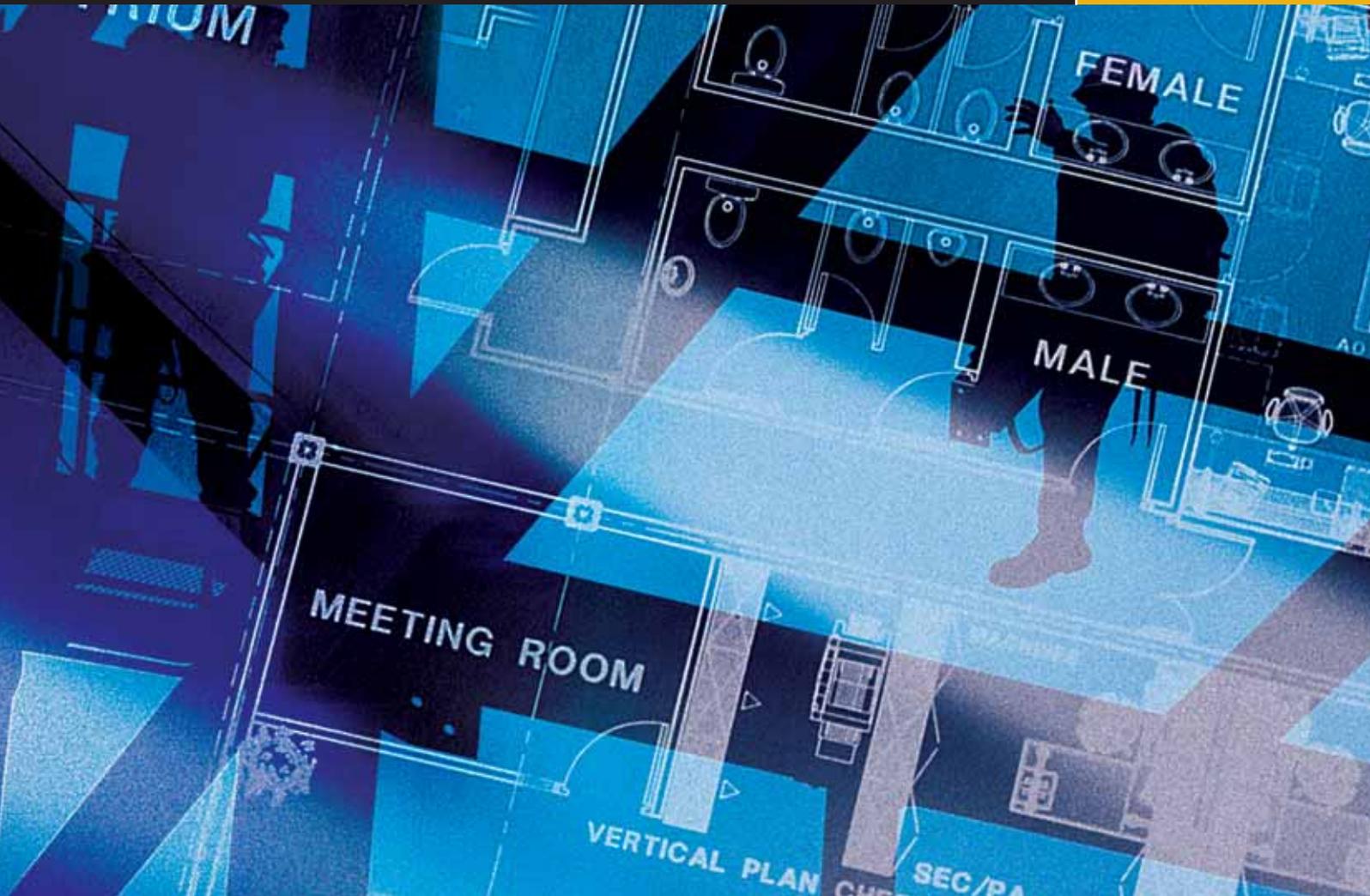


Design quality

Achieving Excellence in Construction Procurement Guide



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NAO endorsement

The NAO recognise that proactive client leadership and robust project management are prerequisites to the successful delivery of construction procurement.

