lack of reliable comparative data with which to compare options.

Action Taken

WS Atkins and other companies are contributing to a three year project with the University of Dundee to examine what data structures are needed to understand and minimise whole life costs. The project is funded jointly by the Engineering and Physical Sciences Research Council and the collaborating companies.



BENEFITS SECURED

Traditionally, the construction industry has made little investment in research and development because of its low profit margins. WS Atkins considers such investment as essential to improve its competitiveness and the service it offers to clients, by allowing it to improve the quality and accuracy of its bids and to give better advice during projects.

24 Examples of initiatives taken by construction firms to improve their performance *continued***Developing a supply chain - Terrapin Limited**

Terrapin supplies and constructs prefabricated buildings. Terrapin manufactures many of its own components and carries out much of the assembly work itself; however, it has to obtain components such as lifts from specialist suppliers and sub-contract some of the more complex engineering work.

Action Taken

Terrapin has identified the key components and services it needs to source externally and established long term relationships with suppliers who can meet its needs and with whom it can have a mutually beneficial relationship.

**BENEFITS SECURED**

There are commercial advantages to Terrapin and its suppliers in establishing such relationships: familiarity with each other's products and work processes reduces time spent on acquiring the products and costs on individual projects. The benefits of this can be passed on to clients with greater certainty about completion dates and costs.

Learning from good practice - MANSELL plc

MANSELL is a privately owned building contractor with an annual turnover approaching £500 million. It has a national network of regionally based operations, with contracts typically of £1million in value and a duration of six months. Its success is therefore dependent on securing repeat work.

Action taken

MANSELL views the short term nature of its contracts as an opportunity to learn lessons from each quickly and to disseminate them through the company. It has developed systems to capture information at project level on the cash position, quality, health and safety, welfare, environmental issues and security, and has procedures to ensure the information is used to manage the project during its duration. This has been supplemented by the development of key performance indicators and customer satisfaction surveys which enable benchmarking between the regions.

**BENEFITS SECURED**

MANSELL has a good reputation within the industry and has recently received the Best Practice award from the Construction Best Practice Programme for its approach to improving all aspects of its business. There are also commercial benefits: in 1999, MANSELL increased its operating profit after taxation by 40 per cent on the previous year.

Source: National Audit Office analysis

The UK construction industry has an important role to play in improving the delivery of high quality construction to cost, time and end user specifications. The industry collectively, together with the Department of the Environment, Transport and the Regions, has launched a number of initiatives to secure improved performance. These initiatives will only achieve improvements if there is sustained commitment across the whole industry to bringing about change built on mutual trust between client departments and construction firms and a common appreciation of their respective priorities.

Part 3

Procuring and Managing Construction

3.1 The construction of a new building involves a series of key stages from determining the best design, deciding on the most appropriate contract strategy, to evaluating the quality of the completed building before it is ready to occupy. **Figure 25 (next page)** outlines the typical construction process followed by government departments with its attendant risks and areas where practice has been weak in the past. This part of the report examines how better value for money can be achieved by adopting good practice in (i) selecting contractors, (ii) designing, (iii) planning, (iv) project management, (v) measuring construction performance, and (vi) remunerating contractors. Our analysis is based on an examination of Demonstration Projects intended to reflect good construction practice as part of the Movement for Innovation programme, discussions with contractors, and the advice of our expert panel.

(i) Selecting contractors

3.2 In order to demonstrate probity and value for money departments have traditionally appointed contractors both at the design and construction stage through competitive tender. Selection of the designer and the main contractor has been primarily on the basis of lowest tender price. Lowest price competition has also extended throughout the supply chain with the main contractor competitively tendering elements of the job to subcontractors and material suppliers.

Performance of central government departments, construction projects

In 1999, a benchmarking study of 66 central government departments' construction projects with a total value of £500 million showed that three-quarters of the projects exceeded their budgets by up to 50 per cent and two thirds had exceeded their original completion date by 63 per cent.

Source: *Benchmarking the Government Client Stage 2 Study 1999.*

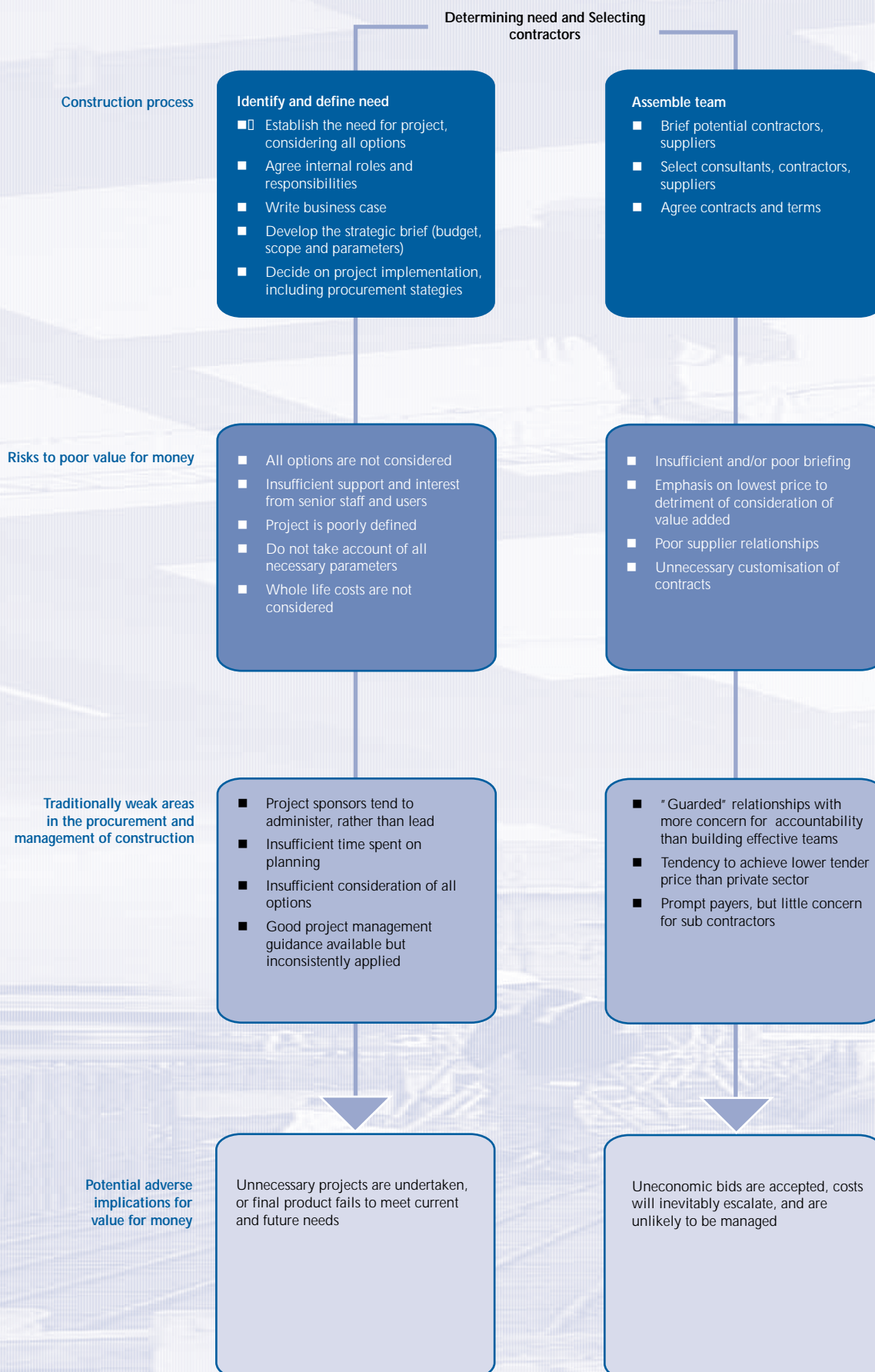
3.3 This approach has led to a number of problems throughout the construction process. For example, appointing design consultants solely on the basis of lowest price without sufficient regard to the quality of the design proposal can result in the design team spending too little time on the design of a building in order to keep within the contract price. Making an appointment without sufficient consideration of design

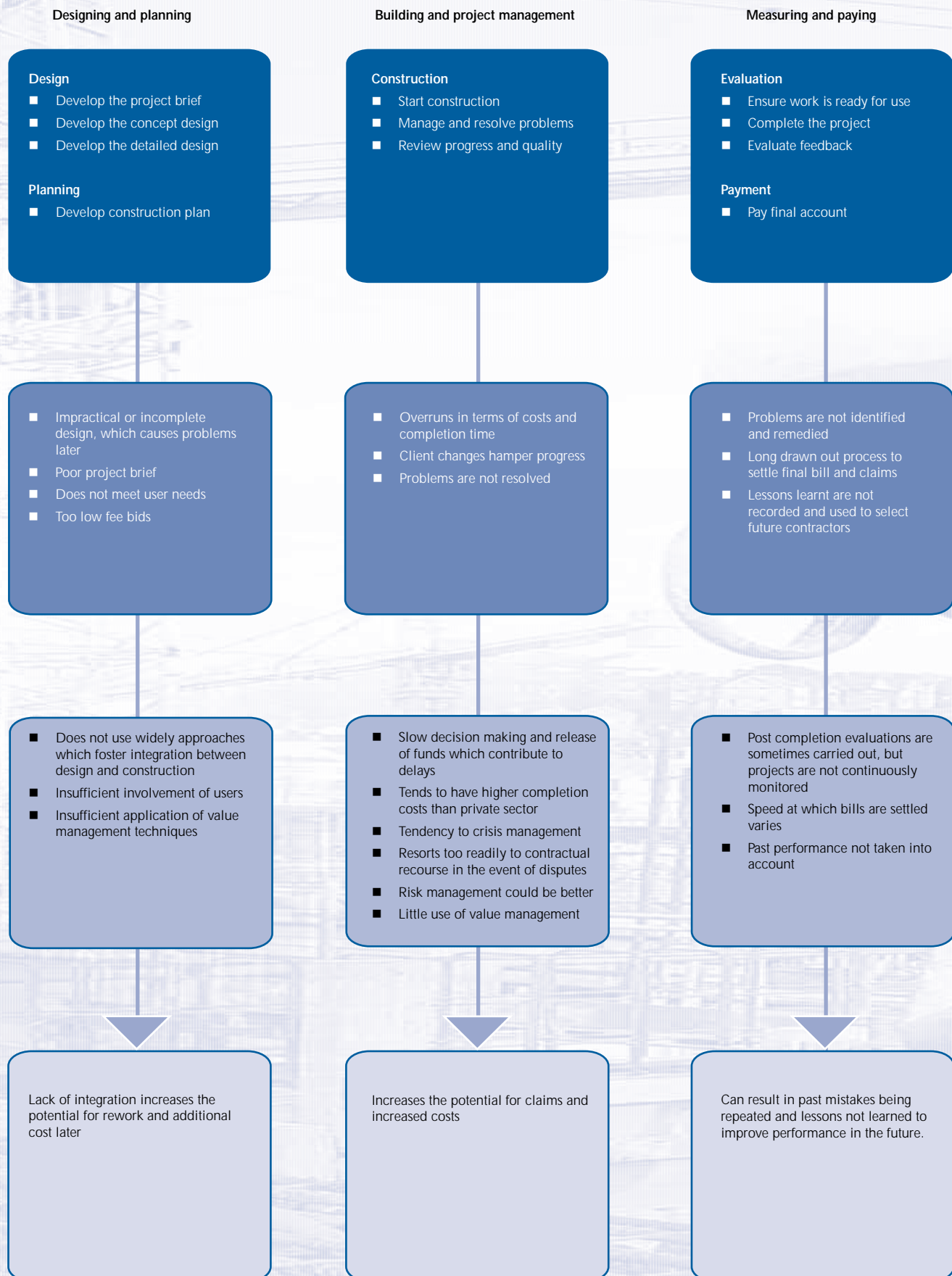
consultants' competence can result in problems of buildability or unnecessary creation of health and safety risks during the construction phase. Such approaches can lead to problems during construction - necessitating significant design changes with associated cost increases - and in the quality of the final building. In addition, because construction firms know that price is likely to be the key factor determining whether they win a contract, they have generally pitched their tenders very competitively and, to do so many have tendered below cost and so typically achieved one per cent profit through claims. Firms have generally tendered on the assumption that there would inevitably be design changes, delays, new requirements, environmental or physical constraints which would increase costs allowing them to make substantial claims and recoup their profit margins. The Government Construction Client Panel's Benchmarking study in 1999 showed that three-quarters of the 66 projects studied exceeded the contract price by up to 50 per cent.

3.4 The Treasury and the Office of Government Commerce have emphasised the importance of government departments achieving value for money in all forms of procurement including construction, while having regard to propriety and regularity. Value for money is about designing and constructing buildings for the best outturn cost likely to meet the operational requirements of users of the building to appropriate standards of quality. This means not only taking out wasteful or non value added costs to meet these requirements, but also ensuring that the building is constructed in a way which will ensure that the costs of running it over its whole operational life represent value for money. User requirements include any specified level of quality or standard of service to be met within the approved budget and operational efficiency requirements of the building or work.

3.5 A number of central government and other public sector bodies as well as private sector clients have significantly changed the way in which they select and buy construction services. In doing so they do not just concentrate on contract price alone but take a longer term view of the likely quality of the finished building

25 The Construction Process: The risks involved





and how the design will influence the cost of running the building over its entire operational life. Examples of good practice are summarised in [Figure 26 \(next page\)](#). We found that in each case the organisation had satisfied the requirements of propriety and regularity. Contractors were still chosen through competition but the basis and criteria for selection were much wider.

3.6 Departments have traditionally spent considerable amounts of time specifying the inputs of a building, for example, the number of windows it should have, the thickness of the walls and the height of rooms. Value for money is more likely to be achieved if departments specify the type of building they require in output terms, that is, the number of people it has to accommodate, the type of equipment that will be used in the building and operational environment this requires, and the sorts of customer services the building has to facilitate together with the constraints in the design or specification of the facility. The contractor and design team then have the opportunity to identify and demonstrate designs that are likely to meet these requirements most cost effectively and also to suggest innovative solutions. Value engineering should be the norm at the earliest stage of a project.

3.7 Estimating the likely costs of a building over its whole life can be difficult. Defence Estates in its Building Down Barriers pilot project (Appendix 13) has developed a framework for making decisions on through life costs. This requires all parties in the supply chain, including material and component suppliers and specialist contractors, to have reliable data on the operational costs of their products including running and maintenance costs.

In evaluating tenders and appointing contractors, departments need to consider not just the initial capital costs but the whole - life cost of the building. Departments need to balance price with the quality of the completed building and its running costs, and recognise that the lowest contract price does not guarantee long term value for money.

(ii) Designing buildings

3.8 Badly designed buildings can fail to meet the needs of end users, cause operational problems, have high maintenance or running costs and can be inefficient and costly to build as well as dangerous. It is at the design stage that most can be done to optimise the value of a building to its end users. Private sector experience shows that involvement of a facilities manager at this stage has many benefits, as they can contribute their experience of operating in and maintaining the building. Capital costs are an important factor in the overall costs of buildings but investment in good quality design and construction can result in a more efficient operating

environment and lower running costs. NHS Estates, for example, has found that good hospital design resulting in a pleasant working environment aids patients' recovery and helps hospital staff do their job more effectively. There is also evidence that good quality office buildings results in less sickness absence.

The initial short term capital cost of a building can have a significant impact on its long term operating costs. For example, the Royal Academy of Engineering in its report "The Long term Costs of Owning and Using buildings (1998)" states that the typical costs of owning a building are in the ratio of 1 (for construction costs): 5 (for maintenance costs): 200 (for building operating costs).

3.9 Design must take into account:

- the future needs of the users and the flexibility needed to meet these;
- demolition or disposal as part of the whole-life cost assessment;
- health and safety of the constructors and maintenance staff as well as users and the community;
- achieving maximised value for money through standardisation and prefabrication; and
- sustainability issues such as the promotion of reuse, recycling and more efficient use of resources within a value for money approach.

3.10 In the past departments have tended to regard design as a separate process to be completed before appointing the main contractor. We found examples ([Figure 27 page 46](#)), however, where organisations had recognised the importance of design and were changing their approach to reflect this and improve the quality and cost effectiveness of completed buildings. The key changes were (i) integrating the design team so that they are part of the construction process and can take more responsibility for the cost and quality implications of their design; (ii) involving the main contractor and specialist sub-contractor at an early enough stage to consider and advise on the likely impact of the design on the cost and health and safety implications of construction, speed of delivery and the operational efficiency of the completed building; (iii) considering the needs of the end users of the building more - it is important to secure their early agreement to the specification to avoid design changes at a later stage resulting in significant cost increases; (iv) recognising that prefabrication and standardisation of building components can improve cost effectiveness; and (v) giving more consideration to the sustainability of the completed building in the longer term and its whole-life costs.

26 Different approaches to selecting contractors

Balancing quality and price - The Highways Agency

In awarding Design and Build contracts, the Highways Agency evaluates tenders on quality and price, the key elements of which are:

- The Agency gives different weightings to quality and price depending on the complexity of the project, for example, for innovative projects the split is 40 per cent on quality and 60 per cent on price, whereas for repeat projects or where a standard design can be used, the split is 20 per cent on quality and 80 per cent on price.
- For each project, the Highways Agency determines the key quality aspects to be assessed, for example, innovative approaches to solving issues such as embankments on motorways, and promoting health and safety.
- Tenderers have to submit the quality and price elements of their bids in separate envelopes. The quality tenders must be at or above a pre-determined threshold before the price tender is considered.
- The system will ensure that in the future only contractors who can demonstrate that they can construct roads of the right quality and within budget will be selected.



BENEFITS SECURED

The Highways Agency is able to give greater consideration to the quality of the final construction. It also means that contractors have more incentive to put forward innovative designs and cover longer term aspects, such as the whole-life costs of roads and environmental impact, because they are aware that price will not be the only criterion by which their tender will be judged (further detail is provided in Appendix 7).

Integrating design and construction - Defence Estates

Defence Estates' approach is to appoint a prime contractor who will manage both the design and construction to deliver a building fit for its specified purpose. Selection of prime contractors is based on an assessment of hard issues (a weighting of 60 is given) and soft issues (weighting is 40). A strong emphasis is placed on the Prime Contractor's ability to integrate and manage his supply chain and on the through-life costs of the facility.

Hard issues include financial stability, technical competence, price, health and safety record, fraud prevention and supply chain management. **Soft issues** include ability to manage costs, understanding of the Ministry of Defence culture, attitude to value management, market awareness, quality of ideas, willingness to share risk, concept of trust, flexibility and clearly thought through strategy for working with the client and supply chain. These issues are given a numerical score to reflect their relative priority, for example, if the contractor has no strategy for working with the client and suppliers zero will be awarded; if they consider such a strategy is essential and actively pursued, a mark of five is given.

Selection will follow a normal three stage tender process (i) advertisement through the Office Journal of the European Communities, (ii) prequalification questionnaire and (iii) invitation to tender. During this last stage, tenderers will be asked to submit proposals against an output-based specification, for example, barracks for 40 soldiers in single room accommodation, and to state indicative costs. Interviews will take place to test the quality of proposals and ability to deliver. At the end of this process, Defence Estates will select a preferred bidder and commence negotiations on the technical solution and commercial issues and when these are satisfactorily completed the contract will be awarded.



BENEFITS SECURED

Defence Estates is able to select contractors who have a proven ability to manage both design and construction and who have demonstrated an ability to manage their supply chain. In addition, the selection process puts considerable emphasis on contractors demonstrating the quality of their work and ability to design a building based on a specification framed in terms of the outputs which the building is intended to deliver. Greater emphasis is also put on considering the through-life costs of the building (further detail is provided in Appendix 6).

Reducing the number of contractors and developing longer term relationships - The Environment Agency

Having a large number of low to medium value contracts with a large number of construction firms can be inefficient, as a considerable amount of effort has to be invested in managing contractors and monitoring quality. The Environment Agency is therefore seeking to raise the average financial value of the contracts which it awards, to reduce the number of contractors which it employs, and to build longer term relationships with a smaller group of contractors. The aim of a longer term relationship is that the contractors should understand the Agency's needs better, so that quality is enhanced and learning curves can be reduced. Having established a longer term relationship, contractors have more incentive to work with departments and agencies to improve quality and reduce costs because they have some assurance over future business.

The Environment Agency uses the following selection criteria to gain assurance as to the reliability and performance of a contractor with whom it may wish to develop a longer term relationship:

- **questionnaires** covering a range of subjects such as the company's financial performance, company policies on staff, health and safety, and its supply chain;
- **references and the Agency's own experience** of working with the supplier: references will be sought from other clients on a confidential basis as to the broad strengths and weaknesses of the supplier, their behaviour and response to problems and contractual issues, ability of their staff to work as a team and ways in which they have added value and reduced processing costs;
- **visit by an Agency team** to suppliers' premises and selected projects to substantiate questionnaire responses and to observe their systems and staff in operation;
- **presentations and interviews** to allow assessment of the capabilities of individual team members and their understanding of the Agency's priorities.



BENEFITS SECURED

The Environment Agency is able to gain greater assurance as to the likely quality and performance of contractors with whom it may decide to enter into longer term relationships (further detail is provided in Appendix 8).

Source: National Audit Office analysis

27 Examples of good design practice.

1. Integrating the design team - Notley Green Primary School

Normal construction practice is for an architect to develop the initial building design in isolation. This can sometimes lead to problems of "buildability" aspects of the design may be difficult to build, or may not be cost effective, or there may be better solutions. Essex County Council adopted a different approach and rather than tender for an architect to design a new primary school for Notley Green, they tendered for a whole design team - including an architect, structural engineer, environmental engineer and quantity surveyor. Tenderers were not assessed on their initial design proposals but on evidence of their ability to work as a team, previous experience and innovative approaches to design and problem solving.



BENEFITS SECURED

The team produced an innovative design for a primary school that made good use of available space by adopting a triangular shape that was more compact and, therefore, cheaper to build (Appendix 11).

2. Consideration of sustainability and whole-life costs - Notley Green Primary School

In designing the new primary school for Notley Green, Essex County Council did not require the design team to stick with the standard design model which they used for primary schools. Instead they asked the design team to focus more on the sustainability of the building and its whole-life costs. As a result the design team incorporated the following sustainable features - maximum use of natural light, re-use of soil disturbed by the construction to landscape the site and maximum use of building materials from renewable sources.



BENEFITS SECURED

Essex County Council acquired a primary school with lower running costs delivered within budget with a design that can be replicated for other schools (more detail is provided in Appendix 11).