They consider that procurement of construction should be on the basis of whole-life value for money and endorse the use of the good practice promoted by this suite of guides. They may investigate whether this good practice is applied in practice in any future examination.

Acknowledgements

This guide has been published after extensive consultation within government and valuable contributions from leading individuals and organisations across the construction industry.

OGC would like to thank all who have contributed.

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The Achieving Excellence Procurement Guides

The *Achieving Excellence* suite of procurement guides replaces the Construction Procurement Guidance series.

The new series reflects developments in construction procurement over recent years and builds on government clients' experience of implementing the *Achieving Excellence in Construction* initiative.

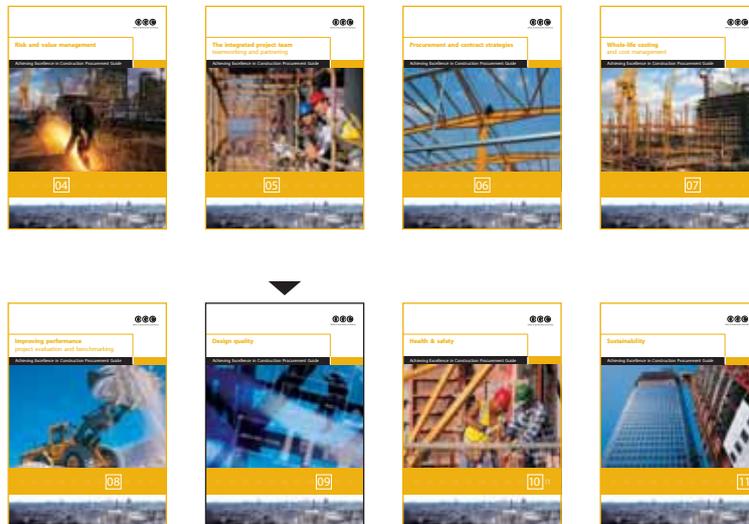
High level guides



Core guides



Supporting guides



Introduction

'Good design may initially cost a little more in time and thought, although not necessarily in money. But the end result is more pleasing to the eye and more efficient, costs less to maintain and is kinder to the environment.'

Lord Rea, House of Lords, January 2003

All clients should aim for good design in their projects. The built environment will affect the lives of many people for years to come, how people feel about their lives as much as how they carry out daily tasks. Clients need to consider the cost and impact of design over the whole life of their projects. They should also understand the importance of their own role in ensuring that good design is achieved and best whole-life value for money is delivered.

This guide explains the characteristics of good design and how design quality can be raised through the procurement process.

Government recognises that good design needs to be supported and encouraged; design is integral to *Achieving Excellence in Construction* and to the achievement of value for money. It is at the design stage that most can be done to optimise the value of a facility to its end users. Good design takes full account of sustainability and environmental concerns. Badly designed facilities will fail to meet the needs of end users, cause operational problems, have high maintenance or running costs and can be inefficient, costly and dangerous to build.

For simplicity this document generally refers to facilities, but this should be understood to cover all construction projects, including new work, refurbishments and maintenance under any procurement strategy.

This guide explains how the client and suppliers work together to achieve design quality of an appropriately high standard. It describes design in the context of the project lifecycle; it highlights the client role at each stage and the key decision points at which Gateway reviews will be appropriate. The guidance focuses on good procurement practice in relation to design quality; it complements more detailed advice from the Commission for Architecture and the Built Environment (CABE) in their guidance *Creating Excellent Buildings*, the NAO and other central bodies.