3. Involving the contractor at an early stage - The Highways Agency: M60-3 contract.

Normal practice is not to involve the main contractor until the building design has been finalised. In the case of the M60-3 contract the Highways Agency consulted on the design for the new road at an early stage with the contractor, who made a number of suggestions as to how the design might be improved. For example, the contractor suggested building a concrete raft over an area of peat, which meant that 180,000 cubic metres of peat did not have to be dug up and removed.



BENEFITS SECURED

The early involvement of the contractor in the design and planning of the construction secured cost reductions and environmental benefits by reducing the number of lorries taking surplus land off-site (more detail is provided in Appendix 7).

4. Focusing on the needs of the end user - Defence Estates: Building Down Barriers

In designing the training facilities at Aldershot and Wattisham as part of the Building Down Barriers project, Defence Estates gave much attention to the needs of the end users and in particular the usability of the facilities and their fitness for purpose. Users were consulted and one change introduced was strong flooring to minimise damage by soldiers and its replacement costs.



BENEFITS SECURED

Users are very satisfied with the physical training centres and find the facilities better than those in centres procured conventionally. For example, the 50-meter swimming pool can be divided into two self-contained pools allowing separate activities in each (more detail is provided in Appendix 13).

5. Pre-fabrication and standardisation - Kingston Hospital

When Kingston Hospital Trust had an urgent need for a hospital block with 132 beds, the Trust recognised that the design would have to use prefabrication to complete the building quickly. The design was for a three-storey, pre-engineered modular structure, composed of steel columns and beams with sheet steel wall and roof panels. It provided all the facilities normally found in a hospital block.



BENEFITS SECURED

Terrapin, the main contractor, handed over the building to Kingston Hospital Trust in 20 weeks compared with original estimates by all potential contractors of over 35 weeks, and the wards were furnished and admitting patients a week later (more detail is provided in Appendix 10).

Source: National Audit Office analysis

Prefabrication and standardisation

What is it?

Prefabrication is the manufacture of sections of buildings which are then assembled on site. Standardisation is the use of components which are made to a general manufactured specification rather than an individual project specification.

Benefits include:

- consistent and reliable quality;
- waste reduction;
- less rework;
- more predictable cost; and
- quicker construction time.

Example 1: Fazakerley Category B Prison used precast cell units and it is estimated that in doing so it cut capital costs by 35 per cent and the construction programme by 4 months; was able to complete the project to schedule and budget; cut the construction time of the block superstructure from 4 months to 12 days; and reduced the amount of noise, dust, vehicle movements and materials wastage.

Source: Construction Best Practice Programme.

Example 2: Movement for Innovation demonstration project 36 - Tesco plc used prefabricated construction techniques for the offices and sales floors of the 30,000 square foot development in Haslemere, which cut construction from 27 to 22 weeks. It is thought that, if the process was refined and put into a production line, savings of 20 to 30 per cent of the cost would be possible.

3.11 Information technology also has the potential to improve the quality of building designs and to make the process more cost effective. For example, Salford University is developing a prototype system which is intended to integrate the design process with construction so that design, risk allocation and project management all draw on one database.

The quality of the design for a new building can fundamentally influence the cost, quality and operational efficiency of the construction process and the completed building. A large number of design changes can contribute to significant increases in the cost of public sector buildings. It is, therefore, essential that departments and agencies give sufficient attention to building design from the outset and that it is fully integrated with the construction process. It should not be a separate exercise done in isolation.

(iii) Planning

3.12 Construction projects in the public sector can have a long lead time - the examples in our case studies range from 4 months to 30 months, from the time when the need for a new building is agreed to when construction work starts. During this period a suitable site for the building may have to be found, planning permission obtained, the brief prepared, the competition to appoint contractors completed and the building design prepared. Once this stage is over, there can be

considerable pressure for building work to start as soon as possible with insufficient time devoted to planning the construction process. While planning may seem to add time and cost to a project up front, it saves time and cost later and enables the project team to cope better with unforeseen events that might delay construction or increase costs. Better planning also leads to reduced whole-life costs, better functionality of the building, greater predictability of time and cost, less waste and fewer accidents. Good planning involves:

- **Risk assessment, allocation and management.** This is essential and must be an ongoing process throughout the life of the project as risks will be constantly changing. It should also drive the procurement route and contract strategy. It involves a comprehensive assessment of the potential circumstances that might arise which could delay the building's completion, increase its costs, or impact adversely on the quality of the building. With collective management of those risks throughout the supply chain, with risk allocated to the party best able to reduce and manage it properly, successful risk management results in the reduction of risks and not just their management. Reliable contingency plans should be in place to deal quickly with any unplanned event arising to minimise its adverse impact on the construction process.
- **Linking the design of the building to its construction.** This involves determining the key stages and their sequence in constructing the building. Getting the construction sequence right so as to minimise delays (from key building materials not being supplied on time, or one part of the construction being completed late or out of sequence, and so delaying the work of another subcontractor) is important for achieving value for money. All those in the supply chain - subcontractors, material suppliers, equipment suppliers and fitters - should understand and agree their responsibilities.
- **Value management.** This is the technique whereby all the components and processes involved in building the construction are critically appraised to determine whether more cost effective alternatives or solutions are available. The aim is to drive out all waste and inefficiency from construction. For example, value engineering (a form of value management) was used in the design and building of training centres as part of the Ministry of Defence's Building Down Barriers pilot projects. It resulted in savings of over £80,000 by identifying an improved method for piling in constructing training centres' foundations (Appendix 13).

Value Management**What it involves**

It focuses on elements of the design or construction process and determines how to increase the value of those elements, that is, in fulfilling user needs, at the lowest cost.

Examples of techniques

Functional Analysis System Technique analyses the functions of a building and the means of achieving them and expresses them in a diagrammatic form. Key factors driving cost and quality can be identified and work concentrated on them. **Matrix Analysis** evaluates each of the options involved in producing part of a building and scores them against key criteria which are weighted. Options can then be prioritised and the one offering best value for money selected.

3.13 Depending on how a building project is organised, detailed planning will be the responsibility of a consultant employed as project manager or contractor. In all cases, however, departments and agencies should satisfy themselves that appropriate planning has taken place. **Figure 28** provides an example of how investing time up-front in planning the construction improved the delivery of the Dudley Southern Bypass.

28 Benefits of planning: Dudley Southern Bypass

Considerable effort went into conducting a value engineering exercise and planning the Dudley Southern Bypass road, with no works carried out until the team was satisfied that it knew the site conditions, the likely risks to the project and had adequate plans in place. The lack of visible progress on site caused some concern within the team's respective organisations, and led to some pressure to start work. The team remained, however, committed to its approach and only started work once it had full plans in place.

The project was completed five months ahead of schedule and within the target cost and the budget agreed with the Department of the Environment and Transport and the Regions. There are no outstanding claims on the project and the final account was in July 2000. These results were achieved despite a major enhancement to the scheme, with the decision, taken after the start of the project, to construct a new Metro line parallel to a section of the road. The team altered its plans to take account of this in constructing the road. This work is estimated to have saved over £3 million on the cost of the Metro line.

**BENEFITS SECURED**

Value engineering achieved savings. For instance, the original specification required the removal of 50,000 cubic meters of waste, to be replaced with quarry material. Much of the material was contaminated, but by working together and involving the Environment Agency in developing solutions, they were able to reuse most of the material within the project. By the end of the project, they had only taken 1,500 cubic metres to be tipped: this prevented 25,000 lorry movements around Dudley.

Source: National Audit Office case study examination - Appendix 12 provides more details.

Planning is an essential part of the construction process and can help to ensure that buildings are delivered on time and to budget. The use of value management and other techniques during planning can also reduce waste and inefficiency in construction. Departments and agencies should always satisfy themselves that appropriate planning has taken place.

(iv) Project Management

3.14 A well-thought-through design and a comprehensive plan are essential for efficient and effective construction but equally important is good project management. The characteristics of good project management include all the points below from the earliest design and planning stage:

- Comprehensive understanding of the key stages in the construction critical to its success.
- Detailed knowledge of the risks associated with the building works with reliable contingency arrangements in place to deal with them.
- Selection of competent people or organisations with the right skills to do the work.
- Regular monitoring of progress against key milestones and budgets based on reliable and timely information to ensure appropriate and early remedial action is taken when necessary.
- Effective communication with and co-ordination of all those involved in the construction supply chain.
- Good project management requires managers with the ability to create and lead a team. The right personality is essential.

3.15 Successive reports by the Committee of Public Accounts have highlighted that poor project management has contributed to construction projects being delivered late or over budget. For example, in their report on the "Management of Building Projects at English Higher Education Institutions" (Fortieth Report 1997-98 HC 550) the Committee recommended that levels of delegated authority for project management staff need to be clearly set out to retain control over decision making during construction. And in their report on the British Library (Second Report 1996-97 HC 38) the Committee emphasised the need for clear roles and responsibilities to be defined and understood and that project management structure should be uncomplicated and reflect good practice. **Figure 29** provides an example of how sound project management was used to ensure the successful completion of training facilities at Aldershot and Wattisham as part of the Ministry of Defence's Building Down Barriers project.

29 Ministry of Defence: Building Down Barriers - Example of good project management

This initiative involved a new approach to construction procurement called Prime Contracting based on integrating the construction supply chain - subcontractors, materials suppliers, specialist design consultants. Defence Estates contracted with one firm for each project - the Prime Contractor and worked with them to design out waste and inefficiency in the construction process on two pilot projects at Aldershot and Wattisham to build training facilities. In both cases the Prime Contractors - Laing and AMEC were the project managers.

Both pilots were tightly managed. The project managers held site meetings of all personnel every morning. Activities on site were co-ordinated to ensure that different contractors were not scheduled to work on sections of the construction at the same time, that technical drawings were always ready in time for use by contractors and that delivery and storage of materials were organised to minimise waste and further movements on site.



BENEFITS SECURED

Prime Contracting and project management has contributed to the success of the construction - including a reduction in construction time of 20 per cent compared to previous experience; materials wastage close to zero compared with industry best practice of 10 per cent; and labour productivity of 65 to 70 per cent compared with best industry rates of 54 per cent.

Source: Ministry of Defence, Building Down Barriers see Appendix 13 for further details

3.16 A key requirement of managing a building project is ensuring the safety and well being of all those involved in or affected by, the building works. Eighty-six people (79 construction workers and seven members of the public) lost their lives on or near building sites⁹ in 1999-00. Accidents account for a great deal of lost time on site - there were 15,000 reportable accidents in 1999-00. The Health and Safety Executive has carried out a study that estimated that some 8.5 per cent of the total contract price of a typical construction project was lost through health and safety incidents and near misses, and the consequences of these. A well planned and well run building site has fewer accidents. Both of the Ministry of Defence Building Down Barriers pilot projects (Appendix 13) had no reportable accidents.

3.17 The Department of the Environment, Transport and the Regions and the Movement for Innovation (paragraph 1.9) initiated the "Respect for People" agenda which has as one of its objectives the reduction of accidents and work-related illnesses. The recent report "A Commitment to People: our biggest asset" sets out recommendations to promote radical improvements in the way industry treats people in respect of health, safety, diversity, site conditions, and training. The key message is that all involved in the construction process, including clients, need to take responsibility for health and safety on site. We found evidence of clients seeking ways to ensure that health and safety are given a high priority in their projects. For example, Defence Estates is asking tenderers for prime contracts to provide information on their health and safety procedures on site and how they will record accidents or near misses. Clients need to create an atmosphere where a team wants to report accidents and learn from them

Reliable project management can have a major influence in ensuring that buildings are delivered on time and to budget. But to do so project management responsibilities need to be clearly assigned and understood; there has to be reliable information to monitor progress; and prompt action has to be taken ideally to prevent problems arising or, if not, to remedy them quickly.

rather than cover them up. A mixture of rewarding good practice and auditing may be a useful approach.

(v) Measuring construction performance

3.18 Sir John Egan in his review "Rethinking Construction" (paragraph 1.5) drew attention to the lack of firm quantitative information with which to evaluate the success or otherwise of construction projects. Such information is essential for two purposes:

- Demonstrating whether completed projects have achieved planned improvements in performance, for example, reducing the number of building defects, improving customer satisfaction, and in particular meeting the 10 per cent annual reduction in construction costs which Sir John Egan's review considered was achievable.
- Setting reliable targets and estimates for future projects based on past performance adjusted to reflect current good practice.

3.19 During our examination we found a lack of reliable quantified information with which to evaluate the performance of individual construction projects. A number of public and private sector organisations are, however, either developing or implementing performance measurement systems. Two examples are briefly described in **Figure 30** overleaf.

3.20 The Department of the Environment, Transport and the Regions, the Treasury and the Office of Government Commerce have introduced a number of initiatives to promote the use of performance measurement by both departments and the construction industry. These have included:

- key performance indicators to compare performance of construction firms across the industry developed by the Movement for Innovation, Construction Best Practice Programme and the Construction Industry Board (**Figure 31**) overleaf;
- establishment of a Key Performance Indicators' Working Group with representatives from industry, which published its report in January 2000 recommending a series of indicators which construction clients should use to measure construction performance;

30 Initiatives to measure construction performance

Defence Estates consider measurement to be a key tool to improve construction performance and manage contracts. It is doing so in a number of ways:

- **External Benchmarking.** Defence Estates assess the Ministry of Defence's performance against other major purchasers of construction through participation in a number of benchmarking initiatives - the Government Clients' Construction Panel, the European Construction Institute, the Business Excellence Model and the Major Contractors Group.
- **A framework for performance measurement** - including core performance measures which compare Defence projects' performance with that of the construction industry as a whole, covering time to complete projects, average cost, number of defects, accident frequency, and customer satisfaction; secondary measures which compare different Defence Estates' projects covering the number of changes to project requirements, final cost against initial estimate, and end user satisfaction; and tertiary measures which are project specific and cover the achievement of targets to improve the performance of the project, for example, building cost reductions, and lower maintenance and operational costs.

Defence Estates also plan to measure construction effectiveness. This is likely to be in terms of the time taken to complete buildings, their cost and quality, the accuracy of original cost estimates and the performance of the completed building. Defence Estates estimate that in two years time they will have reliable data on construction costs including client costs, contractor's costs and design and construction costs.

MANSELL plc - a major construction firm

MANSELL plc have a number of indicators to assess their business performance including:

- customer satisfaction with product and the service provided;
- elimination of defects at the time of handover and at the end of the defects liability period;
- environmental awareness;
- safety;
- profitability;
- productivity (number of staff per £ million);
- perception by client as user friendly;
- likelihood of repeat business; and
- predictability of cost and time.

In developing these indicators, MANSELL plc consulted its clients to ascertain what is important to them in terms of MANSELL's performance. Measurement is both through a customer satisfaction questionnaire and use of data from MANSELL's management information systems.

Source: National Audit Office

- The Government Construction Clients Panel and the Office of Government Commerce have developed a series of six input and 12 output key performance indicators to measure performance during the life of the project. A software system for collating and analysing the data is being piloted. The system will be rolled out across central government in early 2001.

- promotion of the use of the procurement excellence model¹⁰.

3.21 The Key Performance Indicators have been particularly useful to organisations with unsophisticated performance measurement systems. Some companies have used the indicators selectively to measure aspects which are important to their business and to their clients, and have used them to supplement their own performance measurement systems. The Key Performance Indicators are not a substitute for more comprehensive performance measurement systems and benchmarking, which can provide more reliable assessments. They do, however, enable companies to gauge their performance in relation to other companies. The indicators are less suitable as tools to manage projects, suppliers or companies, or as criteria for evaluating tenders or in evaluating the success of a construction project in reducing the operational costs of a building. The Department of Environment, Transport and the Regions recognises that more needs to be done to develop objective and comprehensive measures to demonstrate construction performance, and in particular to promote further improvements by both departments as clients and construction firms.

Examples of key performance indicators

Defects - Rated by client on the impact of defects in the project at handover on a scale of 1-10;

Safety - rate of reportable accidents per 100,000 employed;

Predictability cost construction - actual outturn cost compared with the figure agreed before construction started.

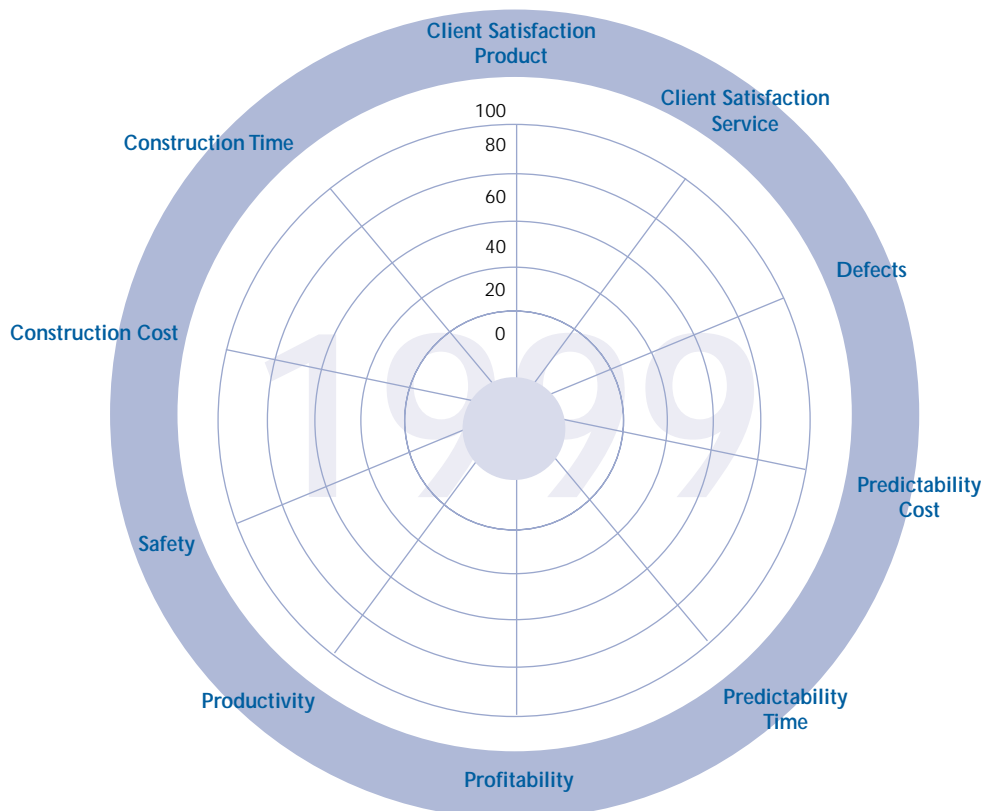
Source: Movement for Innovation

Measuring construction performance is essential to determine whether planned improvements in efficiency and the quality of buildings are being achieved, and to learn lessons for future projects. Departments need to measure their performance as clients and gain assurance that their investment in new buildings gives value for money. Contractors need to measure their performance as suppliers of construction services, and to demonstrate that they provide value for money. To be effective, however, performance measurement requires comprehensive, objective and reliable information.

¹⁰ The Office of Government Commerce has developed a framework for applying the European Foundation for Quality Management's Excellence Model to procurement to identify strengths and weakness. One key element of the model focuses on the results of procurement activity such as price benchmarking, cost savings and transaction costs.

31 Aspects of construction performance covered by Key Performance Indicators

Figure 31 shows the areas of construction for which there are Performance Indicators



Source: Movement for Innovation

(vi) Remunerating suppliers

3.22 One method of promoting improvements in construction performance is the basis on which contractors are paid. All construction projects involve some degree of risk with associated costs should these risks materialise. Agreeing a contract price that is too low and barely allows contractors, professional advisers and suppliers to cover their costs is likely to be a disincentive to good performance - contractors are likely to seek every opportunity to increase costs through claims often leading to lengthy litigation. It is obvious that all suppliers need to make a reasonable profit margin to continue to exist. Conversely, a contract price which allows firms to earn excessive profits will not represent value for money. Some balance is needed so that contractors have reasonable financial incentives to deliver good quality buildings on time and to budget while departments need to be able to demonstrate that their contract strategy includes a form of remuneration that ensures that taxpayers' money is being well spent. It is necessary to provide incentives which promote a co-operative team approach, essential to ensuring effective partnering arrangements, to designing out risk and to tackling any unforeseen difficulties that arise. It is likely that this will involve an equitable allocation of the pains and gains of such arrangements. We found a number of

good examples (Figure 32 overleaf) whereby departments and agencies were using or developing different forms of contracting to remunerate contractors. These had a range of benefits as well as some potential disadvantages which need careful management.

How contractors are remunerated will influence their performance. Careful judgement is needed to ensure that contractors have sufficient financial incentives to perform well, while departments need to be confident that value for money is being achieved.

32 Methods of remuneration to incentivise contractors

	Fixed Price (Design and Build)	Target price	Payment on the basis of outcomes	Target price with agreed profit and overhead (Prime contracting)
What is it?	The contractor is appointed to design as well as construct the building and is paid a combined fixed price for both. The risk of the design not working is transferred to the contractor.	Client and contractor work together to develop a target price for the building. Often there can be some sharing of efficiency improvements as well as risk.	Contractors are paid on the basis of achieved outputs such as delivery on time and achieving agreed standards of reliability, capacity and safety.	A target price is developed during the design stage. The price has two elements - cost which all those involved in the construction supply chain seek to reduce and profit which increases as a result of greater efficiency and innovation.
Benefits	The client has certainty as to the final price of the building.	The client has greater certainty over price and the contractor has an incentive to make cost savings for the benefit of both the contractor and the client.	Incentivises contractors to consider the longer term needs of end users and the overall performance of the completed building.	The prime contractor and the firms involved in the supply chain all need to know their costs which they are incentivised to keep to a minimum.
Potential disadvantages	Transferring all risk to the contractor may not be cost effective, as the client still carries the risk to their business of the new building not being available when required. Client organisations are increasingly looking at ways of allocating risk to the best party able to manage them.	The target and arrangements for sharing efficiency and cost savings need to be established carefully to ensure value for money.	This form of contract can be complex, and it may take time to reach agreement with contractors on the outputs to be achieved and how achievement will be measured.	The target price has to be set at a level which provides sufficient incentive to contractors while also representing value for money for the type and complexity of building being constructed.
Examples of government organisations using this form of remuneration	The Highways Agency: M60-contract 3 (Appendix 7).	The Environment Agency: Beach Management Project (Appendix 8)	The Highways Agency are considering how it might use this form of remuneration (Appendix 7).	Defence Estates: Building Down Barriers (Appendices 6 and 13).