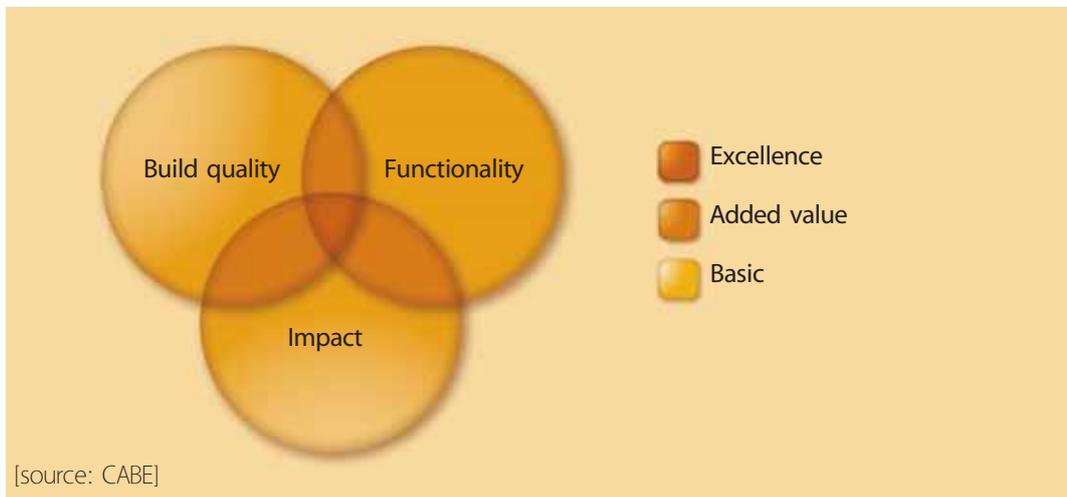
Principles

What is design quality

Design quality is a combination of functionality (how useful the facility is in achieving its purpose); impact (how well the facility creates a sense of place); and build quality (performance of the completed facility).

Figure 1 shows these key aspects and illustrates that the more overlap between the three, the higher the design quality.

1 Key aspects of design quality



Design quality is about much more than style or appearance – it incorporates the key requirements of the stakeholders and business, functionality, whole-life value in relation to maintenance, management and flexibility, health and safety, sustainability and environmental impact. It is not merely subjective; it can be defined and measured. The Construction Industry Council (CIC) has prepared the Design Quality Indicators tool (DQI) with support from DTI, OGC and CABE as a means of measuring and evaluating design quality; the DQI is explained in more detail later in this section.



09 Design quality

Quality in design and construction has to be treated as one. Quality means right first time, delivery on time and to budget, innovating for the benefit of the client and stripping out waste – whether it is in design, materials or construction – on or off-site.

It is important that the pursuit of design quality is not undertaken in isolation. It is essential to integrate design quality in the overall procurement process, bringing together client leadership, integration of the project team and continuous improvement.

Why design quality is important

Design quality is critical for the success of any construction project; better designed schools contribute to better education, better designed hospitals help to improve the quality of patient care and so on. Roads and bridges, parks and playgrounds, buildings, river management and the space between them all need good design.



It is the responsibility of all clients, but especially public sector clients, to commission projects of which present and future generations can be proud. There is a significant role for clients in promoting good design. It does not necessarily involve high cost; good design will provide value for money in terms of total cost and cost-in-use. It will also address issues of sustainability and environmental concerns.

Good design should:

- make a positive addition to the location, the environment and the community
- add value and reduce whole-life costs
- create built environments that are safe to construct and safe to use
- create flexible, durable, sustainable and ecologically sound environments for the community
- minimise waste of materials, energy and pollution both in construction and in use
- be attractive and healthy for users and the public
- contribute to construction that is quick, safe and efficient
- produce facilities that are easy and cost effective to manage, clean and maintain.

[Source: *Better Public Buildings*]

Design quality can be defined quite precisely in terms of quality elements for a specific facility such as an office workspace:

- efficient, clear space for maximum flexibility of layout
- place making – defined places for entry, reception, work, breaks, drinks and catering, services
- accessible to all and, where relevant, welcoming to the public and customers
- a workplace, location and building representing organisational values
- maximum access to views and outlook
- good environmental qualities: lighting, heat, air with individual control of the environment where possible
- design for comfort and ergonomics, particularly in furniture and lighting
- use of colour, texture, light and architectural features to enliven the work environment
- design for security and safety
- design for energy efficiency and future-proofing.