Source: National Audit Office analysis

Appendix 1

Study Methodology

The main aspects of our methodology were:

- We consulted a large number of key players within the construction industry including Sir Michael Latham, Sir John Egan and representatives from umbrella bodies; large and medium sized contractors; specialist contractors; consultants, professional institutes and industry commentators such as academics (Appendix 14).
- We analysed key reports and literature on the construction industry such as "Constructing the Team" by Sir Michael Latham (1994), the Levene Efficiency Scrutiny in Construction Procurement by Government (1995) and "Rethinking Construction" by Sir John Egan and others detailed in the bibliography.
- We examined the **Office of Government Commerce** initiatives to improve the performance of departments and agencies as clients of the construction industry. These included the Achieving Excellence programme, Construction Clients Panel, the Government Construction Client Task Force and the Government Construction Industry Task Force. We attended Government Construction Clients Panel meetings, the Achieving Excellence Conference and a workshop explaining the Achieving Excellence programme to departments.
- We examined the progress made by three agencies and a non-departmental public body in changing the way they procure and manage construction. We interviewed key staff developing and implementing change, examined key documentation and reviewed the results achieved so far. Each of the bodies is an active member of the Government Construction Clients Panel and advanced in implementing change to procurement practices (Appendices 5 to 8):
 - Defence Estates an agency of the Ministry of Defence;
 - NHS Estates;
 - The Highways Agency; and
 - The Environment Agency.
- We interviewed those involved in delivering the **Department of Environment, Transport and the Regions** initiatives and analysed information and data from those initiatives, in particular the Movement for Innovation and Construction Best Practice Programme (Appendix 2). We attended two Movement for Innovation conferences and two regional meetings of people involved in the demonstration projects.
- We examined five Movement for Innovation demonstration projects (Appendices 9 to 13):
 - Anglian Water;
 - Kingston Hospital;
 - Notley Green Primary school;
 - Dudley Southern by pass; and
 - Building Down Barriers

These were chosen as good examples where project teams or the organisations had applied best practice techniques providing lessons with the potential for wider application. We interviewed the main participants in the projects from both the client and supply side, examined key documents and where appropriate visited the site of the project.

- We commissioned an analysis from Professor Norman Fisher and Dr Stuart Green reviewing the literature on the issues surrounding the use of partnering in the construction industry - "Partnering and the UK Construction Industry - the first ten years" (Appendix 4).
- We commissioned Davis Langdon Consultancy to carry out a survey of recent initiatives to improve performance in the construction industry (Appendix 3).
- We established an expert panel to advise us on practice in the construction industry, our methodology and findings. The panel comprised Malcolm Dodds, Reading Construction Forum; Professor Norman Fisher, Reading University; Professor Andrew Graves, University of Bath; and Mark Smalley of the Warwick Manufacturing Group. In addition, Sir Michael Latham, Willmott Dixon, gave us valuable comments on our findings.

Appendix 2

Department of Environment, Transport and the Regions initiatives to improve construction performance

Initiative

What is its purpose?

Who is it aimed at?

Construction Best Practice Programme

(Funded by £2 million from Department of Environment, Transport and the Regions in 1999-2000)

Established in February 1998 to:

Identify current best practice and raise awareness of it; and

Provide advice and assistance to organisations to improve their performance and competitiveness.

Those who need help to change and those who have yet to recognise the need to change but will be willing to do so.

Movement for Innovation

(Funded by £550,000 from Department of Environment, Transport and the Regions in 1999-2000)

Established in November 1998 in response to "Rethinking Construction" to:

Encourage openness, sharing of knowledge and experience;

Bring together project teams committed to "Rethinking Construction";

Facilitate a Knowledge Exchange;

Effect a "movement for change" in the construction industry.

Innovators within the industry.

Housing Forum

(Funded by Department of Environment, Transport and the Regions - £100k;

Housing Corporation - £100k; membership £250k)

Launched in December 1998 in response to "Rethinking Construction" to take forward specific improvement initiatives in the housebuilding sector.

Clients and suppliers in the house building sector. Initially this has been predominantly the social housing sector, but the Forum has been expanding into the private sector as well.

Local Government Task Force

Source: National Audit Office analysis

Launched in October 1999 to promote the principles of "Rethinking Construction" in Local Authorities.

Local Authorities.

What has it done?

Construction Best Practice Programme links with and builds on existing activities by marketing them to the construction industry. The current services are: **Help Desk** - 5,893 contacts; **Website** - 90,766 user sessions; **Inside UK Enterprise company visit schemes** - customised DTI scheme which has arranged visits for 2,107 attendees to forward thinking construction companies; **Construction Productivity Workshops** on issues such as benchmarking, supply chain management - 3,694 attendees; **Construction Industry Environmental Forum workshops** and best practice seminars - 1,437 attendees; **Connect for Better Business** customised DTI scheme - 468 attendees. There are also a number of programmes which the Programme has initiated: **Champions for Change** - 426 individuals signed up to promote change within their companies and supply chain; **Best Practice Clubs** to form local networks - 22 clubs currently established; **presentations** generally on the programme - 19,522 attendees. Construction Best Practice Programme also circulates **Key Performance Indicators wall charts and packs** - 120,000 charts in 1999, 900 packs sold and has 77 case studies of good practice available on its Website and in hard copy.

Construction Best Practice Programme estimates that they have reached 9 per cent of the population working in the industry. Surveys indicate that 86 per cent of those surveyed have taken action following contact with the Programme, and 54 per cent say they have taken action only as a result of the Programme.

Demonstration projects: 171 projects submitted in three rounds which have resulted in 31 case histories which were disseminated at the Conference in May 2000 (case histories are only published when the demonstration project has provided key performance indicators). The Key Performance Indicators for the case history projects showed better results than for industry as a whole, for example, higher profitability.

Cluster Groups: There are 8 regional cluster groups involving 95 demonstration projects. By May 2000, 48 cluster meetings had been held with another 27 planned for the rest of 2000.

Knowledge exchange: This was launched in May 2000. It provides information on the Movement for Innovation and links to the Websites of other industry improvement initiatives.

Board: There are 31 board members of 9 clients, 18 companies from the industry and 4 from other organisations

Working Groups: There are seven working groups covering: Key Performance Indicators; Respect for People; Supply chain Management; Knowledge Centre; cultural change; Training and education; sustainability. To date these have produced: Site Welfare Checklist; Discussion paper on supply chain management; Trust and Money; the industry Key Performance Indicators pack and a report to the Minister for Construction (January 2000).

Team: Its role is to monitor the demonstration projects' delivery of Egan targets and disseminate the information and lessons learnt. There are 13 secondees to the team, 8 from companies working within the construction industry, one from a client organisation, one from an industry umbrella body; and one each from Construction Industry Training Board, the Health and Safety Executive and the Building Research Establishment.

Conferences: two held to date July 1999 and May 2000.

Demonstration Projects - Four rounds of projects have been assessed: out of 150 potential projects 56 have been approved, which cover 37,000 new build and refurbished units with a construction value of over £320 million. The first annual report was published in April 2000.

Website - Provides information on the Forum and disseminates lessons from the demonstration projects.

Working Groups - set up to explore topical issues currently these are: Sustainability; Customer satisfaction - which is overseeing an annual survey into the performance of housebuilders, the first of which is to be run in summer 2000; Recruitment, Retention and Respect; and Refurbishment which is working in conjunction with the Local Government Task Force.

Partnering Report - which examined experiences of partnering in housebuilding.

Benchmarking Club - approved in March 2000 this aims to help organisations improve performance through the development and application of a structured and effective benchmarking system using Housing Sector Key Performance Indicators.

Conference - March 2000 - 550 attendees.

Working Groups - Partnering; Housing; Best Value; Communications.

Appendix 3

Different countries' approaches to improving the performance of their construction industries

Country	Initiative and date of publication	Organisation responsible	People/Cultural issues
Australia 	Building for Growth, Building and Construction Industries actions agenda, April 1999	National Building and Construction Industries Action Agenda	<ul style="list-style-type: none"> Workplace relations Training and skills development Regulation and standard
Finland 	Re-engineering the construction process using Information Technology (ongoing 1997 - 2002)	Tekes (National Technology Agency)	
Ireland 	Building our future together: strategic review of the construction industry, June 1997	Strategic review committee, set up by the Government	
Japan 	Future directions of the construction industry, coping with structural changes of the market, 1998	Central council on construction workforce contracting business	<ul style="list-style-type: none"> Reducing conflict between the parties to the construction process and reduce the cost of dispute resolution A regulatory environment that will promote quality and safety in building design and construction, by the most cost effective means
Singapore 	Construction 21. Re-inventing construction. June 1999	Singapore Ministries of Manpower and National Development	
South Africa 	Creating an enabling environment for reconstruction, growth and development in the construction industry. November 1997	South African Government Green paper	<ul style="list-style-type: none"> Raising the skills level of the construction workforce. Enhancing the professionalism of the industry
United States of America 	National Construction Goals 1994	Construction and building Subcommittee of the National Science and Technology Council	

GENERIC ISSUES FACING THE CONSTRUCTION INDUSTRY

Measurement and business improvements	Information Technology	Environment	Trade facilitation and exports	Stage of Development Implementation
<ul style="list-style-type: none"> ■ Project delivery and business improvement ■ Encouraging innovation 	<ul style="list-style-type: none"> ■ Information Technology 	<ul style="list-style-type: none"> ■ Environment 	<ul style="list-style-type: none"> ■ Trade facilitation and exports 	<ul style="list-style-type: none"> ■ Recommendations accepted by Government for implementation
<ul style="list-style-type: none"> ■ Information networking in the construction process 	<ul style="list-style-type: none"> ■ Information networking in the construction process 			<ul style="list-style-type: none"> ■ Currently under development
<ul style="list-style-type: none"> ■ Fair, transparent and efficient procedures, including competitive construction tendering, in accordance with EU regulations ■ Improving efficiency and productivity in the construction industry 	<ul style="list-style-type: none"> ■ Improving efficiency and productivity in the construction industry (through the use of Information Technology) 	<ul style="list-style-type: none"> ■ A regulatory environment that will promote quality and safety in building design and construction, by the most cost effective means 	<ul style="list-style-type: none"> ■ Promoting the competitiveness of the Irish industry in the domestic and international markets 	<ul style="list-style-type: none"> ■ Majority of recommendations implemented and a number of other recommendations in the process of implementation
<ul style="list-style-type: none"> ■ Improvement of bidding and contracting systems ■ Structural reform of the construction industry 				
<ul style="list-style-type: none"> ■ Enhancing the professionalism of the industry ■ Improving industry practices and techniques 	<ul style="list-style-type: none"> ■ Improving the professionalism of the industry (through the use of Information Technology) 		<ul style="list-style-type: none"> ■ Developing an external wing (to promote international development) 	<ul style="list-style-type: none"> ■ Recommendations to be implemented over a five year period
<ul style="list-style-type: none"> ■ Towards a partnering approach ■ Monitoring equipments ■ Quality and productivity improvement programs ■ The integration of design and construction delivery ■ Contract conditions to effect best practice ■ Contractor accreditation to effect best practice ■ Performance standards 				<ul style="list-style-type: none"> ■ Emphasis on black empowerment job creation, alternative action and affordable housing
<ul style="list-style-type: none"> ■ 50% reduction in delivery time ■ 50% reduction in operation, maintenance and energy costs ■ 30% increase in productivity and comfort ■ 50% fewer occupant related illness and injuries ■ 50% less waste and pollution ■ 50% more durability and flexibility ■ 50% reduction in construction work illnesses and injuries 				<ul style="list-style-type: none"> ■ Implementation of National Construction Goals planned between 1994 and 2003

Appendix 4

Partnering and the UK construction industry the first ten years - a review of the literature

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Summary

Since World War II, a long list of reports have identified the poor performance of the UK construction industry. Possibly as a result of this and pressure from major client groups, partnering has been identified as one way of improving performance for the project procurer, the end user, and the design and construction team.

A case for partnering can be found in the literature, but more recently some concerns have also begun to emerge. In addition there are many definitions of partnering, perhaps because of the very different 'world views' of the various authors. The concepts of 'project partnering' and 'strategic partnering' are identified. There is broad agreement in the literature about the overall philosophy of partnering. However, there are widely divergent views on a number of its features; leading to the view that it is like many other management concepts in being imprecise, inclusive and subject to continuous redefinition. It is difficult at times to distinguish between partnering as a distinctive practice and partnering as managerial rhetoric. Identified benefits and concerns are summarised in the paper.

From the literature, the conclusion is drawn, that there is wide agreement over the benefits of partnering as a project procurement strategy for the UK construction industry. Many see it as far more than just a procurement strategy, rather a fundamentally new way of doing business. However, this is somewhat weakened by a lack, so far at least, of rigorous, verifiable evidence to support claims that are made. This is despite the carefully argued need for such evidence in the literature. It is clear that in-company evidence is available, as a company will claim to know what represents value for its business and most have remained enthusiastic after a number of projects. Such evidence if independently audited would add serious weight to claims. In addition, some of the benefits and concerns that have been identified have clear implications for public sector clients who are using a partnering procurement strategy. Those charged with public spending need to be suitably equipped with both appropriate

tools to identify and sanctions to protect the taxpayer against any anti-competitive behaviour that may emerge.

The background and overview

Since the late 1980s in particular, partnering has been increasingly advocated as an important way of improving the performance of the UK construction industry both for clients and for the different members of the project team. It has been seen as an important way of dealing with the inherent problems of an industry still widely seen by many as a 'design to order' industry: issues such as fragmentation, poor communication and a lack of integration, collaboration and trust. Partnering has been promoted as one technique that could be easily adopted from 'design to manufacture' industries such as the car industry and from retailing, and adapted, it has been argued, to give considerable benefits to all partners involved. Terms such as 'win - win' have been widely used by advocates. In addition, Partnering has been a response by both the US and the UK to levels of performance being achieved in Japan's construction industry. It will be seen that there are many definitions of partnering and different terms such as strategic alliances and framework agreements. In this paper the term partnering is used to refer generically to all such collaborative approaches (see: Bresnen and Marshall 2000).

Since World War II a catalogue of reports have bemoaned the then current levels of performance of the UK construction industry and/or advocated change (e.g. Emmerson 1962; Bowley 1963; Banwell 1964; Higgins and Jessop 1965; Bishop 1972; NEDO 1978; Munday 1979; Ball 1980; Allen 1983; NEDO 1983, 1988; Latham 1994; DETR 1998). Several (e.g. Flanagan 1985) identified some improvements that had been made but concluded that these were patchy. However, a consistent theme can be discerned through the reports, one of fragmentation, short-termism, a lack of trust and a lack of collaboration within the client/design/construction team. In addition they have identified a lack of serious and sustained commitment to education, training, safety and research and in particular the low levels of commitment to serious skills development. These shortfalls were leading to consistently low levels of performance in areas such as cost, time, quality, running costs and fitness for the end user. Possibly as a result, when partnering was first mooted in the US (e.g. CII 1989, 1991) it was received with a level of enthusiasm in the UK. This led to a number of well written and argued reports that advocated its use and benefits. The reports also discussed the business practices that encourage or inhibit collaboration between clients and their project team members (e.g. CRINE 1994; Latham 1994; Bennett and Jayes 1995, 1998; ACTIVE 1996; Bennett et al

1996; Barlow and Cohen 1996; Green and McDermott 1996; Holti and Standing 1996; CIB 1997; ECI 1997; CCF 1998 and CHF 1999). A more critical view then emerged with Barlow et al 1997 discussing the 'side effects' and the shortcomings of partnering as well as the benefits. This approach was supported by Green 1999 and Bresnen and Marshall 2000, all of whom, although conceding that there are many powerful arguments in favour of partnering, expressed concerns in a number of important areas. Most of the issues raised deal with how the benefits are used rather than questioning their existence. If powerful organisations grab too much of any benefit, that is an attack on any trust that has developed, which is a key component of successful partnering.

The literature presents a good case for partnering, but also reflects some concerns that are now beginning to emerge. There are also different schools of thought on the form that partnering could or should be taking, the conditions under which it could flourish and how barriers to partnering can be overcome (e.g. Barlow et al 1997; Thompson and Sanders 1998; Green 1999; Bresnen and Marshall 2000).

The aim of this paper is to outline the key issues and debates about the benefits or otherwise of partnering and to critically assess them. In addition it will deal with the issue of definition and look at the wider organisational, cultural and contractual issues raised by the implementation of partnering.

Partnering - the definitions dilemma

One thing that becomes clear from a study of the literature is that there are many definitions of partnering, possibly as a result of the very different world views of the various authors. The US Construction Industry Institute (CII 1989) offered an early definition:

'A long-term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based on trust, dedication to common goals and on the understanding of each others individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovations and the continuous improvements of quality products and services.'

As Green (1999) points out, partnering from this point of view is primarily concerned with maximising effectiveness and, as a result, reflecting the purpose of countless other management improvement techniques. Perhaps the most widely accepted definition is that offered by Bennett and Jayes (1995):

'Partnering is a management approach used by two or more organisations to achieve specific business objectives by maximising the effectiveness of each participant's resources. The approach is based on mutual objectives, an agreed method of problem resolution and an active search for continuous measurable improvements.'

This definition develops the idea of the need for the measurement, on a continuous basis, of any improvements achieved. Bennett and Jayes also differentiate between project partnering and strategic partnering. As the name suggests, project partnering, which they claim accounts for 90% of partnering in the US, is used for just a single project, whereas strategic partnering builds in an incremental fashion on lessons learned over a series of projects, with potentially greater benefits. Bennett and Jayes (1998) build on their earlier work by adding the idea of three generations of partnering, developing in an evolutionary manner as the working relationship between partners develops. This area is also developed by CIB (1997) which, in offering a definition similar to Bennett and Jayes, emphasises the benefits of partnering as a new procurement route for construction that can tackle the problems caused by the level of fragmentation in the industry. However, CIB falls short of Bennett and Jayes' (1998) position and seems to suggest that partnering is little more than a new, preferred procurement route. Bennett and Jayes see 'strategic partnering' in particular as much more than just a new procurement route - rather as a fundamentally different way of doing business.

Generally by implication, fragmentation has been assumed in the partnering literature to be a bad thing and flexibility to be desirable. However, it is argued in the management literature that the two are usually linked and fragmentation is often the price paid for the desired flexibility. This issue of fragmentation and flexibility is complex and is comprehensively dealt with by Bennett (2000). All of this must be seen in the context of a cyclical industry. It is worth noting that the Japanese construction industry, until recently seen as much less fragmented (and flexible) because of predictable workloads, is now, with a much more uncertain existence, seeking greater flexibility. However CIB warns that partnering as a procurement strategy is not suitable for all project types, although the evidence to support this statement is not clear. The need for an appropriate culture is also emphasised in the later references (Bennett and Jayes 1995; CIB 1997). Both ECI (1997) and Egan (DETR 1998) broadly adopt the Bennett and Jayes definition; however, ECI seeks to apply partnering to the public sector. As Bresnen and Marshall point out (Bresnen and Marshall 2000), there is broad agreement about the overall philosophy of partnering. However, there are widely divergent views on a number of other features, such as the precise role of contracts and other partnering charter type statements (mission statement + project objectives + roles and responsibilities + opportunity realisation /issue resolution), the duration of any partnering arrangements, the need for formal team building, dispute resolution and the role of financial and other incentives. The

review suggests that partnering is still an imprecise and inclusive concept, capturing within it a wide range of behaviour, attitudes, values, tools, techniques and practices (see: Bresnen and Marshall 2000). Holti and Standing (1996) suggest that:

'Rather than being a separate or definable initiative in its own right, partnering (or increasing collaboration) is best understood as the result of making progress with one or more of a number of inter-related technical and organisational change initiatives.'

This view is supported by other literature (see: Loraine 1993; NEDO 1991). It is also noticeable in some of the more recent literature (see: Thompson and Sanders 1998; Bennett and Jayes 1998), that there is an attempt to portray partnering in a more sophisticated way, possibly in order to explain the imprecision and inclusiveness discussed above. The authors suggest that partnering practice is best described as either a range along a continuum from competition to co-operation, collaboration and coalescence, or in terms of the idea of three generations, developing in an evolutionary manner as the working relationship between partners develops. However, it is clear from the literature, as Bresnen and Marshall point out (Bresnen and Marshall 2000), that the term 'partnering' is frequently used in the more 'evangelical' literature to capture a spirit of co-operation that may occur on a project. Much of the literature does not, however, deal thoroughly with this point and ignores the good work on the issues surrounding and implementing co-operation and the building of long-term relations through partnering (see: Carlisle and Parker 1989; Carlisle 1991; Axelrod 1984; Carlisle 1991b). Several other concerns are expressed in the literature (see: Hinks *et al* 1996; Green and McDermott 1996). Firstly, one of the consequences of the imprecise language used by many advocates where partnering can also signify an outcome, is that it is very difficult to distinguish at times between partnering as a distinctive practice and partnering as managerial rhetoric or corporate propaganda, or indeed partnering and TQM. Secondly, the use of partnering methods and language on their own may not lead to better project procurement or indeed collaboration, in just the same way that using traditional procurement methods does not necessarily lead to poor performance or disputes.

One other interesting feature that is evident from a review of the literature is the emergence of a school of thought that sees partnering in a more practical light, simply a set of tools and techniques there to be used by busy practitioners. This approach has led to the development of checklists of systems and procedures (see: Loraine 1996; Roe 1996), with the underlying suggestion that there is a need for a more central role for formal contracts. This view seems to either ignore or minimise the importance of the need for changes in culture and attitude. It also seems to ignore the danger of putting a tool such as partnering into the hands of practitioners still operating with the traditional 'bad ways' of both thinking and practice. A review of wider management literature would challenge this school of thought. The sort of changes needed

successfully to introduce a new procurement strategy such as partnering are not brought about by forms of contract, bureaucratic procedures or structures alone (see: Mintzberg 1979; Lawrence and Lorsch 1967; Kast and Rosenzweig 1985).

A statement of the case for partnering

A reading of the literature confirms that there is no shortage of arguments in favour of partnering, but the difficulty is balancing between pure rhetoric and the much less frequent statements of benefits supported by hard evidence. However, a consistent theme is that partnering provides the construction industry with a more efficient way of working.

Bennett and Jayes (1995) claim that using project partnering will deliver typical cost savings of between 2-10% and with strategic partnering and that over time the savings can reach 30%. They also claim that the cost of partnering is low, adding usually less than 1% to project costs. In addition they claim that partnering can service quality, deliver better designs, make construction safer, meet earlier completion deadlines and provide all parties with increased profitability. They quote examples based on case studies of productivity gains by clients, designers and managers working together of between 50 - 200%. For site activities, however, they quote 5 - 20% and for specialist contractors up to 50% (a specialist concrete contractor working with a construction management firm over a ten-year period). Some evidence in support of these claims is provided in Bennett and Jayes (1998) and Peace (1999). What is still not entirely clear is how much these results were due directly to partnering or other factors such as a team of exceptional or inspired individuals. Similar benefits have been claimed for other management techniques such as the 'continuous improvement' concept. Other benefits quoted include improved customer focus and better quality. There is a possibility that the benefits being witnessed can be quite simply and predictably explained as a result of the 'Hawthorne Plant' effect, first identified by Elton Mayo in the late 1920s (Roethlisberger and Dickson 1939).