[Source: CABE: *Creating Excellent Buildings*]

The design process: overview

In summary, the design process involves these sequential steps:

- interpreting client needs and project context
- feasibility study to assess business value of the project and design options
- outline design – diagrams and sketches leading to more complete designs of the whole facility as a three dimensional solution
- detailed design – all the component parts and how they will fit together.

The role of the client

The client's primary role is to demonstrate clear leadership. This starts with developing a clear brief with help from independent client advisers and the integrated supply team as required – this is essential to achieve good design. Early decisions are the ones that matter the most – it is at the briefing stage that most can be done to optimise value.

'The million-pound mistake is made on day one, in poor briefing and design thinking.'
Better Public Buildings



Most clients, especially those whose construction projects are infrequent, will need expert advice to inform their design decisions. Where required, the client role in evaluating quality can be supported by an independent client adviser with design expertise; such specialist support is essential for clients with limited experience. Stakeholder consultation and commitment is essential to project success; it is important to ensure that key stakeholders are identified early in the project and their buy-in secured.

Understanding design scale

The important aspects of design are considered at different scales, gradually focusing in from the overall environment and surrounding area to design detail. Good design should be sought at all scales of the project, in the context of the site, setting and public realm; the facility as a whole; and the small details.

In the context of the site and its environment:

- addressing the surrounding physical, social and economic context through the application of good urban/rural design principles
- acting as a visual focus or complementing open spaces that already exist
- providing well designed public spaces both internally and externally
- helping to create a site with identity
- exploiting views and orientation.

At the scale of the facility:

- providing for all required functions
- offering options with degrees of flexibility and adaptability
- providing a healthy, safe environment during and after construction
- sustainability during construction, operational use and disposal – for example, through sustainable use of energy and materials.
- accessible to all.

At the detail scale:

- the quality of light – natural and artificial
- colour - bold, natural or subtle
- finishes and materials – looks, texture, durability
- ironmongery, fittings, equipment – looks and ease of use
- use of works of art and landscaping
- ensuring access for all.

Selection and assessment of the site is important. However, it must be recognised that often the client has no choice but to work within the constraints of a given site. Where there is choice the selection of an appropriate site with the necessary location, access, size, shape, development rights and other project specific elements will make a significant difference. If it has in addition features such as trees, water frontage, interesting topography or townscape, then the possibility of achieving design excellence is greatly enhanced.

Critical success factors for achieving design quality

The critical success factors for achieving design quality are:

- clear brief and sound business case
- expert advice where necessary from independent client advisers
- designers in the integrated project team with appropriate skills and experience
- early involvement of the integrated project team
- a good site (where choice is possible)
- an effective client who champions design
- well managed design and procurement processes
- an adequate budget and timescales.

Design Quality Indicators

Design Quality Indicators assess design quality under three main headings:

- *Impact* – character and innovation, form and materials, internal environment, urban and social integration. These refer to the facility's ability to create a sense of place and to have a positive effect on the local community and environment. They also cover the wider influence the design may have on the disciplines of building and architecture.
- *Build quality* – performance, engineering systems and construction. These relate to the engineering performance of a facility, which includes structural stability and the integration of health and safety aspects throughout the project lifecycle. They also relate to robustness of the systems, finishes and fittings.
- *Functionality* – use, access and space. These are concerned with the arrangement, quality and interrelationship of spaces and how the facility is designed to be useful to all.

More information about DQIs can be found through the Construction Industry Council, at www.dqi.org.uk/DQI/default.htm. Other specialist tools (including AEDET for the NHS and DEEP for Defence Estates) are relevant for specific sectors (see the box overleaf).





DQI principles for specific sectors

Design Excellence Evaluation Process (DEEP).