Partnering in the Team (CIB 1997) offers a surprisingly weak set of arguments in favour of partnering. They consist of a series of vague testimonials for by the 'great and good' of the industry with no attempt at independent verification. Clearly commitment to the concept of partnering by senior industry figures is important, but without the rigorous measures outlined by Bennett and Jayes (1995) this could easily be little more than a corporate marketing exercise. This also applies to a lesser extent to the case studies that they provide, which, although light on detail, nevertheless fulfil their presumed task of being illustrative and informative.

Barlow (1997) identifies both benefits and concerns. Amongst the benefits claimed are improved project quality, more effective use of personnel, reduced claims and litigation, a

better working environment, improvements in cost scheduling and profitability, responsiveness to changing business conditions and specific benefits for individual participants from strategic partnering. He quotes a Canadian study of defence projects that revealed measurable improvements (Irwin and Spatling 1996). Amongst partnering concerns Barlow identifies the need for up-front resources and expenditure with no immediate return. Other concerns he lists are over-dependency on the partnership, maintaining the value received, equitable sharing of risk, protecting proprietary information and increased time spent communicating. Generally the benefits of partnering are well summarised by several authors, in particular by Bennett and Jayes (1995) and Bresnen and Marshall (2000).

As discussed at the beginning of this paper, partnering is attempting to address UK construction industry issues that have been of concern certainly since World War II. Of particular and repeated concern are the issues associated with the fragmented nature of the construction industry and the characteristics of a 'design to order' industry (Harvey and Ashworth 1993). It would be interesting to know how much this is due to the influence of the professional institutions unique to the UK construction industry (and former colonies) and their traditional grip on education. Such influence, if not addressed, would impinge on the ability of innovative procurement strategies such as partnering to overcome the effects of fragmentation. One of the strongest arguments running through the literature as a consistent theme is the desire to reduce adversarialism and the level of litigation and to resolve problems as they arise jointly and informally, through inter-party collaboration. A further consistent theme is the desirability of partnering between the client and the principal contractor, but also specialist trade contractors (Construction Productivity Network 1997; Thompson and Sanders 1998). Less attention is given to partnering with other parties such as designers, consulting engineers, cost consultants, component suppliers and the numerous other key contributors to a successful project.

A conclusion that can be confidently drawn from the literature is that there is wide agreement over the potential benefits of partnering. These include a commitment to co-operate, because it will aid each partner to achieve both the objectives of the project and at the same time his own business needs (for a good description of this see: Bennett and Jayes 1995; Bresnen and Marshall 2000). No clear distinction is made in the literature, however, between co-operation between individuals and co-operation between companies. Clearly different factors will be involved and co-operation between individuals is likely to be much easier to achieve. In addition, it is argued that the greater certainty of workload associated with strategic partnering allows, the more effective deployment of resources and team building. Further, it is argued that it allows experience to be captured and passed on within the team and develops a research culture that seeks new and innovative solutions.

However, there remains the difficulty of distinguishing between pure rhetoric and statements of benefits that can be supported by hard evidence, as the evidence offered in the literature is often far from convincing. Case study examples quoted as evidence in support are often vague on detail and written in a way that is both anecdotal and lacking in self-criticism. This lack of objective criticism of the effect of the introduction of partnering is also evidenced by the concentration on successful examples of partnering by 'blue chip' companies. There are, however, several studies on partnering that attempt to seek a balanced rigorous assessment of the effects of its use. These are CII 1994, Larson 1997 and Angelo 1998.

Cultural, organisational and contractual changes needed if partnering is to succeed

One of the clear conclusions from the long list of government and industry reports discussed above is that conflict is very much the industry norm. Non co-operation, based on fundamentally different world views and interests between clients, designers, engineers, cost consultants and contractors, is a major characteristic of the industry. Often it is the issue of commercial pressures, and in particular traditionally low margins, that forces partners to act in traditional, adversarial and exploitive ways (Higgins and Jessop 1965; Latham 1994; Bresnen 1996; Bresnen and Marshall 2000). The literature would suggest that economic conditions that encourage collaboration are an important factor in forcing contractors to accept change. For example, a buyers' market, where powerful clients or client groups force changes on contractors in terms of ways of working or risk acceptance, has been observed in the oil and gas sector (Green 1994, 1995; Bresnen and Marshall 2000). But this is hardly the spirit of partnering. The opposite could also be true. Other issues are raised in the literature such as the building of trust, project team building, the need for top-level commitment, the role of the individual and the need for open and flexible communication (Barlow *et al* 1997; Rowlinson and McDermott 1999; Ogunlana 1999).

Given that trust is identified in the literature as one of the cornerstones of successful partnering. It is surprising that many of the advocates of partnering in the construction industry have notably ignored the wider management literature on trust between business organisations. The partnering literature assumes that trust within organisations is the same as trust between organisations, ignoring the broader institutional constraints that impinge upon relationships. Some advocates of partnering even make simplistic analogies with marriage and personal relationships. Discussions of partnering arrangements based on inter-organisational trust are founded on the assumption that organisations are unitary entities sheltered from environmental influences. Blois (1999) argues that trust can only be granted by individuals. The argument that partnering depends upon trust between organisations is therefore interpreted as shorthand for 'two

sets of individuals each of which is trusting the organisation of which others are members'. Individuals would clearly be unwise to adopt blanket trust of organisations that are subject to short-term economic pressures. Such economic exigencies are always likely to take precedence over the sensitivities of middle managers. The likelihood of individuals trusting an organisation will be further significantly shaped by the organisation's reputation for trustworthiness (Kreps 1996). Of particular importance is the way that an organisation has behaved when faced with unexpected contingencies. Some firms will protect their reputation by adhering to principle even when it is not in their short-term interest. Individuals are unlikely to trust organisations who, despite an overt commitment to partnering, revert to form when faced with an unexpected occurrence. As pointed out elsewhere in this paper, some of the major advocates of partnering possess reputations for fair practice that are currently being questioned. Claims to have suddenly 'seen the light' should be, and invariably are, treated with suspicion. If partnering is dependent upon trust, it must be recognised that this in turn is dependent upon behaviour over prolonged periods of time. The behaviour of organisations and individuals within the construction industry will not be changed by exhortations from the CIB or others.

There is evidence that partnering can depart from the ideal if specific concerns dominate the thinking of the powerful members of the partnership. Concerns such as a drive for cost reduction, or determined attempts to push risk or cost reduction down the supply chain. Indeed, where the sole purpose of the partnering exercise is to improve performance on a continuous basis, low margins may result in the use of power to squeeze suppliers or subcontractors too hard, in which circumstances as Bresnen and Marshall put it '*.. there is the paradoxical danger that partnering could become a victim of its own success*' (Bresnen and Marshall 2000; see also: Imrie and Morris 1992; Bresnen 1996; Green 1999). Green examines some of the companies put forward as illustrations of good practice and expresses concern over the track records of a number of them, partnering with suppliers in other, non-construction areas of their business. Green points out that several cited are currently under investigation by the UK Competition Commission.

Imrie and Morris (1992) and Bresnen (1996) also point out that there is evidence of an unwillingness to commit fully to close long-term partnerships because they inhibit open price competition and the use of alternative suppliers. Rasmussen and Shove (1996) put this point neatly when they suggest that there is no easy solution based on exhortations to act in ways that fly in the face of powerful economic imperatives and well-established traditions. Clearly the benefits of partnering are going to be relative as it will serve different interests for different parties. Bresnen and Marshall (2000) build on this by demonstrating from the literature on organisational and cultural change the complexity of the task facing those wishing to develop a suitable organisation and culture for partnering. It is likely that short-term changes can only be achieved as a result of the economic/power issues raised

1 Key factors associated with trust in economic activity. In: Korczynski, M. (2000) The political economy of trust, *Journal of Management Studies*, 37(1) p16

Dimension	Low-trust economy	High-trust economy
Agents' Motivation	Economic, opportunistic	Economic, social and ethical
Agents' time horizon	Short	Long
Agents' level of rational calculativeness	Narrowly rational	Trust even where is no objective basis for expectation
Key property of the market	Creates power imbalance; threatens agents' economic existence	Provides information to allow knowledge of trusting behaviour
Relative power of agents	Skewed	Similar
Status of enforcing agency	Illegitimate, inefficient	Legitimate, efficient
Role of reputation	Reputation does not function	Reputation functions
Status and role of collective institutions	Weak status, narrow role	Strong status, wide role
Likelihood of repeat exchange with same agent	Low	High

above. They go on to suggest that there is serious doubt in the literature about the possibility of manipulating or changing organisational cultures, as they are not simple variables like organisational structures or reward systems. This view contrasts with that of Carlisle (1991, 1991b) and Axelrod (1984) who argue that cultural change is possible. A culture is the very essence of what a company or an industry is. Bresnen and Marshall (2000) further suggest that some current conditions do assist any pursuit of change in the construction industry; however, there are others that still pose major barriers.

Korczynski (2000) has compared the factors associated with a low-trust economy with those for a high-trust economy. (See Table 1). The structural characteristics and ingrained practices of the construction industry would seem to accord much more closely with the factors associated with a low-trust economy. The industry is notoriously short-term and narrowly rational. The market is further characterised by significant power imbalances throughout the supply chain. The possible weakening of professional and trade associations may be indicative of a construction industry that is moving even further towards a low-trust economy. The project-based nature of the industry makes the likelihood of repeat work relatively small beyond the industry's large clients.

Barlow (1997) identifies the fact that there is no one formula for setting up a partnering agreement, as the type of project, the degree of risk, preferences of clients and other specific factors will determine the form it should take. A contingency approach is suggested. Such factors will also determine contractual arrangements. However, in nearly all the projects that Barlow observed a standard contract was somewhere

behind the innovative process. Bennett and Jayes (1995) deal with the various contractual questions, looking at issues for the public sector and methods of adjudication. In addition they look at the issues caused by the use of partnering in the light of current EU competition regulations.

Several examples observed by Barlow (1997) had a full dispute resolution procedure agreed, including a committee to deal with disputes. However, Barlow did observe an increased level of trust developing between parties with the contract seen more as a safety net. This attempt to improve trust was strongly advocated by Egan, who urged companies to work together on a basis of trust (DETR 1998).

Partnering and the public sector

Some issues associated with the benefits and risks of engaging in the partnering approach have clear implications for those charged with protecting the taxpayer. Better value for money is one of the much-trumpeted benefits of partnering. However one concern is that as the partnering process becomes more established and effective and the benefits of partnering become evident, so too do the barriers to entry. This is already becoming apparent on public sector PFI projects, where in some instances the barriers to entry are becoming so high that there is concern about competition being stifled and the resulting effect on 'value for money' achieved. For a comprehensive discussion on the main issues peculiar to the public sector see ECI (1997).

There is a culture in the public sector that is based on the idea that one-off competitive tendering is the safest way to get value from public money. However, from a public spending viewpoint, there is merit in allowing the market-place in terms of partnering to work its course and disprove this notion. If this policy is to be followed, then those charged with public spending need to be equipped with both appropriate tools to identify and sanctions to protect the taxpayer against anti-competitive behaviour, such as can result from integrated supply chains.

However, the growth in PFI projects offers serious opportunities and challenges to the project procurer in the public sector. The use of partnering as a procurement strategy or as a new, fundamentally different way of doing business, is widely claimed to be a serious option for achieving better value for money for the taxpayer, provided the concerns outlined above are properly dealt with. Using the concept of 'third generation partnering' (Bennett and Jayes 1998), it may be possible to provide the public sector with healthy competition between a suitable number of networks of partnering organisations. The public sector as customer has an important role in influencing the growth of such networks. Recognition of this is in contrast to the prevailing practice in the public sector of using its power to foster competition *within* project teams, with often serious consequences for the taxpayer.

Conclusions

This review of the literature suggests that there is evidence to demonstrate that there are measurable benefits in using partnering as a project procurement strategy within the UK construction industry. Some see it as much more than a procurement strategy and suggest the term 'paradigm shift'. There is evidence relating to both the private and public sectors. However, this is not surprising given the problems caused by fragmentation, the low level of trust that is the norm and the confrontational nature of the industry. As both Latham (1994) and Egan (DETR 1998) point out there is considerable slack within the industry. Thus, if partnering is a strategy that can deliver improved collaboration and therefore better communication and integration, better levels of trust and fewer disputes, then it will be a significant step forward. How to make that step is described in the literature (for example, see: Bennett and Jayes, 1998).

Independently verified evidence of measurable benefits is currently lacking in sufficient quantity and breadth to be convincing. However, Peace (1999) has begun to alter the balance on this. This lack of verifiable evidence is surprising, given that partnering has been used for over ten years. Also because, as Bennett and Jayes (1995) made clear, '*successful project partnering depends on devising (and agreeing) simple robust measures of performance*', what evidence there is, is mixed. It is important to note that some of the negative evidence demonstrates the inappropriate or incorrect use of partnering, rather than challenging the concept that benefits are possible.

It is suggested that factors that will indicate partnering success include:

1. Measures expressed as numerical ratios or as percentages so that there are no project-specific units of measurement.
2. Measures devised by a monitoring group drawn from the project partnering group or the strategic partnership group as appropriate.
3. Independent studies that seek to develop and test a set of generic scales that can be used by the industry at large.

However, in each case it is important for any measure to be independently verified, so as to avoid charges of 'corporate marketing propaganda' or 'current fashion'. Clearly there are dangers of overplaying both the benefits and the ease of implementation and of attempting to provide a standard partnering solution to all project situations. There is also a danger of a counter attack against the partnering concept by traditionalists, who have their own reasons for supporting the status quo. But as Green (1999) points out, with major clients pooling their buying power and demanding partnering, it is not surprising that it is difficult to find a contractor who is less than totally enthusiastic about partnering and who has not believed in it, or been practising it for many years. It is also worrying that major client groups appear to have discouraged

questioning of the benefits of partnering. In addition, there are longer-term concerns over partnering in general, as witnessed in the allegations against major food retailers currently under investigation. If powerful organisations grab too much of any benefit, it is against the spirit of trust central to partnering.

Finally, there is an urgent need for those charged with public spending to deal with the issue of barriers to entry. They must also be equipped with appropriate tools to identify and sanctions to protect the taxpayer against anti-competitive practices when they occur. For example, when do integrated supply chains, or barriers to entry become anti-competitive? This must be balanced, however, against the fact that 'cut throat' competition also poses just as real a threat, with disastrous long-term consequences.

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Appendix 5

The NHS Estates



- 1 The NHS has the largest property portfolio in Europe, and is also one of the most complex with facilities ranging from Victorian to contemporary and in type from District General Hospitals to Health Centres. It has capital assets with a replacement value of £72 billion. Expenditure on construction in 2000-2001 will be almost £3 billion. NHS Estates (formerly the NHS Estate Management and Health Building Agency) was established in 1991 with:
 - A vision of a modern NHS Estates with a dependable infrastructure of quality buildings, equipment and systems appropriate for the delivery of modern healthcare and which are flexible to accommodate changes in medical science and technology; and
 - A mission statement of ensuring "optimum use of the Estate for better healthcare" (since updated to "Building Better Healthcare").
 - 2 Responsibility for the procurement of healthcare facilities is delegated to NHS Estates Trusts and Authorities which means that there are potentially over 500 organisations within the NHS Estates that could be clients for the construction industry.
 - 3 The role of NHS Estates is to:
 - provide support and advice to ministers and the NHS Executive on professional and technical issues related to the management of the NHS;
 - assist the NHS Executive to develop and implement policies and strategies for the capital investment programme and facilities management;
 - performance manage the NHS capital investment programme, and maintain the management information systems that support this;
 - Liase with other Government Departments, the NHS and the private sector to identify and promote the application of best practice by the NHS to achieve continuing improvements in value for money; and
 - Provide assistance on a consultancy basis where requested to NHS bodies to enable them to obtain value for money at all times either in the management of their estate or the procurement of healthcare facilities.
- ## Why were changes necessary to the NHS Estates approach to procuring healthcare facilities?
- 4 There have long been concerns that when the NHS is procuring health care facilities, it is not obtaining value for money and this results from reasons such as:
 - The fragmentation of the client base and the resultant dilution of procurement skills the reason for this being that the key objective of NHS Trusts and Authorities is the delivery of patient care and therefore they should not need to be experts in the procurement of healthcare facilities;
 - The inability of NHS Trusts as a result of the competition generated by the internal market to collaborate in the procurement of healthcare facilities at different sites that results in large numbers of suppliers being utilised causing inefficiencies in the procurement process;
 - Investment decisions based on lowest initial capital investment and not whole life costs;
 - The inability to manage the early stages of projects effectively to ensure that users are properly engaged in the process to avoid later changes to the functional requirements for healthcare facilities;
 - The lack of supplier involvement at the early stages of schemes; and
 - The lack of an effective project evaluation process throughout the life of schemes that enabled the NHS as a whole to benefit from lessons learned.
 - 5 The Government Client Improvement Study in 1998 identified the NHS as an average performer in construction procurement. In March 1999, NHS Estates submitted its target dates for implementing "Achieving Excellence" and established a specialist project team to consider the policy initiatives required to meet "Rethinking Construction" targets.
 - 6 This was given added impetus with the Public Services Productivity Panel's report "Sold on Health (Modernising Procurement, Operation and Disposal of the NHS Estate)" published in April 2000. This identified a number of opportunities to improve the management of the NHS estate and included a recommendation that NHS Estates should identify and implement a programme of improvement of the NHS capital procurement programme.

What is NHS Estates doing?

7 NHS Estates has established an initiative called NHS Procure 21 whose objective is to establish a culture of continuous improvements in performance in the procurement of healthcare facilities. There are four key elements in NHS Procure 21:

Partnering

One of the key recommendations to come out of “Sold on Health” was the introduction of partnering for the procurement of health buildings. Through its initiative **Procure 21**, NHS Estates proposes to identify and appoint:

Specialist Procurement Advisors - Healthcare Planners, Cost Advisers, Design Advisers and others to support the NHS Project Director; and

Principal Supply Chain Partners - organisations that have supply chains that enable them to design, construct, finance and operate facilities.

They will be appointed on a framework agreement for a period of 5 years. The NHS would award all publicly funded projects with a works cost in excess of £1million and all PFI projects with a works cost exceeding £1million and not exceeding £20 million to Principal Supply Chain Partners that are selected for appointment to the framework agreements. NHS Estates has identified two NHS regions in which to pilot this initiative - the North West and West Midlands and NHS Estates is working with them to implement the initiative.

The key objective for the procurement advisors and supply chain partners appointed to the framework is to achieve continuing improvements in value for money over the life of the healthcare facilities. To support this, NHS Estates is establishing a performance management process that involves the use of Performance Indicators over the life of the frameworks. It is also essential that all suppliers contribute to a continuous improvement process that will involve them in sharing innovation and knowledge for the benefit of the NHS.

Currently it is proposed that Specialist Procurement Advisors and Principal Supply Chain Partners will be selected for appointment to the frameworks on the basis of best value criteria (quality and cost) and this process will use the European Foundation for Quality Management Excellence Model. The criteria will include:

Technical Criteria

- Proven track records of the supply chain members
- Quality of resources and expertise available
- Design capability
- Management contracting capability
- Hospital commissioning ability
- Facilities management track record

Commercial Criteria

- Ability to manage time, cost, quality and risk
- Ability to put appropriate finance in place
- Economic test and year on year improvement

Soft Criteria

- Evidence of ability to partner
- Evidence of supply chain management ability
- Evidence of appropriate attitude and culture
- Understands NHS culture
- Proven ability to innovate
- Willingness to take part in continuous improvement

When selecting and appointing Principal Supply Chain Partners for specific projects, NHS clients would invite two to submit outline proposals based on a performance specification. These would be evaluated on the basis of time, annual equivalent cost over the life of the facility, and quality (design quality and innovation). After evaluation of the proposals the selected Principal Supply Chain Partner will be appointed to work in partnership with the NHS client and its Specialist Procurement Advisors to design and construct the facility which may also include operation and funding thereof dependant on the factors affecting specific schemes.

Establish the NHS as a best practice client

- 8 NHS Estates is developing a number of initiatives to improve the NHS performance as a client. These include:
- Establishment of a training and development plan for Project Directors to develop the skills needed to manage the procurement of a capital asset, this proposal includes establishment of a register of Certified Project Directors together with a requirement for Continuing Professional Development;
 - The development of guidance and training on issues such as risk management, value engineering/management, supply chain management, life cycle costing and producing output/performance specifications, all guidance to be dynamic and subject to continuous improvement to support the continuous improvement process;

- Establishment of a continuous improvement process which will involve the NHS, the Specialist Procurement Advisors and the Principal Supply Chain Partners in learning sets to share knowledge and ensure that lessons learned are communicated for the benefit of all;
- Increasing efficiency in the procurement process through the use of information technology.

Design Quality

- 9 NHS Estates is interested in the impact of design both on the well being of patients and the efficiency of the processes carried out in a medical facility. It has developed a programme called "Achieving Excellence in Healthcare Design" which includes research, development and dissemination of best practice and working with architects and designers from outside the NHS to consider new solutions to the changing needs of the NHS. It has also assembled a database of best practice design examples called "Beacons." NHS Estates is also considering how it can improve its briefing for projects, in particular output specifications, sustainability and the scope for standardisation. In addition the ability of all supply chain members - designers, contractors, sub-contractors, suppliers, components manufacturers to contribute to design will be encouraged.

Benchmarking and Performance Management

- 10 NHS Estates is participating in external benchmarking with Defence Estates and the Valuation Agency with whom it has signed a Tripartite Concordat whereby they have all agreed to share information so that they can learn from each other's experiences. It proposes to establish and support internal procurement learning sets at a national and regional level, the objectives of which would be to:
- learn from each other's performance;
 - test out innovative ideas to improve performance;
 - share best practice and innovation;
 - benchmark performance in the NHS Estates and other sectors; and
 - carry out process benchmarking with other industries.

The outcome

- 11 NHS Estates estimates that it can achieve the "Rethinking Construction" savings of 10 per cent on construction costs, which would yield an extra £300 million each year. It also expects that projects procured under NHS Procure 21 will be delivered on time and to cost and will provide better quality facilities.

Lessons Learnt

- 12 NHS Estates is still in the early stages of this change. However, its experiences have already highlighted several lessons:
- ✓ It is essential to have a communication strategy when embarking on a programme of change. This has been particularly important for NHS Estates given its role as an advisor and influencer rather than as a direct procurer and has increased the need for it to win and retain the support of its customers for its plans.
 - ✓ Fundamental change takes time and problems often arise when addressing the detail. The NHS Estates proposes to do this using the two pilot projects before implementing the initiatives further.
 - ✓ Beneficial change is not brought about just by changing methods of procurement, but by looking at issues of design and an organisation's skills as a client in areas such as briefing and project management.
 - ✓ The achievement of continuous improvements in value for money requires effective supply chain management together with a project evaluation and continuous improvement process.