The MOD is responsible for more heritage buildings than any other government department. Defence Ministers are also departmental design champions and are responsible for improving the quality of design of MOD buildings in accordance with the Departmental Action Plan *Better Defence Buildings*, and the Design Excellence Evaluation Process.

DEEP is divided into three key themes, like the DQIs – function, impact and build. Function is about turning requirements into operationally efficient solutions; impact is about the ways in which design affects the external and internal environment; build applies to construction performance.

In addition, there are two common threads of innovation and sustainability that apply across all areas. Innovation is about championing new ideas and methods, collaboration across the integrated project team, smarter construction and procurement of economic and more efficient buildings. Sustainability is concerned with determining whether or not to build; conserving and using renewable energy; reducing the impact on the environment. Further information is available at www.defence-estates.mod.uk

Achieving Excellence Design Evaluation Toolkit (AEDET)

In order to achieve design excellence the AEDET has been developed in the NHS. This is a toolkit for evaluating the design of healthcare buildings from initial proposals through to post project evaluation. Developed by the NHS in collaboration with CABI and the CIC, together they have developed evaluation criteria that ensure they all work within a common, industry-wide framework.

AEDET has three main categories – functionality, impact and build standard. These are subdivided into 10 sub categories – use, access, space, character and innovation, citizen satisfaction, internal environment, urban and social integration, performance, engineering and construction.

The AEDET toolkit, instructions and working examples are available for download at www.nhsestates.gov.uk

Case Study

Centre for Mathematical Studies, University of Cambridge

Finalist for the Prime Minister's Better Public Building Award 2003

The University's Department of Pure Mathematics, Mathematical Statistics, Department of Applied Mathematics, Theoretical Physics and a new Physical Sciences and Technology Library are accommodated on a seven-acre site, in a series of interconnected pavilions around a central core building and a distinctive circular library.

The eco-friendly design grew out of a need to meet requirements of the mathematicians and the local community, and to satisfy the University's high standards of energy efficiency. Solar sensors and movement detectors control lighting; in areas with no windows, ventilation and lighting are introduced via glass lanterns that are a feature of all the pavilion rooftops, while the central core, insulated by a grass roof-garden, has motorised blinds activated on hot days. The building is very economical to run. The total of all running costs is only 1.8% of the capital cost, even better than the previous high standards in the industry.

The three phase development is a classic example of the changes in 'best practice' in the construction industry following the Latham and Egan reports. While phase one was on a single stage, lowest price, JCT basis, the third phase was two stage, with a quality/price balance in appointments, and the Engineering Construction Contract.

The project was also winner of the British Construction Industry Major Project Award 2003, the David Urwin Design Award 2003, Royal Fine Art Commission Trust Specialist Award 2003 and RIBA Award 2003.



Key roles

The design champion role

The OGC/CABE report *Improving Standards of Design in the Procurement of Public Buildings* sets out eleven recommendations for clients to help ensure design excellence. These recommendations include:

- every public sector client undertaking one or more capital construction projects above an agreed threshold should appoint a senior design champion for the project
- there should be clear procedures to ensure that schemes that do not achieve an acceptable level of design quality do not receive public funding and do not proceed until they do so; this will be the design champion's responsibility.

Ministerial Design Champions are charged with taking a close and continuous interest in the quality of facilities constructed in their respective departments and agencies. There should also be a design champion role at the project level, whose responsibilities and decisions should be consistent with the wider ministerial role. The design champion should have enough time and authority within the project to speak for quality and have a commitment to design. Generally the design champion would be an appropriately senior manager – but should not be the senior responsible owner (SRO), who is responsible for all aspects of the project. *AE2:Project organisation* explains the client roles.

Even at an early stage it is important to identify the person who will act as a design champion and define their role, way of working, and relationship with the rest of the team. Early input as soon as the project is underway will be needed from the design champion to help establish the vision and aspirations for the final outcome. The champion can be included in the project team specifically for this purpose or be someone with other responsibilities such as the investment decision maker (IDM). This is likely to be the case in small projects. The design champion does not need to have experience of construction projects but must have the authority within the project to keep design quality as a vital shared goal and will need to learn about design issues that are relevant to the project.

The design champion's role is to:

- articulate the vision and the desire for high quality design
- formulate client aims for quality of design and ensure these are clearly stated within the outline brief
- help to define, check and evaluate quality throughout the process
- insist that quality is maintained throughout the project.

Independent client advisers

Expert advice may be needed from independent client advisers at key points in the project in order to help make decisions and set the right framework for design excellence. Advice may be needed in business analysis, developing the brief, reviewing design quality and advising on detailed design considerations. At the outset advice may be required to determine the business need. For the definition and review of design quality an adviser from one or more of the design professions relevant to the project may be needed. Advisers with other skills may also be needed but should not be assumed to be qualified to advise on design.

Working as an integrated project team

Design, construction, operation and maintenance should not be considered in isolation from one another. Design ideas will provide better value when they are developed alongside knowledge of construction options and an understanding of how to obtain value from the whole supply chain, including manufacturers. Constructors are best placed to contribute their own expertise when they are involved in the development of the early design concepts. *AES: The integrated project team*, explains the importance of using integrated teams, and how to bring one together and manage it. The principle is simple: the client and the supply team working together can reduce waste, improve quality, innovate and deliver a project more effectively than if the parties are in a fragmented relationship that may be adversarial.

The Gateway process

The Gateway process should be used to check that the design process is being properly managed. This helps to ensure:

- the use of appropriate design advice
- the benchmarking of design standards
- the evaluation of design quality
- rigorous endorsement and approval processes.

Gateway reviews check progress at key decision points in a project's life, as shown in Figure 2 overleaf. (For more information about the Gateway process, see www.ogc.gov.uk/what_is_ogc_gateway_review.asp). There are several ways that decision points and key milestones are described for construction projects, including the RIBA plan of work and those used by the NHS. A table comparing the principal terms can be found in CABE's *Creating Excellent Buildings*.

Case Study

HM Treasury, London

Finalist for the Prime Minister's Better Public Building Award 2003

Refurbishment of HM Treasury has breathed new life into a Grade 2* listed building. The new accommodation brings the Treasury staff together in one building. The design challenge was to remodel the building to make use of the myriad corridors, unused light wells, staircases and unproductive spaces whilst remaining sympathetic to the heritage constraints. The result is a flexible, modern office space that delivers significant environmental and energy saving gains. The refurbishment has provided an extra 25 per cent of useable space for 1,200 staff; views through the building have been improved thanks to transparent roofs and light wells and a large courtyard at the centre of the building has been landscaped to create an internal garden area.

The project was also recipient of the British Council for Offices 2003 National (and Regional) Award for Refurbished Workplace.



09 Design quality

2 Gateway process and key design questions

Procurement stage	Gateway review	Key questions that the SRO should ask about the design aspects
Establish business need	Gateway 0: Strategic assessment	Have we appointed a design champion? Have we identified appropriate sources of independent client advice? Does the timescale allow enough time for the development of a high quality design?
Develop business case	Gateway 1: Business justification	Is the project brief robust enough to deliver good design without compromise? Have we identified and consulted appropriate sources of design advice? Are we using tools such as DQIs?
Develop procurement strategy	Gateway 2: Procurement strategy	Is sufficient weighting given to design capability in selecting teams?
Competitive procurement	Gateway 3: Investment decision	Have we optimised the design as far as possible? Are we satisfied about buildability?
Award and implement contract	Decision point 1: Outline design	Will the proposed design achieve the benefits we want? Are we using DQIs? Have risks been reduced through good design?
Detailed design	Decision point 2: Detailed design	Does the design take full account of maintenance etc?
Construction		Are we using DQIs?
Take delivery of facility	Gateway 4: Readiness for service	Are we using DQIs or other feedback tools?
Manage contract for services	Gateway 5: Benefits evaluation	Have tools such as DQIs been used to assess success?