Appendix 6

Defence Estates

- 1 Defence Estates is an agency of the Ministry of Defence and was established in April 1999 with the Chief Executive being accountable for the management of the estate as a whole, but with top level budget holders remaining individually accountable for the property they occupy. The estate is very large, accounting for 1 per cent of UK landmass with assets worth £14 billion, and complex with numerous sites of scientific interest and a great variety of buildings and facilities ranging from listed buildings and ancient monuments to airfield and training facilities. The Ministry of Defence spends £1 billion on construction each year, 60 per cent of which is accounted for by maintenance.
- 2 For the purposes of procuring this construction, the Ministry of Defence estate is currently organised into 90 regions for property maintenance, having contracts with Work Service Managers who competitively tender this work, and Establishment Works Consultants who act as informed advisors to Ministry of Defence property managers. Capital programmes are treated as a separate activity and are funded separately.

Why did Defence Estates wish to change?

- 3 The Strategic Defence Review in 1998 concluded that the defence estate needed to be managed more as a corporate asset and to maximise value for money from property maintenance and capital works. It, therefore, placed increased responsibility on the Chief Executive of Defence Estates for its management and for the development of an improved procurement process. To deliver against the Strategic Defence Review and to meet defence capability and commitments, Defence Estates has led the development and publication of an agreed departmental estate strategy. The strategy provides the impetus for a variety of new estate management initiatives to be developed and implemented across the Ministry of Defence.
- 4 Moreover, the Department was dissatisfied with the way in which it procured construction and the results achieved. The current procurement system has proved complex and costly to administer with numerous small contracts tendered. It has been estimated by one of Defence Estates' major contractors that for every pound Ministry of Defence spends on property maintenance, up to 60 pence is accounted for by administrative costs. The system also does not provide any incentive to the Works Services Manager to spend efficiently and there

is a lack of forward planning with no linkage between property maintenance and capital expenditure. Defence Estates also found that within projects there were too many interfaces between the client, and the supply chain contributing to poor communications and misunderstandings. More generally its relationships with suppliers were becoming increasingly adversarial.

- 5 In 1996, the Defence Estates' predecessor, the Defence Estates Organisation reviewed the performance of its construction suppliers and concluded that it was paying too much for inefficient work which often delivered functionally inefficient buildings and facilities. It also found that the industry could not predict the running and maintenance costs of facilities.
- 6 Against this background Defence Estates initiated the Building Down Barriers project to develop a supply chain management system and used two pilot projects to refine the process and demonstrate the benefits. Appendix 13 contains the details of the Building Down Barriers experiment. The results from the trial have provided a stark contrast with those achieved using traditional methods of procurement, showing significant benefits in the efficiency of the construction process, for example, the construction time was reduced by 20 per cent and materials wastage to virtually zero. Projected through life costs are 7 to 14 per cent lower than the estimated cost of traditionally procured facilities although capital costs are some five per cent higher than the reference cost used.

What Defence Estates is doing

- 7 The Ministry of Defence's Estates Strategy, published on 7 June 2000, states that:

"We will seek to improve relationships with our suppliers reflecting the highest business standards and methods. New procurement processes based on increased partnering with the private sector will deliver better value for money."
- 8 Defence Estates is fundamentally changing the way it procures construction for both capital and maintenance, with a policy of using **Prime Contracting** as the preferred procurement route where Private Finance Initiatives are inappropriate. Prime Contracting involves the integration of design, construction and maintenance under the control of a fully accountable **Prime Contractor** who is responsible for:

- the selection of sub contractors;
 - the management of procurement from the rest of the supply chain;
 - the design of the facility;
 - the co-ordination and overall systems, engineering and testing;
 - planning, programming and cost control; and
 - total delivery of the facilities ensuring that they are fit for, the specified purpose and in line with through life cost predictions and delivered by the target completion date.
- 9 There will be two types of Prime Contracts. The first will cover capital works for large and complex capital projects where the contractor will design and construct an asset fit for its intended purpose and maintain the facility for at least three years to prove its through life cost predictions. Defence Estates is piloting this approach for a number of projects (see paragraph 14).
- 10 The second type will be for **One Stop Shops** where one Prime Contractor will deliver all property maintenance and capital works below a defined value for all three services in a region. Defence Estates plans to have a structure of up to twelve regional One Stop Shop contracts which will run for five to seven years with options to extend to ten. Prime Contractors will be paid at agreed milestones provided that they can satisfy Defence Estates that they have paid their supply chain. Defence Estates will start the tendering process for One Stop Shops in the autumn 2000, with the aim of having all contracts in place by 2004.
- 11 Selection for Prime Contractors will be based on a mix of hard and soft issues, 60 per cent on hard issues. Evaluation of the soft issues is done using a Ministry of Defence evaluation tool developed to assess soft issues in equipment development bids. Bidders will need to reach an acceptable standard in both hard and soft issues. Examples are:

Hard	Soft
Financial stability	Ability to manage costs
Technical competence	Understanding of MoD culture
Health and safety	Attitude to Earned Value Management
Fraud prevention	Market awareness
Supply chain	Quality of ideas and proposals
Price	Willingness to share risk
	Understanding of concept of trust
	Flexibility
	Relationship strategy

- 12 Selection will follow a three stage tender process of advertisement through the Official Journal of the European Communities inviting expressions of interest; a prequalification questionnaire; and invitation to tender. During this last stage tenderers will be asked to submit proposals against an output-based specification and indicative costs. Interviews will take place to test the quality of proposals and ability to deliver. At the end of this process, a preferred bidder will be selected and commence negotiations to finalise the technical solution and commercial issues leading to award of contract.
- 13 The contracts will be managed through Integrated Project Teams which will be dedicated to the contract for its life including selection. The Integrated Project Team will be composed of a representative from the ultimate user, a Defence Estates project manager and technical and commercial support. A partnering approach will be adopted by the team in its relations with the Prime Contractor. The Prime Contractor will become a member of this team once appointed. Defence Estates intends to have a "hands off but eyes on" approach to the project whilst managing the contractual interface. The key management tools it will use are open book accounting; performance measurement, and a requirement to provide information about the supply chain from time to time.

Progress to date

- 14 Defence Estates issued a "Core Conditions and Summary Guide to Prime Contracts" in May 2000. It is using the Prime Contracting model in five projects at: Faslane (a nuclear facility); Andover (officer accommodation and technical buildings, and some facilities management); Wimbish (refurbishment and new build of junior rank accommodation for 300 soldiers); Tidworth (primary health care centre with a requirement for some facilities management); and Nelson (junior ranks single living accommodation project).
- 15 In introducing the changes to procurement, Defence Estates has recognised that this is not just a change in process or procedure, but a fundamental change in culture which affects all Defence Estates staff, their clients and suppliers. Therefore, it has embarked on a major change programme internally and externally. The key components of which are:

Internal

- Use of the Business Excellence Model to identify the improvements Defence Estates needs to make to achieve its vision of being at the forefront for their estate management, and to develop plans for doing so.

- Development of a knowledge management system to map business processes and create a framework for the storage, retrieval and distribution of knowledge. This will provide a platform for continuous improvement initiatives.
- Publication of a Values into Action booklet that identifies the behaviours which reinforce the new cultural values.
- Workshops bring together industry, Defence Estates staff and clients to address specific issues in Prime Contracting.

External

- Defence Estates held a continuous series of seminars with major contractors, consultants and clients to present its options and obtain feedback to the Prime Contractor initiative. Feedback has also been sought throughout the process through workshops and one to one discussions. More than 60 contractors and consultants have taken part;
- Defence Estates has contributed to the development of a "Handbook of Supply Chain Management" and supply chain training modules are being rolled out for the industry. 150 firms have attended these to date.
- There has also been a programme of customer roadshows.

The outcome

Potential Benefits

- 16 Ministry of Defence's Estate Strategy states that where Prime Contracting is used they expect to demonstrate value for money improvements of 30 per cent over the lives of projects by 2005. In terms of qualitative outcomes, Defence Estates expects that the changes will result in:
 - fewer interfaces between end-users, Defence Estates and suppliers;
 - clearer definition of responsibilities;
 - sharing of risks between Defence Estates and the prime contractor and its supply chain; and
 - a move away from adversarial relationships.

Lessons Learnt

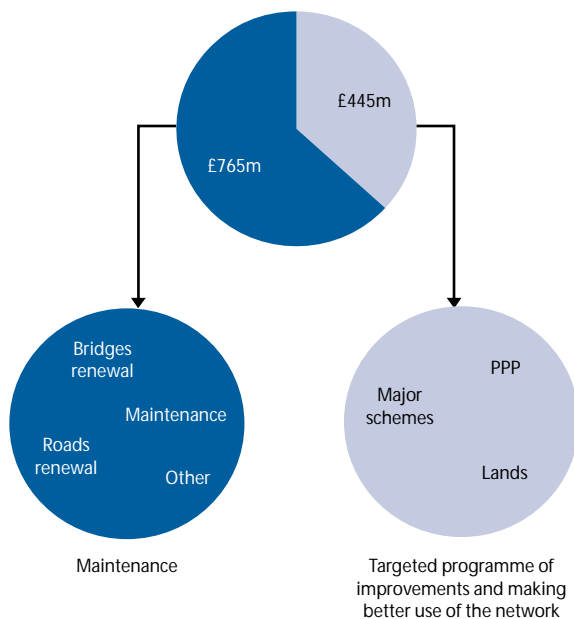
- ✓ Defence Estates found the Business Excellence Model was invaluable in identifying areas of performance which need to be improved and in establishing a different approach to construction procurement.
- ✓ Defence Estates has been very open with the construction industry in changing its procurement methods. It has received more adverse reaction to its proposals from the industry and media than other organisations, and has been put under pressure to issue the new contracts more quickly. However, Defence Estates believes that, despite these problems, it was right to adopt an open policy.
- ✓ Defence Estates decided to implement change using a top-down management approach to ensure that all staff adopt the change. It has recognised that change in the procurement and management of construction is not limited to improving the form of contracts, but requires the development of new processes and procedures and a change in staff attitudes.

Appendix 7

The Highways Agency

- 1 The Highways Agency maintains, operates and improves the network of 10,500 kilometres of trunk roads and motorways and 16,000 structures in England on behalf of the Secretary of State for Environment, Transport and the Regions. The network has an estimated replacement value of £60 billion. In carrying out its remit, the Agency spends some £1.5 billion a year, of which £1.4 billion is spent on construction projects which develop the network (Targeted Programme of Improvement) and make better use of it or maintain it through infrastructure renewal projects and routine maintenance to keep the network safe and open. **Figure 1** shows the breakdown of the Agency's expenditure in 1999-2000.

1 Highways Agency's Expenditure on Construction



Why did the Agency wish to change?

- 2 Following its establishment in 1994, the Agency conducted a review of its construction procurement. It was using traditional methods of procurement and was dissatisfied with the results achieved, projects had poor predictability both in terms of outturn time and cost. In the early 1990s, projects had an average outturn cost of 24 per cent more than the original tender price. This has continued to rise with more recent projects procured using traditional contracts achieving an average outturn of 40 per cent above the tender price. The Agency was also concerned that it had an adversarial relationship with suppliers. The Agency decided to develop alternative forms of procurement and ways of working with suppliers which would provide **better predictability of delivery to time and to budget and a reduction in the number of disputes on contracts.**
- 3 In 1998, the Department of Environment and Transport conducted a strategic review of the roads programme against the criteria of accessibility; safety; integration economy and environmental impact. Subsequently, road maintenance was made the Agency's first priority. This was supported by an increase in funding from £530 million in 1997-1998 to £765 million in 1999-2000. These increased funds and the greater certainty of a three year budget allocation have given the Agency the opportunity to operate a long term programme with increased emphasis on whole life costs.

What the Agency is doing

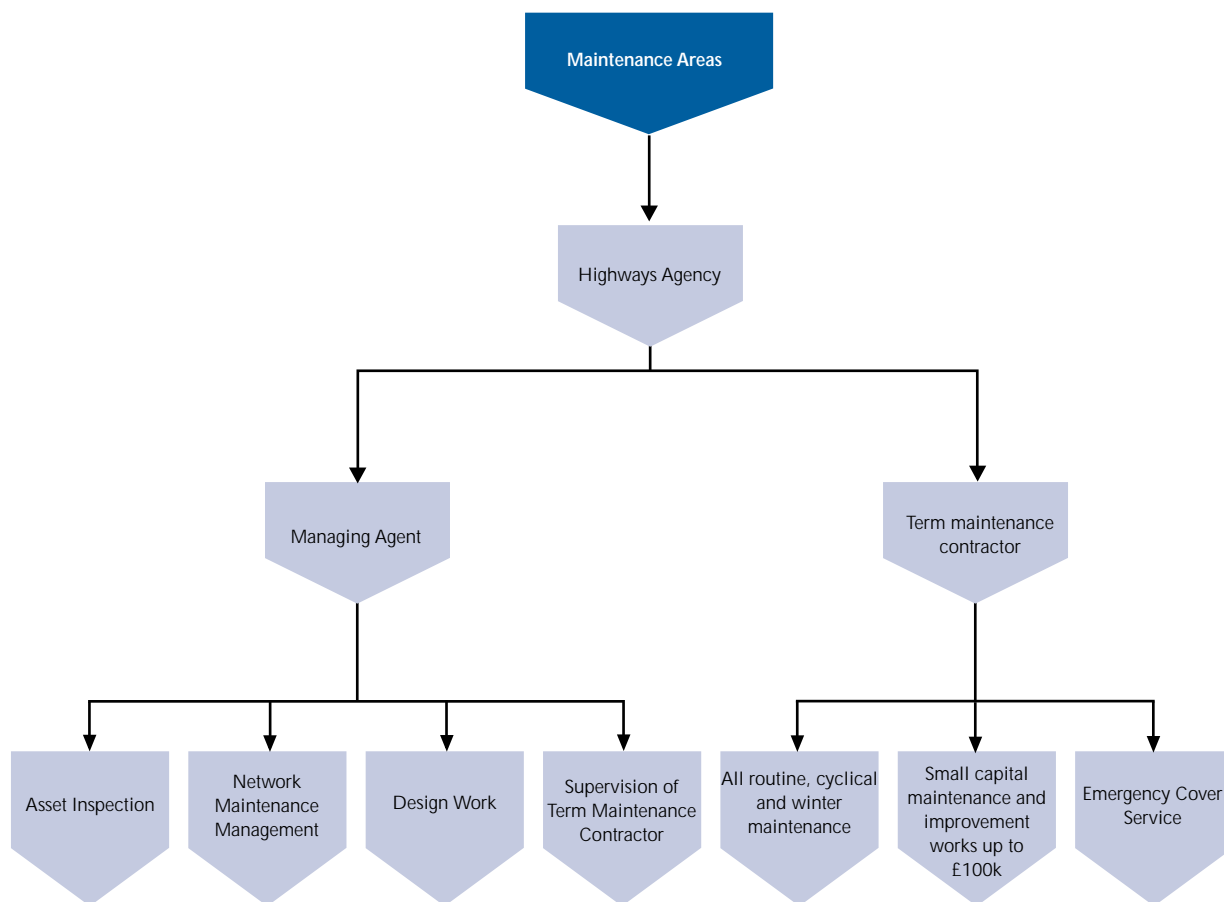
- 4 The Agency is making changes in four major areas:
 - maintenance;
 - procurement methods and the form of contracts;
 - the introduction of partnering to project management; and
 - other ways of collaborating with suppliers.

Maintenance

- 5 Before the Agency was established in 1994, 91 Local Authority Maintenance Areas carried out maintenance of the road network. The Agency rationalised this structure into the current 20 areas where it has contracts with:
 - a Managing Agent who manages and oversees all maintenance projects in the area with a value of less than £1million, and is recompensed by a lump sum and fees; and
 - a contractor (called a Term Maintenance Contractor), who carries out maintenance work up to a maximum value of £100,000. Work valued above this amount is competitively tendered. The contractor is paid by reference to a schedule of rates and lump sum preliminaries.

The respective roles and responsibilities of the Managing Agent and the contractor are set out in **Figure 2**. The first four contracts let in 1996 come up for renewal this year.

2 Roles and responsibilities of the Managing Agent and Contractor for Maintenance



Source: National Audit Office

- 6 The Agency has further plans to develop maintenance arrangements to combine the roles of the managing agent and contractor - **Paving the Way**. It is consulting the industry and others about its two main options: the managing agent and contractor to form a partnering arrangement or one entity performing both functions called a Managing Agent Contractor. A further deviation that will introduce Private Finance is being developed. The Agency will pilot these first two options with the four contracts to be retendered next year, three using the first option and one the second to benchmark performance.

achieved through traditional arrangements. The Agency is increasingly using output specifications and introducing an element of pain/gain sharing into its contracts to provide contractors with further incentives to innovate and provide value for money.

- 9 Internal guidance encourages staff to develop a procurement strategy for each project to identify the most appropriate form of contract, taking into account factors such as the value and complexity of the project, and the degree of certainty about the design.

Forms of Procurement and Contracts

- 7 Recently, the Highways Agency has experimented with and developed a range of contracts, including pioneering the design, build finance and operate form. The Agency now uses a new form of contract - the Engineering and Construction Contract - for most work between £100,000 and £5 million.
- 8 The Agency aims to use contracts and methods of procurement which provide a greater certainty of project outturn and allow more flexibility than is

Partnering

- 10 The Agency defines partnering as a collaborative approach to delivering the programme to agreed common objectives. For major projects, the Agency informs potential suppliers during the tendering process of its intention to adopt a partnering approach throughout the project. Workshops are held at the start of the project with the Agency project team, the main contractor and the key sub contractors to:

- facilitate team building;

- clarify the aims and objectives of the parties;
- agree joint objectives for the project;
- develop processes and procedures for communications and problem resolution; and
- produce a partnering charter for the project.

The directors of each organisation are involved in the initial workshop to ensure visible senior management commitment. Further workshops are held at key stages of the project and as required.

Other ways of collaborating with suppliers

- 11 The Agency has recognised that there are still significant opportunities to improve value for money from their expenditure:
 - It wishes to enable contractors to contribute more to a project. Their ability to do so can still be constrained by the timing of their involvement, over prescriptive specifications and a lack of a sufficient contractual mechanism to reward them for innovation.
 - Through optimum rather than maximum risk transfer, with risk residing with the party best able to manage it.
- 12 The Agency is already addressing some of these issues through the use of mechanisms such as Design and Build contracts, and building in target prices with pain/gain share mechanisms to provide incentives for contractors. However, it is looking to further develop these tools, and has a number of new initiatives and pilots either in progress or about to begin.

Early Contractor Involvement Design and Build

- 13 The Agency is experimenting with a variation in the Design and Build package to allow contractors earlier involvement in projects. It has a pilot project A500 junctions in Stoke underway requiring contractors to tender for a two-stage contract: the first stage of which is to steer the project through the statutory process and develop a full working design; the second stage is the construction of the scheme. This should give contractors the chance to contribute more fully to the design of schemes, particularly in terms of ideas for making schemes more buildable. It should also allow the contractor to identify risks earlier in the project and enhance their ability to manage them.

Framework Arrangements

- 14 The Agency has developed an engineering and construction based framework contract that it is using on road and bridge maintenance work in some areas. Framework arrangements are intended to increase the Agency's knowledge of the supply chain and to provide contractors with an incentive to improve performance. The intention is to enter into agreements with a number of main contractors for 18 months initially, but later 3 to 4 years. Work will be instructed under the Engineering and Construction Contract arrangements, and there will be a sharing arrangement for savings and additional cost against delivery of the target price.

Construction Management Pilot

- 15 This pilot scheme is similar to that for Framework Agreements, but with two key differences:
 - the Agency appoints a Construction Manager, whose role is to plan and co-ordinate the project; and
 - the Agency enters into direct contracts with a number of suppliers in different trades, with whom it works under a partnering arrangement.

The Agency has been prompted by the example of retailers, who report huge reductions in costs when adopting such approaches on repeat work.

Implementation programme

- 16 In common with other organisations that have embarked on a programme of change, the Agency realised the need to change practices and behaviour both within the Agency and in the industry, and to keep stakeholders advised of its plans. It has set up a Procurement Steering Group to oversee policy development as well as the implementation programme.

Internal

- 17 The Agency has made extensive use of pilot projects to trial both new forms of contract and partnering approaches to project management. The aim is to develop sound information on different procurement and contractual options so that future project managers can choose the most appropriate form of procurement for a specific project. Project boards are required to give feedback to the Procurement Steering Group which oversees the development of procurement policy. A Monitoring and Evaluation Project Board is responsible for ensuring that these pilots are effectively monitored and reports separately to the Procurement Steering Group.

- 18 The Agency disseminates new policies and procedures to staff formally by guidance notes, but has found that peer example and project and divisional champions for partnering are particularly successful tools for gaining acceptance of the new ways of working. In particular high profile and risky projects such as the Newbury bypass and the M60 Contract 3 demonstration project (see Figures 3 and 4), which have performed well as a result of using new forms of contract and/or partnering approaches, have proven to be especially powerful agents for change.

External

- 19 The Agency is proactive in keeping industry and other external stakeholders informed of its proposals and seeking their views. For example, it issued a consultation document on its proposed changes to maintenance contracts - "Paving the Way" and invited views from 1,600 people drawn from its supplier base, trade associations, professional bodies, local authorities, Department of Environment and Transport and other government departments. The Agency followed this up by holding workshops to provide greater depth to the views received which it has published and used to further develop the options. The Agency's Head of Procurement also meets key suppliers on a regular basis to give and receive feedback on performance.

Outcome

- 20 The Agency has begun a continuous programme of improving its procurement and delivery of construction projects. It envisages that its new strategy will allow better predictability of project outturn costs and time and quality improvements. At present, there is little quantifiable information other than at individual project level to demonstrate conclusively the benefits of these changes. This is because many traditionally procured projects are still running and others procured under the new arrangements are not yet complete. The Agency is continuing to monitor the outcomes of its work and to benchmark its success internally and with other construction procurers.

Demonstrable Benefits

- 21 A number of completed projects do demonstrate the benefits of the new methods. The Newbury Bypass and one of the M60 projects are described in Figures 3 and 4.

3 Newbury Bypass

What is it?

A new road linking the Midlands to the south coast constructed between 1996-1998 at a cost of £105 million.

What was different about it?

Whilst the contractor, Costain, was appointed under an Institute of Civil Engineers Contract 5, this was the first scheme in which the Agency applied the principles of partnering to all aspects of the project. The main features of this were the use of a professional facilitator; value engineering incentives; and informal dispute resolution procedures.

What were the Benefits?