Practice

Preparation

Business Justification

At an early stage in the project preparation, the SRO should identify a design champion to take responsibility for design quality throughout the project. This may be the departmental champion with a responsibility for all the organisation's construction projects or an individual assigned the role specifically for the project. Requirements for independent client advice should be determined and appropriately skilled advisers identified. (See *AE2:Project organisation* for details of project roles).

Vision statement and stakeholder buy-in

The SRO, with the support of the design champion and independent client adviser, should develop and communicate a vision for the project that will inspire excellent design. This vision will normally be a simple statement of objectives, to obtain early consensus and provide a reference point throughout the life of the project. This stage, at which objectives are agreed and high level options considered, is critical to achieving design quality.

Understanding what constitutes good design for the project

Key stakeholders need to be identified (including end users) to enable consultation to begin at an early stage. It is essential that users have high level representation and influence on the client side; it is only through users that the business benefits of a construction project will ultimately be realised. Other groups with specific concerns relevant to the project and its location must also be included in consultation (for example English Heritage). The client members of the project team must understand and properly express stakeholder needs and concerns so that the project can respond to them (see *AE2:Project organisation* for more information about project governance).

When considering a construction project, a client will need access to expert advice to understand the specific design qualities that will support the business requirement. The project team should develop a shared understanding of what design quality means and how it might have an impact on the proposed project. Looking carefully at facilities inside and out, in all weather conditions, relevant location environments, and studying books, journals, and case studies of excellent facilities is a good way to start. Opportunities should be taken to visit other facilities together, to consider what works and what does not, and draw lessons for the new project. Looking back at what was done previously, and how well that worked, is an essential part of this process. In addition to functionality, these assessments should consider sustainability, health and safety as well as operational and maintenance factors. CABE's website www.cabe.org.uk contains a library of examples of good design and provides access to many publications about design quality and how to identify and work to achieve it.



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Using Design Quality Indicators (DQIs)

The DQI tool (outlined earlier in Principles) provides a useful method to structure discussion for this early stage and to help establish shared design aspirations. It is particularly applicable to buildings, though relevant sections can be used for any project. The tool is available from the CIC and information about it can be viewed at www.cic.org.uk. It is based on questions that cover aspects of ten different qualities under headings of functionality, build quality and impact.

The DQI can be initiated by either client or supplier and is usually provided by the supplier as part of their service. The demand for whole-life value should be clearly established by the client at the start of the project, when the scope and the budget are set. Resources allocated wisely on design quality will save money in the long run, providing a facility that is built with sustainable principles so that it is economical to manage and maintain, can adapt to changing demands over its lifetime and maximises its residual value.