Value engineering reduced the amount of earth disposed from a planned 800,000 cubic metres to 4,000 cubic metres, thus saving the direct cost of removal, land fill tax and a quarter of a million lorry movements.

The scheme was completed on time.

The project achieved an outturn of £105 million compared with a tender price of £70 million. However, £25 million was accounted for by security costs made necessary by disruption from protestors, the works costs of £80 million were 14 per cent more than tender price, compared with 40 per cent achieved on other recent projects.

Lessons learnt

- ✓ At the outset of a project, it is vital to understand each party's objectives. It is only then that it becomes possible to set agreed common objectives for the project. For example, acceptance that a contractor needs to make a fair and reasonable profit can reconcile a contractor's objective of maximising profit with the client's aim of getting value for money from the project.
- ✓ Milestone payments need to be devised to ensure that payments are not made in advance and that contractors have a reasonable cash flow and can pay their sub-contractors in a timely fashion.
- ✓ Clearly understood problem resolution procedures, which delegate problem resolution to the lowest level possible, need to be agreed at the start of a project and followed when problems arise.
- ✓ Having the right personnel on a project with the appropriate skills and attitudes is key to success. The Agency has found that most people both from the supplier and the client side can adapt, but those that cannot may need to be taken off projects if they are in positions where they can block progress.

4 M60 Contract 3

What is it?

This contract is one of four let to construct the last remaining sections of the Manchester Outer Ring Road. Work began in 1998 and is due to be completed in 2000. All four contracts have faced problems such as difficult ground conditions, bad weather and protestors.

What was different about it?

Given the problems experienced on the other M60 projects, the Agency decided to let this project using a Design and Build Contract. A partnering approach has also been adopted in the project.

What were the Benefits?

Approximate estimated outturn	Contract 1 (1996-2000)	Contract 2 (1994-1997)	Contract 3 (1998-2000)	Contract 4 (1993-1996)
Project overrun	17 months (Incomplete)	15 months (Completed)	3 months (Incomplete)	8 months (Completed)
Tender cost	£101 million	£50 million	£50 million	£18.9 million
Estimated outturn	£150 million	£82 million	£60 million	£30 million
Percentage increase	48 per cent	62 per cent	20 per cent*	58 per cent

* Most of the increase for contract 3 is attributable to client changes to reflect changes in legislation during the course of the project. The changes were to specifications of certain elements, which should reduce whole-life costs.

The Design and Build contract gave the contractor, Balfour Beatty, the opportunity to contribute innovative ideas reduced cost and increased the buildability of the scheme. For instance, they built a concrete raft to carry the road on one section, which saved the removal of 180,000 cubic metres of peat.

To date, there are no claims on the project; this compares with one of the other contracts which has had 165 claims. Problems have arisen on Contract 3, but all parties have worked together to resolve them.

Quality assurance is self regulated by Balfour Beatty. Whilst, the success of the project in terms of the quality and the performance of the output can only be measured in time, there have been immediate savings. Only nine people are engaged on supervisory work on the site at a cost of £30,000 per month compared with 60 to 70 people on another of the contracts at a cost of £100,000 per month. Payment by milestones rather than on measurement has also meant that there is little requirement for quantity surveyors on the project.

Both Balfour Beatty and their designer Gifford, have used teams who have worked together on a previous Design and Build project for the Agency, and have been able to build on their previous experience.

Appendix 8



- 1 The Environment Agency's aim is to protect and improve the environment and make a contribution towards the delivery of sustainable development through the integrated management of air, land and water. A major part of the Agency's work involves the maintenance, operation and improvement of flood defence structures. It was created in August 1995 and took up its statutory duties on 1 April 1996. It took over the functions of the National Rivers Authority, Her Majesty's Inspectorate of Pollution and Local Authority Waste Regulation and is a non-departmental public body. It is jointly sponsored by the Department of Environment, Transport and the Regions, the Ministry of Agriculture, Fisheries and Food and the National Assembly for Wales. It is responsible in England and Wales for regulating and controlling pollution, managing water resources and providing flood defence. It administers and enforces environmental and abstraction licences, carries out work to remedy or prevent pollution and monitors these areas in response to European Commission directives. It also carries out conservation, and manages and maintains waterways. Total expenditure in 1999-2000 was some £625 million, of which 60 per cent is spent with suppliers and contractors including some £145 million on construction.
 - 2 The Environment Agency has a ten year capital programme of £1.5 billion which represents about two per cent of the UK construction market. The majority of the capital programme is in flood defences. At any one time, the Agency has 600 projects ongoing across eight regions. These projects have had historically an average value of £0.5 million and vary from £10,000 to £80 million. The Agency's construction supplier base consists of over 80 contractors and 40 consultants and includes both small and large suppliers.
- ## Why did the agency wish to change?
- 3 In June 1996, the departing Chairman of the National Rivers Authority wrote to the Chair of the new Environment Agency suggesting that the new Agency would need a better procurement strategy for capital projects. The Ministry of Agriculture, Fisheries and Food was also concerned about the inconsistency of approach between regions on capital programme management. Consequently, the Agency commissioned a review of procurement strategy and project management associated with capital projects from Gardiner and Theobald, who reported in December 1996.
 - 4 The Report concluded that, with its recent creation, the Agency had an opportunity to establish a blueprint for procurement that would address many of the earlier problems. The Report's authors were impressed by the current achievements and perspectives including cost control, the testing of new tools and techniques introduced into the construction industry and the readiness of staff to acknowledge that improvements to current processes could bring more success. It also concluded that the Agency did not take advantage of its strength as a client to influence the industry. It made the following recommendations which were accepted by the Agency.
 - The Agency should, as a major client, play a full and comprehensive part in various current initiatives seeking to achieve improvements in the construction industry.
 - The Agency should develop a procurement strategy to optimise value for money by:
 - packaging projects and optimising the use of teamworking to gain the benefits that such an approach can generate;
 - focusing on optimum solutions to individual project development;
 - putting in place well trained, well motivated and empowered staff capable of achieving exacting goals and objectives; and
 - making full use of many of the recently introduced new tools, techniques and approaches to construction such as partnering, benchmarking and risk management.
 - The Agency should establish a comprehensive communications capability to ensure greater information sharing and collaboration across boundaries.
 - The Agency should develop performance measures and benchmarks to ensure it can measure continuous improvements in its own achievements and those of its suppliers.
 - 5 The Agency considers that within five years cost improvements of at least 15 per cent are possible with the commitment of the Agency and its consultants and contractors to continuous improvement targets.

What the Agency is doing

- 6 In April 1997, the Agency embarked on a programme of change to create a new procurement strategy and ultimately a national capital programme management function. The aim was to co-ordinate procurement where appropriate and to raise the average value of contracts offered to the market to make them more attractive and to exploit the Agency's purchasing leverage. The Agency was determined to make the necessary cultural shift towards new ways of working.

Project Team

- 7 The Agency created a project team with an externally recruited project manager and four internal staff members with experience in procurement, programme management, project management and internal audit. A core of eight specialists were appointed from the start under framework agreements including a very well respected expert on contract forms. The specialists covered the following areas:

- Risk management
- Value management
- Benchmarking
- Project management
- Change management
- Engineering procurement expertise
- Cost management (was brought in later).

Implementation strategy

- 8 The brief for the team was to implement the recommendations of the procurement review. The team decided that the most appropriate way to implement a new strategy is to get people involved as it is being developed. This ensures staff buy in to the changes and the development of good ideas. The Agency established a Procurement Initiative Group of a cross section of staff to evaluate ideas as they were piloted. This reduced internal resistance and was a good channel of communication with the rest of the Agency.
- 9 The team also built on activities in progress in the Agency. For example, a lot of work had already been done on new forms of contract. Indeed, in early 1996, the Agency piloted a new suite of contracts (new engineering contracts). Working groups were also established to take forward and develop elements of the work such as the procurement strategy and benchmarking. Eventually, 80 members of staff were involved in these groups. Again, these people helped communicate the new ideas being developed to others within the Agency.

Communication policy

- 10 The Agency recognised that to promote better value for money from new procurement methods, it would need to ensure good communication of the key messages and plans: to staff internally; to other stakeholders such as the Ministry of Agriculture, Fisheries and Food; and to its suppliers. It considered that all three elements were of vital importance.
- 11 In January 1997, a major presentation was made to internal staff, from engineering and procurement throughout the Agency. It had a mixed reception; in engineering, 20 per cent of staff were lukewarm and 80 per cent were hostile. A robust response from senior management drove some of the negativity underground and led to tensions throughout which resurfaced at the end of process.
- 12 The Agency found that it was essential to communicate with the whole organisation using all available means such as e-mails, memos and cascading the information through key staff. The project team wanted to ensure that staff got the correct message and not a distortion. The team monitored the impact of different methods by sending out test messages. The most effective means of communication was found to be direct face to face followed by direct written contact. Thereafter, the team sent key messages direct to 250 staff, 130 involved directly in capital projects and others in the organisation including client representatives. The team also ran a series of roadshows in regional offices, often combining it with a training session. For example, project management training was given in the morning followed by a presentation and questions in the afternoon.
- 13 The Agency has ensured that relevant staff at the Ministry of Agriculture, Fisheries and Food have been informed and consulted about all developments. As the sponsor department for the Agency's flood defence work, the Ministry of Agriculture, Fisheries and Food was concerned that new ways of working would weaken its approval role. However, the Agency demonstrated to the Ministry that the changes were appropriate and would strengthen the approval system for individual projects.
- 14 The Agency was proactive in communicating with the relevant sections of the construction industry. The Agency recognised that, to achieve improvements such as better project predictability in terms of cost and time and cost reductions, it would need the support and co-operation of the industry. The Agency was concerned to allay any unfounded fears in the industry about the changes to its procurement strategy. In May 1999, the Agency held a suppliers conference at the Commonwealth Centre in London. At the conference, the Agency outlined its strategy and asked for industry views from the 110 consultants and contractors

represented. The Agency also announced that it planned to have 40 best practice projects worth some £150 million. These best practice projects would be designed to test the new approaches. The conference has been followed with regular bulletins to the industry in October 1999, March 2000 and October 2000.

Training

- 15 As the Agency viewed training as another essential element in changing the culture of the organisation, it utilised specialist in-house training skills to help it design and deliver the extensive training programme necessary to implement the revised approach.
- 16 The team has had an extensive training programme in place since it embarked on its change programme. It has run two day and one day courses on facilitation skills and has organised workshops on subjects such as benchmarking and risk management. The internal demand for the two day course on the new forms of contracts exceeded expectations and over 200 procurement and engineering staff have now been trained in this area.
- 17 As part of the programme, rolling out the new procurement strategy, the Agency has developed and run a three day course on the strategy. From April to October 2000, 21 people will have attended each of the six courses. Staff attending the course are primarily from both procurement and project management and a small cross section of internal clients, conservation and finance staff. Two or three places on each course were given over to suppliers and regional engineers from the Ministry of Agriculture, Fisheries and Food have also attended.

Developments and test projects

- 18 As announced at the supplier conference in May 1999, the Agency is testing the new approaches on 40 projects with a combined value in excess of £150 million. The projects include:
 - beach management on the South and East coasts worth £50 million over 5 years, put together using the Agency's capital programme database linked to a new geographical information system;
 - a package of North East and North West flood defence projects worth £18 million;
 - ten packages in the Anglian Region with a combined worth of £50 million;
 - a package of gauging stations in Southern Region; and
 - a framework contract with Corus Group for sheet steel piling.

- 19 The Agency analysed its consultancy procurement and found that they had 46 suppliers. In late 1999, it developed a five year consultancy framework and began a three stage selection process. Of 156 initial applicants, 28 proceeded to the second stage of which 11 will proceed to the final selection in September 2000. Four consultants were selected in October 2000. Successful candidates will become members of teams where planning, design construction and client expertise is integrated and accessible at all stages of project and programme delivery. There have been some interesting responses from the market, for example, four joint venture submissions from nine companies have been received.
- 20 The Agency now has in place a national capital programme management team responsible for co-ordinating the procurement and project management of capital projects. The Agency decided that a national structure was essential to deliver the new procurement strategy and should provide improved consistency in processes and relationships with suppliers. This has been a difficult thing to put into place but was helped by an internal restructuring within the Agency.

The outcome

New Procurement Strategy

- 21 In March 2000, the Agency launched its new procurement strategy for engineering works. Through this new strategy, the Agency intends to make radical changes to its relationships with suppliers to achieve the following aims:
 - to deliver best value for money to its customers;
 - to be at the leading edge of technology, innovation and business best practice; and
 - to champion environmental best practice.

The Agency has a detailed action plan for achieving the remainder of the change. As part of its strategy, it has set cost saving targets for ten years based on 1998-99 expenditure of £121 million (see [figure 1](#)). It will be some time yet before the full benefits of the changes can be measured.

1 Cost improvement targets

Financial year	1998-99 1	1999-00 2	2000-01 3	2001-02 4	2002-03 5	2003-08 6-10
Cost reduction from previous year	0%	2%	3%	5%	5%	3%
Change as a percentage of 1998-99	0%	2%	4.9%	9.7%	14.2%	29.3%
Benefits (£ million)	0	2.4	6.0	11.7	17.2	35.5

22 As part of the strategy, the Agency will develop the following systems and processes:

- Cross committee funding - to support project packaging
- Integrated management system - consistent application of best practice
- Contract management system - supplier management
- Benchmarking - performance monitoring and improvement
- Historic cost database - estimating and target setting
- Geographical information system - to support project packaging
- Investment appraisal - improve the quality of business cases
- Risk and value management - improve certainty of outcome and reduce cost
- People development - link development plans to competency profile
- Sustainable construction - promote the principles of sustainability.

Demonstrable benefits

23 **Beach management** comprises the full range of options for providing defence against flooding from the sea. Traditionally, defences have taken the form of structures such as sea walls and embankments often protected by rock armour. Increasingly, softer defences such as beach nourishment, the raising of beach levels using sand or gravel dredged offshore, are being used. The Agency spends about £8 million a year on beach nourishment work. Following a review utilising both internal and external expertise, the Agency has moved away from project specific procurement to procuring a 5 year programme of work where specialist beach nourishment contractors work with the Agency to reduce real costs through improved productivity. Incentivised target cost contracts are being used. Substantial improvements on historic benchmarked costs are being achieved. Benefits have flowed from an improved understanding of the contractor's costs enabling constructive negotiation during the procurement process with further benefits flowing during construction from the target cost incentive mechanism. The Agency is well on the way to achieving its target savings of 15 per cent within 5 years.

24 The North East Combined Capital Works project comprises seven Flood Defence projects of varying size and type packaged within one contract. An important part of the Agency's new procurement strategy is to use packaging to raise average contract values from the current level of £0.5 million to about £5 million within five years. The Agency believes this will provide an attractive workload upon which longer term relationships focussed on continuous improvement can be founded. This project was the first package to be trialled and, 18 months into the contract, is already delivering many of the envisaged benefits. The contractor has been able to manage risk by transferring resource from one part of the package to another when problems have been encountered. There have been substantial economies of overhead. The contract was awarded on a combination of fixed prices and target costs with transparent risk allocation. Based on performance to date, overall savings of eight per cent are forecast against a targeted ten per cent.

Lessons learnt

25 The Agency considers that the lessons learnt fall into two areas: how to change people in business, who are well versed in what they are doing, but are resistant to change; and how to run a change management programme. The Agency recognised it was at least two years work and needed a clarion call to ensure that staff and suppliers were aware of the seriousness of the Agency's intent. It was essential in changing such a key part of the Agency's business that senior management commitment was highly visible from the start of the project. Work on elements of the change programme had to be carried out efficiently and completed to time. It was also very important that the work delivered a credible and acceptable strategy.

26 The approach of involving as many staff as possible in the development of the strategy worked very well. It ensured that the expertise and experience of staff was fully exploited in bringing forward new ideas and testing the innovations. It increased staff commitment to the ideas being developed and helped communication with the rest of the Agency. The work also released some of the previously suppressed innovative spirit in some staff who said that "I could not have done this two years ago".

27 When communicating with staff at the early stages of a project, it is important that staff are allowed to express

any reservations and be heard by senior management and that any negativity is dealt with and not driven underground.

28 Lessons learnt in running the project include:

- ✓ it was better to take people out from their normal jobs to free up time to work on the national project, staff maintaining their jobs had too many conflicting demands;
- ✓ the logistics of selling the message across a geographically dispersed organisation should not be underestimated, the project team did a lot of travelling;
- ✓ team interactions need to be thought through, the team considered the skills and expertise necessary to work on some of the projects and developments but not the personalities - more should have been done to identify potential personality clashes;
- ✓ resistance was strongest in the middle management group who often had 25 to 30 years experience working in a particular way;
- ✓ other pressures can be exploited, for example the North-east region gave incredible support to the changes mainly because of the cost pressures they faced; and
- ✓ project teams need to be kept together and allowed to retain their identity.

Appendix 9

Anglian Water



- 1 Anglian Water is responsible for the management of water and wastewater in the largest and driest geographical region in Great Britain. It has an annual turnover of over £900 million and manages assets valued at some £16 billion. It maintains 35,000 kilometres of sewers and 35,000 kilometres of water mains and owns 1,100 sewage treatment works and 150 water treatment plants. It employs over 7,000 staff. It also has an international operation.
- 2 Anglian Water undertakes construction projects in four related areas: water treatment and supply, sewerage and sewage treatment. It commissions some £350 million of capital works a year in Great Britain. The Technology Group within Anglian Water manages construction projects on behalf of the company.

What were the drivers for change?

- 3 In 1998, Anglian Water undertook an intensive study of its engineering capacity. It did so because of the prospect of a tougher regulatory regime with the regulator, OFWAT, proposing cuts in customer charges. Reductions of 17.5 per cent were anticipated to be required by OFWAT. The Company also wanted to become an international leader in the water industry. Senior management were concerned that there was a lack of focus on efficiency and were unclear how to judge the performance of their construction management. There were four different engineering offices each with a slightly different approach to construction procurement and project management. The engineering arm of Anglian Water was concerned that Purac, a construction contracting subsidiary of Anglian Water, did not perform as well as other contractors. Purac saw Anglian Water as one of its most difficult clients.
- 4 Capital projects were often late and the date for completion and final cost uncertain. There were problems with defects and unfinished work on handover of projects. The quality of the final product was sometimes compromised with resultant concerns about compliance with regulatory standards on drinking and bathing water and sewage discharge. On-going claims took a long time to be settled. Anglian Water recognised this approach as very inefficient.
- 5 Externally, Anglian Water was aware that other companies were finding ways of substantially improving performance. In particular, it saw that some companies were making increased use of partnering and having very successful results. Staff were also aware of the

conclusions of the Latham Report "Constructing the Team". The review was to optimise the supply and delivery of engineering services in Anglian Water to achieve the following objectives:

- to maximise its contribution to growth of Anglian Water;
- to provide a commercially robust measurement system for future engineering performance;
- to reduce capital construction costs by 20 per cent by 2000-01;
- to reduce capital management costs by 20 per cent by 1999-2000; and
- for the above to be sustainable over the long term, five years.

What was different

- 6 In July 1998 following the review, Anglian Water embarked on a programme of change in its procurement and management of construction. The implementation of the new strategy took over 12 months. Anglian Water wanted to promote cultural change within the organisation to enable partnering and strategic sourcing from key suppliers with performance measurement and continuous improvement at the core of the changes.

Implementation

- 7 The Technology Group Directorate was centralised in the Peterborough office and incorporated project management, engineering and procurement. Procurement has subsequently been hived off into a new area known as Supply Chain Management and comes under a different directorate. Staff needed to adopt new working methods and to acquire additional skills with people taking more responsibility for the success of projects. Over 600 people were involved in the relocation; staff were encouraged to move and given financial incentives to do so. Local jobs or voluntary severance were offered to those who could not move because of family circumstances. Selection for jobs at the new office was subject to internal open competition with skills and experience being key to decisions as to job allocation.

Communication

- 8 All staff were able to attend presentations explaining the outcome of the review and, later on, the proposals for relocation. To explain the new strategy, Anglian Water

ran facilitated workshops of mixed groups of staff across the disciplines. These workshops detailed the new methods of working under development and the ethos behind them.

- 9 Anglian Water has developed a comprehensive knowledge management system which includes its guidance, regulations, draft contracts, costing information and the results of projects. This is available to all staff.

Training

- 10 Over 300 staff from engineering and procurement have been trained in project management, value management and other asset management and delivery processes. Anglian Water has also run "engineering the future" workshops. These were about the necessary behavioural changes. The workshops of between two and five days have been about interpersonal skills and the key principles behind the change in culture and practice.

Pay and reward

- 11 Anglian Water is also introducing a new pay scheme to reward staff for the achievement of objectives with basic pay increases rather than bonuses. It is intended to provide increased flexibility with staffing by allowing pay progression without necessarily taking people away from direct technical work and into "management" roles.

Pilot projects

- 12 Anglian Water wanted to develop partnership arrangements with its suppliers:
 - to improve cost, quality and time certainty;
 - to reduce costs and time;
 - to improve the quality of the final product ensuring certain compliance with regulations;
 - to facilitate innovation;
 - to improve communications and to reduce duplicated effort by Anglian Water and the contractors.
- 13 Anglian Water has piloted its new approach to relationships with suppliers in six major projects covering water and sewerage projects. The early ones were converted to partnering after problems arose on the projects causing delays and cost claims. The first one was expensive but did mean that customer needs were fulfilled in a timely manner. In the second project, the delays were likely to lead to compliance problems and so it was essential to complete the project on time. Anglian Water negotiated a target cost of £13 million with a pain/gain share on the final outturn and a bonus

or penalty for completion on time. The project was completed within budget and on time. All subsequent partnering contracts have had open book accounting with target cost with a pain/gain split and in some cases, where completion on time was essential, a completion bonus and penalty.

Supply chain management and strategic sourcing

- 14 As part of its strategy, Anglian Water identified that not only did it need to work in partnership with the supply chain but that it must reduce the number of suppliers it used on capital projects. In September 1998, it identified that it had 250 contractors and consultants with whom it did work. Anglian Water recognised that to get the best out of its partnerships with contractors it had to work closely with them to bring about continuous improvement to the costs, quality and duration of projects. Contractors need to do repeat work to learn from the process and to identify further ways to drive out waste. Reducing the number of suppliers also reduces the administration and tendering costs of procurement staff.
- 15 From September 1998, Anglian Water held internal and external consultation workshops to develop its thinking on how best to identify and select suppliers with whom to enter into framework agreements. In December 1999, Anglian Water went to the market for strategic partners for its capital programme. Some 145 contractors and consultants expressed interest in tendering and completed a pre-qualification questionnaire, 76 of whom went on to the second stage. Anglian Water had presentations from and interviews with 37 suppliers and went on 26 site visits. After this the tenders were evaluated on the basis of health and safety record, quality of their proposals, environmental record, cultural alignment, track record in contracting and partnering, and cost. Anglian Water entered into negotiations with 17 suppliers and, in February 2000, signed five year framework agreements with nine of them: six contractors, two design consultants and one cost consultant. This gives Anglian Water a range of expertise covering the different types of work required.
- 16 Anglian Water has also developed a methodology for deciding on the allocation of work to the contractors within the framework agreements. It will ensure that they are chosen for particular parcels of work which match their capabilities. The prices tendered by the contractors will be used as a basis for agreeing target costs of projects. Anglian Water will ensure that there is a reasonable spread of work between the contractors. Anglian Water will measure the performance of suppliers and work with them to improve performance. It will also benchmark project performance to facilitate internal consistency and also to identify potential suppliers.

The outcome

- 17 Anglian Water has successfully reduced its supplier base from 250 to nine. Given the duration of projects, Anglian Water has yet to realise the benefits of these longer term relationships. However, it has seen reductions in capital costs of over 20 per cent on some of its partnering projects.

Demonstrable benefits

- 18 On the Ipswich "Project Orwell" scheme, a wastewater flood prevention project, Anglian Water entered into a slightly different partnering arrangement. It went out to open competition and at the final stage reduced the number of contractors from six to two. It then ran a parallel design and bid process for nine months. At the end of the period, Anglian Water chose the best design, agreed a target price of £26 million, and entered into a full partnering agreement. It paid the unsuccessful bidder for its design and bid costs. This arrangement gave Anglian Water some security that it was agreeing a fair and reasonable target price and had the most appropriate design. The two designs produced were very similar which gave Anglian Water additional confidence in the final design. The contract stipulated open book accounting and target price with a pain and gain share and a completion bonus or penalty. The 24 month project was completed over four months early and £6 million below the target price.

Lessons learnt

- ✓ Partnering can reduce the capital costs of projects by 20 per cent if properly run.
- ✓ Partnering has to be accompanied by risk and value management. On one project Anglian Water saved six per cent of project costs by managing the risk centrally. Normally, each part of the supply chain would include a sum in its price for risk so Anglian Water found that it was paying for the same potential risk a number of times. Good management of the risks once identified resulted in fewer risks materialising.
- ✓ Performance measurement and benchmarking of internal and contractor performance is essential to promote continuous improvement.
- ✓ Open book accounting together with an open attitude in Anglian Water is also important.
- ✓ The contractor needs to make a fair and reasonable profit.
- ✓ Joint bonuses to reward success motivate if aimed at the entire partnering team.

Appendix 10

Kingston Hospital



The project

- 1 Kingston Hospital NHS Trust needed a three-storey hospital block with 132 beds on a cramped brown field site, on an existing car park at Kingston Hospital, very quickly.
- 2 In April 1997, Kingston Hospital NHS Trust was faced with a problem concerning elective surgery and the provision of medical training at Queen Mary's Hospital, Roehampton. The Trust was left with an urgent need for an additional 132 beds at Kingston Hospital. The Trust found space for a surgical block on a car park surrounded on three sides by other hospital buildings. Planning permission had to be obtained quickly and was granted for five years only. The Trust recognised that it could only acquire the ward block in the required time by using prefabrication techniques. Trust staff were unable to identify any other medical facility of this size which had been built in this way. But they had no option but to go out to the prefabricated building market for imaginative workable solutions. The Trust went out for competitive bids in September 1997. Terrapin Limited won the £3.4 million contract to build a 3,000 square metres hospital block on the lowest price bid.



- 3 All four tenderers for the project, including Terrapin, proposed a timescale of 36 weeks or longer. Terrapin worked with the Trust to identify ways to reduce the construction time to 18 weeks at no extra cost. The structure is a three-storey pre-engineered modular design, composed of steel columns and beams with sheet steel external wall and roof panels. Accommodation consists of five-bed and single-bed bays, each with an en-suite bathroom. There are two assisted-use toilets and bathrooms on each floor. Each bed is served with medical gases and a nurse call system. The block had to provide all the facilities one would expect in a normal hospital ward.
- 4 The Trust had approval to go ahead with the project from the Secretary of State for Health on 30 March 1998. Work started on site on 14 April 1998. On 4 September 1998, Terrapin handed over the building to

the Trust after only 20 weeks construction time. The wards were commissioned by the Trust in less than one week and the first patients were admitted on 10 September 1998.

What were the drivers for change?

- 5 There was only one significant driver - the urgent need for 132 beds by the beginning of September 1998 as acute services had to be relocated from Queen Mary's by that date since junior doctor accreditation was to be withdrawn.

What was different?

- 6 It was not innovative for Terrapin to construct a facility in such a way, as it is its core business. However, the Trust had not used prefabricated construction before and no prefabricated facility of this size had been built in the hospital sector. Terrapin had built some smaller healthcare projects. The real difference was the use of manufactured components in a hospital setting and the need for close collaboration between all parts of the supply chain to ensure that the tight deadlines were met. This meant, in particular, that the Trust had to adopt new procedures for approving plans and work.
- 7 Prefabrication was essential to the success of this project. Terrapin planned to take as much construction off the critical path as possible. It did this by ensuring that as much work as possible was done off-site at its factory, even the boiler house was modular. In addition, every stage of construction required detailed and careful planning especially as jobs, done by different trades on the site, often had to run concurrently.
- 8 Many of the usual procedural chains involved in approving changes to the requirements had to be circumvented with both sides accepting the need to short circuit the information routes to ensure that there were no delays in getting construction drawings to those on site doing the work. The Trust also recognised the need for rapid decisions and often made these on site without requiring revisions to detailed drawings. Definitive drawings and specifications were completed at the pre-construction stage, an essential element when using prefabricated components. These components are made to high levels of accuracy so that they can be constructed on site very quickly and without revision. Groundwork on site also needs to be accurate.
- 9 In addition to the tight deadlines, there were other constraints on the project team. The site was adjacent to an intensive care wing and, therefore, had to be as quiet and as dust free as possible. No night working was

allowed until the external walls were completed. The site was extremely cramped, leaving the crane operator and construction team very little space to manoeuvre when putting into place components such as the steel frame. The team lost two weeks of construction time almost as soon as they went on site because they discovered that site service records were not accurate. There were unidentified underground services passing underneath the site. Fortunately, Terrapin had already planned to build a suspended ground floor to reduce construction time. On a conventional build, delays would have been much longer.

- 10 The project required concentrated effort from Trust staff especially the Estates Manager. He was in constant touch with site and participated in weekly meetings with site foremen etc. The ability to work flexibly was essential. The Estates Manager dealt directly with the Contractor and not through a consultant, employed by the Trust, as would be usual practice. Both parties agreed as far as possible to freeze the design in June 1998 except for any unanticipated essential changes.
- 11 Terrapin already had an established supply chain, including subsidiary companies and companies with whom it had had a working relationship for ten years or more. It did not have a relationship with a company supplying medical gases. The Trust suggested that Terrapin might wish to use the normal supplier to the hospital site - Hill-Rom Medaes. Terrapin were content to do so and to use other regular suppliers to Kingston Hospital. This arrangement with Hill-Rom Medaes worked very well and they have worked together on subsequent jobs.
- 12 Under normal circumstances, it would take longer than 20 weeks to obtain and install hospital lifts. Terrapin used its long-standing relationship with Stannah Lifts to procure lifts to a much shorter timescale. Stannah Lifts were not expert in the health field and commissioned the large lifts necessary to carry patients in beds to and from surgery from another company. The number of lift movements required when fully operational were not correctly calculated which resulted in the lifts overheating and breaking down. Stannah Lifts put an engineer on site to avoid patients being stuck in lifts until the problems were resolved and eventually replaced the lift controls. Stannah and Terrapin bore much of the cost of the additional work.

The outcome

- 13 The project was delivered to time and budget in a condition which enabled patients to be admitted less than a week later. The Trust was extremely happy with the product and the working relationships established. Terrapin had met its commitments fully, including the minimisation of disruption, noise and dirt on site. Users had three concerns following the handover: lack of space in the corridors and assisted-use bathrooms; the

lifts; and heat retention in the summer. The space in which to construct the hospital block was very cramped and it was not possible to have the corridors and bathrooms any bigger. Stannah Lifts rectified the problems with the lifts which were related to microprocessors and the specification not complying with the appropriate standard. The Trust had considered the need for air-conditioning at the outset but had decided against specifying it on cost grounds. In retrospect the Trust thinks it would have been advisable, although the building is only marginally hotter than other buildings on the site. The Trust has subsequently installed air-conditioning.



Lessons learnt

- ✓ It was possible to build the hospital block in a very short time because a high level of prefabrication was used.
- ✓ It was crucial that both the Chief Executive of Kingston Hospital and the Managing Director of Terrapin were committed to the success of the venture and were seen to be so by their staff.
- ✓ The Trust had to work closely with the people on site and to be flexible in approving changes to the project.
- ✓ Components were only delivered to the site when they were needed. This minimised waste and damage to materials and made the best use of a cramped site.
- ✓ All parts of the supply chain had contractual arrangements with Terrapin but, when problems arose during the construction, the Trust used its influence with those members of the supply chain that worked for it in other parts of the hospital.
- ✓ Planning issues presented a challenge as the building design was novel. The Trust found it worthwhile to employ a very good planning expert to deal with all the planning and fire authorities.

Next steps

- 14 The project is a Movement for Innovation demonstration project and has been presented at the Movement's conference in July 1999 and at cluster meetings. Terrapin has tendered for other work in the health sector, using some of the companies new to it that it employed on this project.

Appendix 11

Notley Green Primary School

The project

- 1 Essex County Council wanted a primary school in a new housing development. Essex drew up the specification for the project in 1997. The school, to open in September 1999, was to have:
 - an initial capacity of 180 pupils, with the potential to expand to accommodate 360 pupils;
 - completion within an approved construction budget of £1.2 million;
 - 1080 square metres with flexible and efficient use of space; and
 - a safe and attractive environment conducive to learning.
- 2 The Council also wanted the project to be used as a test bed for ideas on how to build a sustainable school within the standard school budget, and to draw on the collective experience of the design team through interdisciplinary working with the client as part of this team.



What were the drivers for change?

- 3 Essex has a proactive and innovative attitude towards the procurement of its schools, and had examined and written papers on low energy design and interdisciplinary working. As a result of this, the Design Council approached Essex as it wanted to test the theory that design is at its best when an integrated design team works on the project from the start, so that all participants take ownership. The Design Council chose a construction project as a test bed, as the construction industry is notable for the lack of integration of design, and because the lead-times involved in building projects allow proper tracking of the creative process.

What was different?

- 4 The twin objectives of exploring sustainability in the design of the school and interdisciplinary working led to different approaches in the procurement of the project, the design process and the physical design and specification of the school.

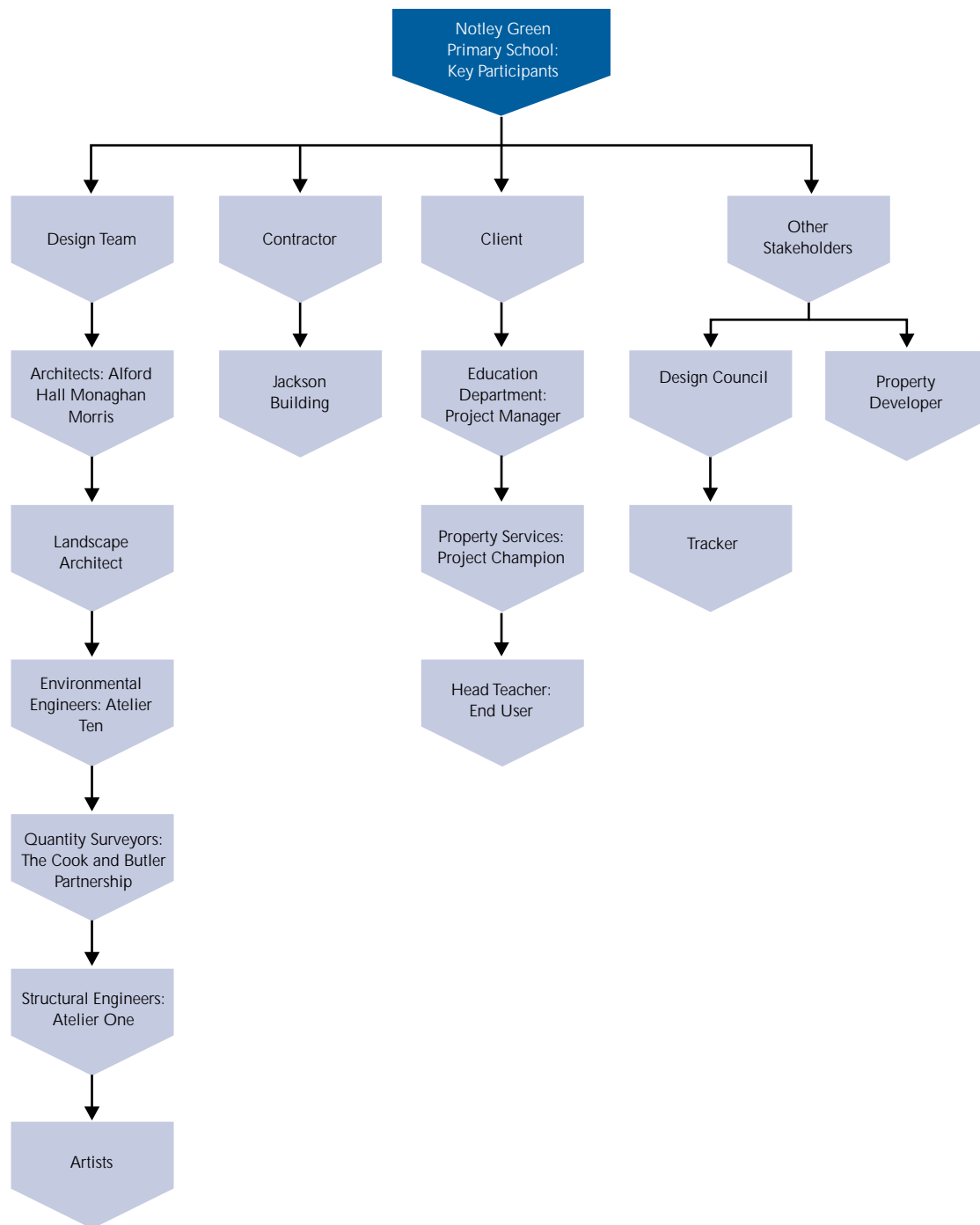
Procurement

- 5 To examine interdisciplinary working, it was important to have an integrated team working on the project from the very beginning, and so the design competition was held to select a suitable team, rather than a design. The selection procedure, which consisted of inviting tenders through an advertisement in the Official Journal of the European Communities, shortlisting and interviews, concentrated on identifying a team who had experience of: designing sustainable buildings, working together, and who could demonstrate an innovative approach to design and problem solving. The competitors were asked to establish the principles of using sustainable construction to produce a prototype high quality building to a standard County Council budget. Having chosen the winning team, Essex appointed the architect as lead consultant. The team was paid a fixed fee of 14.7 per cent of the budget for building the school, and it was left to the team to decide how to divide this among them. This was to allow the team to determine how to remunerate the service engineers so that they would design out equipment, rather than the normal practice of paying them a percentage of the cost or price of the equipment installed.

Process

- 6 Traditionally, the architect leads the design process producing a detailed design and specification, which structural, mechanical and electrical engineers, contractors and surveyors then implement. For the Notley Green Primary School, the whole of the design team (**Figure 1** opposite) was integrated from the very start of the project to allow the individual professions to contribute more fully to the design process as a whole. The design was developed in a series of meetings, at which the client was present, over six months. A tracker was appointed by the Design Council to record the process. The contractor was not involved in developing the design.
- 7 The integrated team approach has not stopped with the handover of the school to Essex. The Design Council held a debriefing meeting with the design team, Essex

1 Key participants in the design and construction of Notley Green Primary School



This shows how many organisations participated in the design and construction of the primary school

Source: National Audit Office

and the contractor six months after completion of the project. This gave the team the opportunity to review the project outcomes against the original brief, to discuss specific issues such as team working and sustainability and to identify the lessons learnt. There are plans to hold another debriefing meeting, a year after completion to allow an evaluation of the project's success in relation to sustainability.

Design

- 8 Essex gave the team the freedom to propose variations from its model design brief which sets its required standards in size and design of facilities and specification of materials, the only stipulation being that the team's design must provide the range of educational facilities required, be sustainable and must be agreed with Essex.

9 The budget proved to be a big constraint on the team: they were not able to carry out as much research as they would have wished, nor in many instances to use their first choice of materials. Indeed, their initial design exceeded the budget and so the team carried out a lengthy value engineering exercise to produce alternatives which would come closer to the budget. The team decided that the design had to produce a building that was simple and compact, with maximum natural light. The building must be made from materials from replenishable sources and use soil already on the site to landscape it, thus making unnecessary the cost and disruption of removing and replacing material. Features of the design are shown in **Figure 2**.

The outcome

10 The team achieved the brief with a school which met the requirements, opened on time and incorporated many sustainable features. The project was over budget (£1.35 million), but by providing more usable space, the sustainability and overall value for money of the school has been increased. For instance, the triangular design has created an extra communal space leading off from the hall which the school can use for a variety of purposes such as a stage for school plays, or a room for smaller meetings. The design also allows access to the classrooms to be locked off, thus increasing the potential for the local community to use the school outside of school hours. The children have completed a building critique which shows their approval of the building; the design has also received praise from the

2 Design of Notley Green Primary School and environmental features

This figure shows the main environmental features in the primary school design



Commission for Architecture and the Built Environment and other informed commentators.

- 11 The team felt that it could have achieved a more innovative and sustainable building with a bigger budget however, this constraint ensured that the project met the objective of designing a replicable and affordable sustainable school.

Lessons learnt

- ✓ The team felt that a more intensive design phase with more cohesion of the team and more discipline would have increased focus. The contractor should be involved earlier in the design process.
- ✓ Progress was impeded during the construction process by team members not being on site or empowered to take decisions for their organisation. The team concluded that site meetings should be more creative and action orientated, with team members empowered by their organisations to take decisions.
- ✓ Team members gained a better appreciation of what each discipline can add to the process. This helped them to both challenge traditional ways of working and to add more value.
- ✓ The client and the contractor made major contributions to the value engineering exercise - the client by giving the team continued encouragement to seek sustainable solutions, and the contractor by suggesting ways of cutting cost, based on their experience.

Next Steps

- 12 The project has provided a number of useful lessons which various project members are now working to disseminate or develop further.
 - Essex hopes to incorporate some of the sustainable elements of the school, such as the cost-effective alternative to PVC cabling and the non-mechanised ventilation system, into the design of other buildings.
 - The Design Council intends to produce two case studies from the project, one of which will distil the lessons learnt on the design dynamic, which they will disseminate to professional institutions and Higher Education establishments. There have already been a series of articles in Architects Journal about the project, and the architect and project champion have also made a presentation on the project at the 1999 Movement for Innovation conference.
 - The architect, the environmental engineer and the quantity surveyor are working together on a primary school in Lambeth, where they are developing some of the lessons learnt at Notley on lighting for a two-storey building.
- 13 Essex County Council and the Design Council are continuing their collaboration by working together on a project looking at alternative approaches to the provision of relocatable classrooms.



Appendix 12

Dudley Southern Bypass

The project

- 1 Dudley Metropolitan Borough Council wanted to build a bypass to relieve congestion in Dudley town centre. The line of the road was originally decided in 1968, and various schemes had been considered for its construction. The bypass involved a 3.1 kilometre stretch of dual carriageway passing over both contaminated land and disused mine workings, and required the construction of bridges and major road junctions. The scheme eventually agreed with the Department of the Environment, Transport and the Regions. In 1996 had an estimated cost and was cash limited to £57 million, including land purchase. Dudley spent half of this on acquiring the land, filling disused mine workings and carrying out other advance works, before they tendered the main construction contract. In 1998, Dudley held a traditional competition to select a main contractor to construct the road. Kvaerner won the competition with the lowest bid of £14.3 million.



What were the drivers for change?

- 2 Dudley Council questioned whether the contract could be completed successfully within the tender price as evidence from the industry was that previous highways' contracts undertaken elsewhere had overrun by 30 to 40 per cent. Kvaerner also identified this as a high risk project. As well as passing over contaminated land, the construction of the road would have to deal with the existing infrastructure such as gas and electricity plant and heavy traffic at one end of the road, which meant work had to take place whilst traffic was still flowing. Both parties agreed that to achieve maximum success for the project, a traditional contractual route would not be the most prudent way to proceed, as it would inevitably lead to contractual disputes with negative consequences for both of them and the project.

What was different?

Partnering

- 3 Dudley and Kvaerner agreed to overlay the confirming Institution of Civil Engineers form (5th edition) contract with a Partnering Agreement, which united the two parties behind the goal of completing the project in a cost effective and mutually satisfactory manner and which had primacy over the contract. They established a joint project team, with a common identity reinforced through mechanisms such as a project logo, and co-location of Dudley and Kvaerner staff in the one open plan site office. Professionally facilitated partnering workshops were held to help establish effective project working relationships between both the two main parties and other affected parties such as the Environment Agency, and the major subcontractors and suppliers for the project.

Value engineering and risk management

- 4 One of the first tasks carried out by the project team using this collaborative approach was a value engineering exercise: to investigate the site; to identify and plan how to manage the risks to the project; and to develop a realistic target price. Dudley felt able to reopen the issue of the price, as there was sufficient margin between the winning and the next lowest bids, to negotiate a target price which would still be below the next lowest bid and within the budget set by Department of the Environment, Transport and the Regions. The target cost agreed was £16.7 million. Dudley agreed with Kvaerner that it would split 50/50 any "pain" or "gain" over or under that target price and that Kvaerner would be paid an agreed maximum management fee of £900,000.
- 5 Considerable effort went into conducting the value engineering exercise and planning the project, with no works carried out until the team was satisfied that it knew the site conditions, the likely risks associated with construction alternatives to the project and had adequate plans in place. The lack of visible progress on site caused some concern within the team's respective organisations, and led to considerable pressure to start work. However, the team remained committed to its approach and only started work once it had full plans in place.

- 6 Value engineering did identify savings. For instance, the original specification required the removal of 50,000 cubic metres of waste, to be replaced with quarry material. Much of the material was contaminated, but by working together and involving the Environment Agency in developing solutions, they were able to reuse most of the material within the project. By the end of the project, they had only taken 1,500 cubic metres to tip, this prevented 25,000 lorry movements around Dudley

Role of Internal Audit

- 7 Dudley decided to involve its internal auditors from the start of the project because of the novel nature of the partnering agreement. Internal Audit agreed that it was best to ensure that the project had appropriate financial controls and audit advice available throughout its life, and so an auditor became the finance officer for the project and was a full member of the team.
- 8 Following on from the principle of collaborative working to achieve the respective partners' mutual objectives, the auditor worked with the team to develop financial controls which would give Dudley an assurance of propriety and value for money, whilst ensuring that Kvaerner and its suppliers were paid promptly. The key features of the financial arrangements was the agreement of Kvaerner to open book accounting, including checks carried out by internal audit at Kvaerner headquarters of overhead allocation and central payments and discounts.

The outcome

- 9 The project was completed five months ahead of schedule and within the target cost and the budget agreed with Department of the Environment, Transport and the Regions. There are no outstanding claims on the project and the final account was in July 2000. These results were achieved despite a major enhancement to the scheme with the decision, taken after the start of the project, to construct major earthworks associated with a new Metro line parallel to a section of the road. The team altered its plans to take account of this in constructing the road. This resulted in additional cost and delay: at one point sections of the project were running nine months behind schedule. A conservative estimate is that this work saved over £3 million on the cost of the Metro line with £1.2 million funded from efficiency gains in the Dudley Southern Bypass. The team has identified other benefits gained from the working methods and systems used on the project. For instance, the financial controls meant that there were only three quantity surveyors between the partners working on the project when typically 10-15 would work on a project of this size.



Lessons learnt

- ✓ Collaborative working and joint responsibility for problems led to better solutions. For example, Dudley negotiated with Railtrack to overcome difficult haulage to route lorries through their property which in turn reduced the disruption caused to the local community by lorry movements. Normally, this would be a matter for the contractor which would have proved difficult to negotiate.
- ✓ The use of value engineering was essential to take waste out of the process.
- ✓ The involvement of internal audit from the outset enabled Dudley to develop strong financial controls which did not impede the construction process.
- ✓ Time spent on planning ensured that the project ran smoothly on site, and allowed the team to deal more efficiently and effectively with unforeseen events such as the decision to build the Metro line

Next Steps

- 10 Dudley and Kvaerner would use the same techniques again and are looking at ways of passing on and developing the lessons learnt from the project. For instance, the auditor assigned to this project has oversight of all contracts issued by Dudley, and is using this responsibility to disseminate the general principles learnt from the project. When suitable partnering projects arise, he will pass on the detailed knowledge gained from this project. Kvaerner is seeking to pass on some of the practices developed with Dudley to other customers, for instance, in relation to open book accounting, and allowing client staff to check and authorise invoices.
- 11 The team is disseminating the lessons they learnt more widely through the Movement for Innovation. They submitted the project as a demonstration project, and spoke at the Movement for Innovation conference in May 2000. Both Dudley and Kvaerner have also participated in cluster group meetings and in the Local Government Task Force conference. Dudley is interested in exploring different approaches to procuring and managing maintenance contracts, and plan to use the movement as a means of making contact with other clients.

Appendix 13

Building Down Barriers

The project

- 1 Defence Estates, established as an agency of the Ministry of Defence in April 1999, assists the Ministry of Defence in managing the defence estate consisting of land, buildings and installations to meet the operational needs of the Ministry, paying attention to its conservation, heritage and statutory obligations. Before March 1999, these responsibilities were previously carried out by the Defence Estate Organisation.



- 2 The Building Down Barriers initiative was established in January 1997, and ran until late 2000. It entails the design and construction of two similar physical and recreational training centres in Aldershot and Wattisham. Work on the construction of the two centres started in May 1999. The initiative is funded by Defence Estates and the Department of the Environment, Transport and the Regions and has three objectives:

- to develop a new approach to construction procurement, called Prime Contracting, based on supply chain integration;
- to demonstrate the benefits of the new approach, in terms of improved value for the client and profitability for the supply chain through running two pilot projects; and
- to assess the relevance of the new approach to the wider UK industry.

- 3 Defence Estates decided to pilot this novel approach on the design and construction of two similar training centres containing gyms and swimming pools. It wanted to contract with one party in each case - the Prime Contractor - and work with them to design out waste and inefficiency in the construction process and the subsequent management and maintenance of the facilities. This systematic approach to the procurement and maintenance of buildings draws on the best available tools, techniques and practices, including through-life costing, supply chain management, value engineering and risk management. It aims to achieve

significant improvements in value for money, profitability and the functional efficiency of the completed buildings. Prime contracting should replace short-term and adversarial supplier relationships with long-term ones based on trust and co-operation. Key features of the approach include:

- strategic alliances between the prime contractor and its sub-contractors;
- continuous improvement targets to reduce costs and enhance quality;
- the use of a systematic analysis of the weaknesses and strengths in existing design and construction process; and
- a focus on the through-life cost and functional performance of the building.

What were the drivers for change?

- 4 In 1996, Defence Estates reviewed the performance of construction industry firms dealing with its then £1.7 billion works procurement programme. It concluded that excellent performance was rare and, in common with other organisations, it was paying unnecessarily high costs for an inefficient and wasteful process which all too often delivered functionally inefficient buildings and facilities. The Latham Report had also estimated that potential savings of 30 per cent were possible on construction projects. Defence Estates identified that there was tremendous potential for standardisation between buildings based on the commonality between processes, components and materials. It saw that multiple benefits would arise if the experiment worked. For owners and users, buildings would have cheaper capital and running costs and would better serve the functional needs of the users, and there would be more accurate forecasts of maintenance and energy costs.

What was different?

- 5 Defence Estates decided to fund a major research initiative to develop the necessary supply chain management process and to test that process using real projects. The initiative has two strands: the two pilot projects, and the research and development to support those projects, to develop the approach and associated tool-kit and to evaluate the initiative. The pilot projects chosen were the design and building of two army physical and recreational training centres at Aldershot and Wattisham.

- 6 The Tavistock Institute and the Warwick Manufacturing Group, Warwick University, were appointed to the Research Group to act as evaluators and facilitators of the initiative. In early 1997, Defence Estates, the Research Group and two construction firms AMEC and Laing devised a satisfactory supply chain process to begin the two projects. Initial contracts were awarded to Laing and AMEC in June 1997. Second-stage contracts for detailed design, construction and maintenance of the training centres were issued in January and February 1999.
- 7 Laing and AMEC organised their projects on the basis of "supply clusters", each slightly different but both based round aspects of the work such as mechanical and electrical services. This allows all those involved in a particular area to participate in the design development, breaking down barriers between those who design, who bid price and who deliver. AMEC and Defence Estates also decided to use the Building Research Establishment activity sampling system for measuring and analysing site productivity - CALIBRE - on the Aldershot pilot project.
- 8 Building Down Barriers identified five specific phases in the life of a prime contracting construction project: inception; definition and appointment of prime contractor; concept design; detailed design and construction; and post hand-over. This latter stage is very important and involves the prime contractor maintaining the building until he has proved the accuracy of his cost prediction of running costs.

The outcome

- 9 Both physical and recreational training centres are now complete. The project sponsors report that users are very satisfied with the training centres and find the facilities superior to those procured conventionally. The Tavistock Institute and the Warwick Manufacturing Group have carried out two interim evaluations of the Building Down Barriers pilots through to early construction stage in March and November 1999. The costs of the initiative have been some £1.6 million to date.
- 10 Capital and predicted through-life costs were compared with the benchmark cost for a similar building procured using the Defence Estates' established design and build method. Calculating the benchmark costs was difficult as there is little available data on true costs as opposed to prices of materials. There is also limited proven information about maintenance and energy costs. Contractors regarded the calculated historic reference costs as too low, especially those for capital costs, and said they did not reflect the likely final cost of a conventionally procured building. The predicted through-life costs compare very favourably with the benchmark, 14 per cent lower for Aldershot and 7 per cent lower for Wattisham. The capital costs are



five per cent higher in both cases, although early estimates of capital costs have been reduced from predictions of ten and seven per cent higher using value engineering. **Figure 1** overleaf illustrates the predicted costs. In addition these achievements are impressive especially as all members of both supply chains are making fair and reasonable profits and overhead recovery.

11 Other benefits include:

- a reduction in construction time of 20 per cent compared to previous experience;
- materials wastage close to zero compared with industry best practice of 10 per cent; and
- labour productivity of 65 to 70 per cent compared with best industry rates of 54 per cent.

Lessons learnt

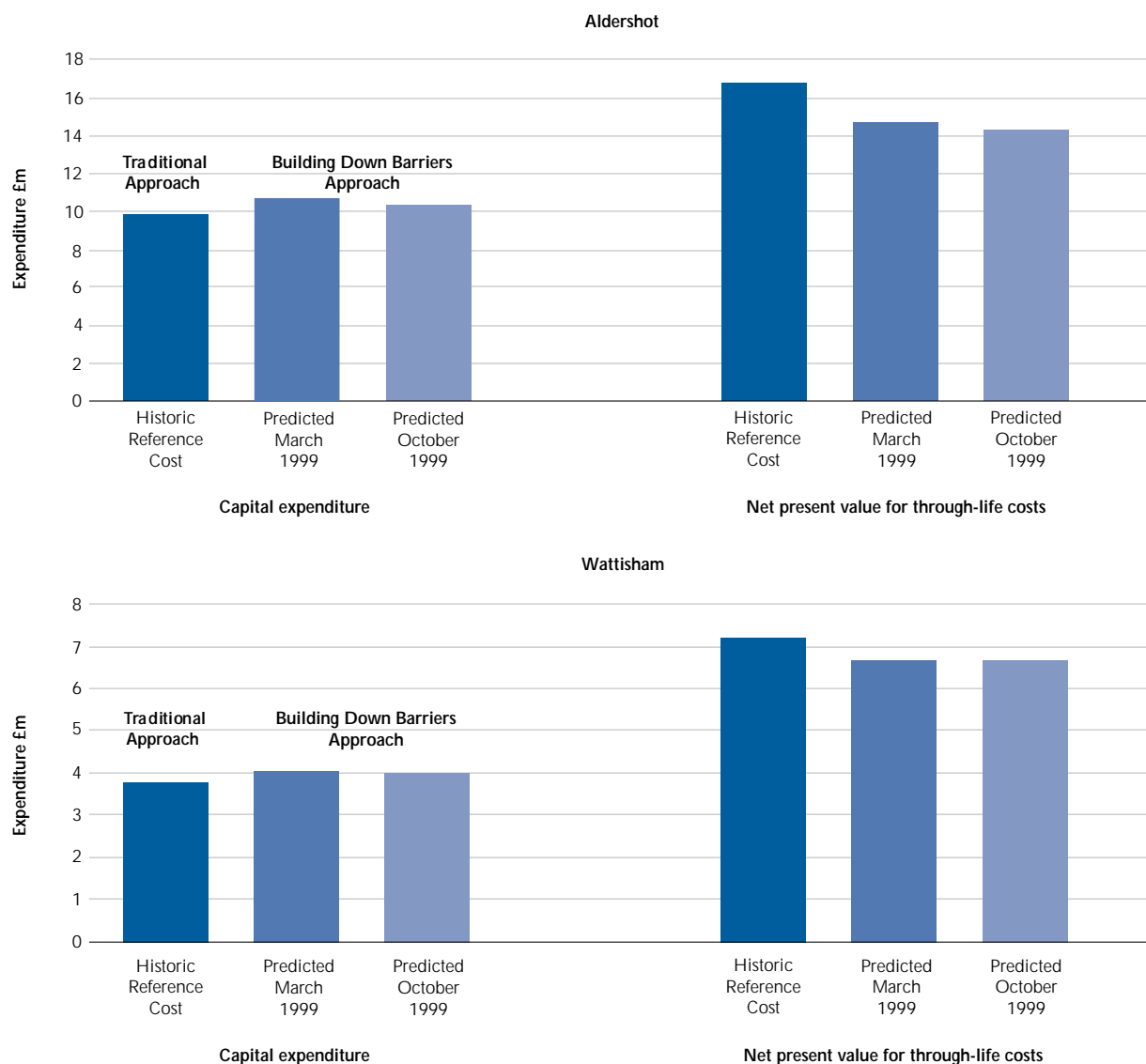
- 12 The evaluation team reported the lessons learnt under the seven underlying principles of the initiative. A summary of the results is given below.

Compete through delivering superior underlying value rather than lower margins

- ✓ Predicted through-life costs and capital costs were further reduced by the use of value engineering after the design process was complete.
- ✓ The Army client allowed higher capital costs to reduce running costs, for example, the investment in a combined heat and power installation at Aldershot.
- ✓ AMEC and the Army have agreed that any further savings made during the building of the Aldershot centre will be shared. At Wattisham, Laing has built in a four per cent saving on capital expenditure into its guaranteed maximum price.
- ✓ The process has worked by removing costs, not by squeezing profit margins.

1 Predicted capital and through-life costs

This figure shows that supply chain management has resulted in lower predicted through-life costs of 7 per cent (Wattisham) and 14 per cent (Aldershot)



Source: Building Down Barriers: Interim Evaluation Reports March and November 1999

Make "value" explicit: design to meet a functional requirement for a through-life cost

- ✓ Drawing up an output-based brief with explicit reference to value was very useful, as was involving the building users and others in its development.
- ✓ It is essential to specify at an early stage any constraints on capital costs or through-life target costs.
- ✓ Limited consideration was given to the aesthetic appearance of the exterior of the training centres, but the process would still work where the impression given by the building was a key feature.

Establish long-term relations with key suppliers

- ✓ Prime contractors learnt a lot about the qualities and capabilities needed for specialist suppliers and design consultants to work in this way, and have laid the foundations of some long-term supplier relations. The full benefits of working with the supply chain will only be realised with further opportunities to work together.
- ✓ A key challenge is how to set up commercial relations between prime contractors and key suppliers, to stimulate performance improvement over a number of projects.

Integrate project activities, through setting up manageable areas for joint decision making

- ✓ The pilot projects found that establishing cluster groups to facilitate design and construction of the centres was essential.

Manage costs collaboratively - using target costing, value management and risk management

- ✓ It is at the design stage that the greatest cost savings can be achieved. It is, therefore, unwise to fix a guaranteed maximum price until the design stage is complete. If the price has to be fixed at an earlier stage, then an incentive scheme for the sharing of benefits should be agreed.
- ✓ A clearer understanding is needed of actual construction costs, in terms of labour, plant and materials. Most construction organisations have difficulty in distinguishing underlying costs from risk allowances, and profit and overhead margins.

Develop continuous improvement within the supply chain

- ✓ Both projects have set up systems for achieving continuous improvement. Application of these systems during the construction phase are crucial, as it is better co-ordination between specialist contractors that leads to the greatest gains.

Mobilise and develop people - through leadership, facilitation, training and incentives

- ✓ Leadership is very important - the prime contractor must set clear directions and boundaries to enable the cluster groups to work effectively.
- ✓ Facilitation of the process and the cluster groups is vital in developing the capabilities of the supply chain to work in new ways.
- ✓ The Building Down Barriers approach has required change at the corporate level of the prime contractors as well as at project level.

Next Steps

- 13 Defence Estates with the Tavistock Institute, the Warwick Manufacturing Group and the Design Build Foundation have produced a handbook of supply chain management for prime contractors based on Building Down Barriers. Training modules for the Building Down Barriers process for industry have been developed and 150 firms have attended the workshops. Defence Estates submitted Building Down Barriers as a demonstration project and has participated in the Movement for Innovation regional meetings. It also has a representative on the Movement for Innovation Board.
- 14 Defence Estates has reached an agreement with the Design Build Foundation that from 31 December 2000 the Foundation will take responsibility for the continuous improvement of the Handbook toolset. This will include the refinement of their registration scheme to reflect the toolset, the provision of training and marketing the toolset to industry at large.
- 15 Following Building Down Barriers, Defence Estates is extending the use of prime contracting across all its procurement expenditure, (see appendix 6 for details).

Appendix 14

People and organisations consulted

Sir John Egan, author of “Rethinking Construction”

Sir Michael Latham, author of “Constructing the Team”,
Chairman **Willmott Dixon Limited**

Contractors

Alfred McAlpine Mr Andrew White, Managing Director
Special Projects

AMEC plc Peter Mason, Group Chief Executive

Balfour Beatty Plc Paul Lester, Group Managing Director,
Alistair Wivell and John Samuel

Coulson Group Limited Stephen Terrell, Managing Director

Jackson Building Limited John Murphy, Construction Director

John Doyle Group Limited Stefanos Stefanou, Chief Executive

John Laing Geoffrey Wort

Kvaerner Construction Limited David Fison, Executive Vice
President, Andy Monk, Managing Quantity Surveyor

MANSELL plc Richard Woodman-Bailey, Business
Improvement Director

Morrison Hamish Robertson, Director of Quality, Nina
Clukow

Tendring Construction Limited Christopher Ewen, Managing
Director

Professional advisors and consultants

Allford Hall Monaghan Morris Simon Allford

Amey plc Shonagh Hay, Business Development Director

Atelier Ten Patrick Bellew

Bennetts Associates Limited Rab Bennetts

Building Design Partnership Richard Saxon

Edward Cullinan Architects Robin Nicholson

Gardiner and Theobald Colin Carter

Gibb Limited Professor Scott Steedman, Director

Halcrow Professor Patrick Godfrey, Director

Mace Bob White, Chief Executive

Property Tectonics Professor Trevor Mole, Managing Director

Thorburn Colquhoun Les Venus, Associate Director

The Cook and Butler Partnership Matthew Stanford,
Quantity Surveyor

WS Atkins David Clements, Managing Director, Alan
Gilbertson and Tim Broyd, Directors

Specialist Contractors/Suppliers

Drake and Scull Engineering Martin Davis, Vice Chairman

Stannah Lifts Limited David Lewis, Operations Director,
John McSweeney, Sales Director, Lawrence Power, Sales
Manager, Mark Bedhall

Terrapin Limited Nick Whitehouse, Chief Executive and
Chairman

Clients

Anglian Water Phil Butler, Head of Commercial Consultancy

British Airports plc Mike Roberts, Group Technical Director
and Andrew Wolstenholme, Director

British Property Federation William McKee, Director
General, Chris Morley

Dudley Metropolitan Borough Council John Anderson, Chief
Engineer

Essex County Council Gordon Powell, Property Care Officer

Kingston Hospital Trust John Langan, Chief Executive, Neal
Deans, Estate Manager

Land Securities Graham Field

Railtrack Simon Murray

Slough Estates plc Sir Nigel Mobbs, Chairman, Dr Bernard
Rimmer, Peter Thompson, Senior Projects

Stanhope Peter Rogers, Director, Paul Lewis, Director

University of Cambridge David Adamson, Director of Estate
Management and Building Services

Industry Bodies

Construction Industry Board Christopher Vickers, Chairman, Don Ward, Chief Executive

Construction Industry Council Graham Watts, Chief Executive

Confederation of Construction Clients Terry Rochester, Chairman, Anthony Pollington

Construction Confederation Jennie Price, Chief Executive

Construction Products Association Michael Ankers, Chief Executive, Anthony Davies, Director

Constructors Liaison Group John Nelson, Secretary

The Electrical Contractors' Association Stuart Burchell, Economic Advisor

Specialist Engineering Contractors Group Rudi Klein

Association of Consulting Engineers Nicholas Bennett, Chief Executive, Mindy Wilson

National Federation of Builders Alan Ryder, Business Manager Eastern Region

Reading Construction Forum Malcolm Dodds, Chief Executive

Professional Institutions

Institution of Civil Engineers Amar Bhogal, Deputy Secretary

Royal Institution of Chartered Surveyors

Trevor Mole, Chair of Construction Panel

Neil Pountney, President of the Quantity Surveyors Division

Chris Powell, past President of the Quantity Surveyors Division.

Mike Ridley, Member of the Institutes' Construction Panel

Irene Woodward, Director of Division and Panel Support

Other Bodies

Commission for Architecture and the Built Environment Stuart Lipton, Chairman, Robert Bargery

Construction Round Table Professor Ken Treadaway, Dr Josephine Prior

Construction Industry Research and Information Association Peter Bransby, Director General

Construction Industry Training Board Peter Lobban, Chief Executive

Design Build Foundation Barry Holmes

Design Council Moira Fraser Steele, Education Director

European Construction Institute Ivor Williams, Director, Bob Lorraine

Academics

University of Bath, Agile Construction Initiative Professor Andrew Graves, Paul Milford

University of Birmingham, School of Public Policy Dr Janet Newman

University of Reading, Department of Construction Management and Engineering Professor Ranko Bon, Professor Fisher, Professor Roger Flanagan, Colin Grey, Professor Peter Lansley

University of Salford, School of Construction and Property Management Professor Martin Betts, Peter McDermott, Dr Terrence Fernando

University of Sussex, Science and Technology Policy Research Professor David Gann

Initiatives

Movement for Innovation Board Alan Crane, Chairman, Rab Bennetts, Mike Burt, Clive Cain, Shonagh Hay, Robin Nicholson, Stefanos Stefanou and Bob White, Board Members

Construction Best Practice Programme Zara Lamont, Director

Housing Forum Judith Harrison, Project Director

Local Government Task Force Ted Cantle, Chairman and Chief Executive of Nottingham County Council

Others

Stuart Humby, formerly of Natwest, the Treasury and the Chartered Institute of Purchasing and Supply

Mike Betts, City Analyst J P Morgan Securities Ltd

Kevin Myers, HM Chief Inspector of Construction Health and Safety Executive

Martin Print, Innovation Unit, Department of Trade and Industry

Robert Gaitskell, Barrister, Keatings Chambers

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Building

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Construction Best Practice Programme - www.cbpp.org.uk

Construction Industry Board - www.ciboard.org.uk

Construction Industry Research and Information Association - www.ciria.org.uk

Construction Research and Innovation Strategy Panel - www.crisp-uk.org.uk

Construction Round Table - www.crt.org.uk

Defence Estates - www.defence-estates.mod.uk

Department of Environment, Transport and Regions - www.construction.detr.gov.uk

Movement for Innovation - www.m4i.org.uk

Movement for Innovation Knowledge Exchange - www.rethinkingconstruction.org

Office of Government Commerce - www.ogc.gov.uk

NHS Estates - www.nhsestates.gov.uk

The Housing Forum - www.thehousingforum.org.uk

Treasury - www.hm-treasury.gov.uk

Glossary

Prefabrication	The manufacture of sections of buildings which are then assembled on site.
Risk assessment and management	A comprehensive assessment and management of the potential circumstances that might arise which could delay the building's completion, increase its costs, or impact adversely on the quality of the buildings, including health and safety.
Standardisation	The use of components which are made to a general manufactured specification rather than an individual project specification.
Prime Contracting	A single supplier, the Prime Contractor, is appointed to manage all aspects of construction - design, building works and completion including all those in the supply chain - architects, subcontractors, materials suppliers, to ensure that the building is completed on time, to cost and meets user specifications.
Value management or engineering	The assessment of the contribution or "value" of each part of the construction process and considering how it can be improved to drive out waste and inefficiency from construction.