3 DQI analysis results

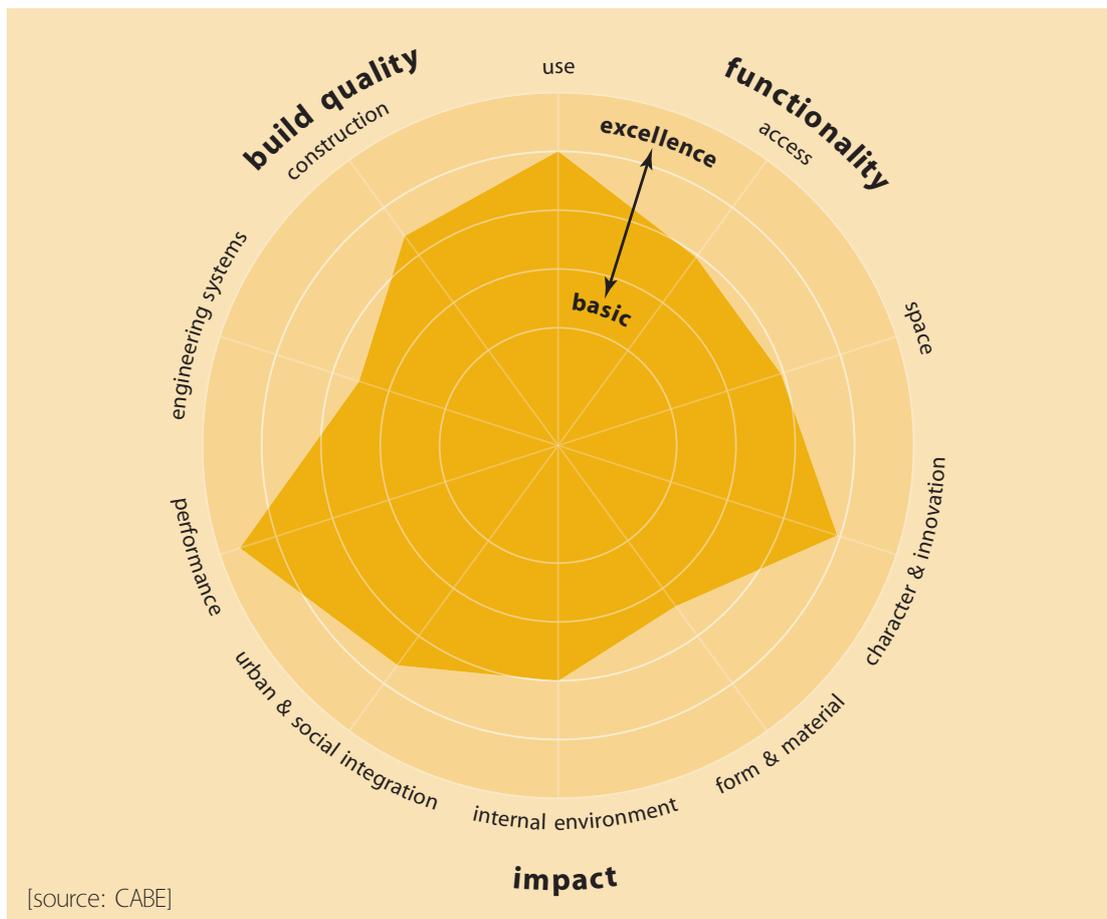


Figure 3 shows how the results of a DQI analysis are presented. In this example, performance is strongest and engineering systems and form/materials are the weakest aspects of the design. This analysis helps the project team to assess how well each aspect is being addressed in relation to the project's priorities.

Setting the budget

Well designed, well constructed facilities will generally have a long term asset value that extends beyond the initial business need. It is important that the SRO takes account of this whole-life value of the asset. Where additional cost is involved to achieve an appropriate level of design quality, it is important to understand that design and construction costs represent a small proportion of the cost in use of the facility over its whole life. Resources spent wisely on design quality have the potential to save money in the long run, providing a facility built with sustainable principles, that it is economical to manage and maintain, and can adapt to changing demands through its lifetime. Expert advice should be sought on where it is good value to accept a more expensive design – typically modelled as having a higher residual asset value at the end of the project period in comparing the net present values (NPVs) of different options. High quality design does not have to be expensive, but the client must commit to a clear budget and ensure that designers know what this is. Late changes to the budget have a much greater effect on the design quality than early changes.

The strategic brief and option appraisals

The strategic brief is established by the SRO with the project team. The strategic brief sets the scene for the creative solution. It sets out aims, facts and issues – not solutions – developed over time into the project brief. From the start, it must be clear, unambiguous and express the vision and key requirements of all the stakeholders. Sustainability, health and safety, design quality, whole-life costs and value must be included. Advisers with business and design knowledge must be consulted, especially in the early stages of developing a brief. The brief is developed throughout the first phase of the project by:

- consultation within the client organisation
- consulting stakeholders
- preparing a business case
- testing ideas with feasibility studies.

Developing a brief makes people think. The process should include the thoughts of all those involved, so that everyone understands and becomes committed to the brief. Top management must approve the brief so that they can champion the project. Users must be committed to the project's success and understand its ultimate benefits for them. The project team needs to know that it has the project sponsor's support throughout the project. Facilities managers need to be reassured that they will be given a facility that is convenient to manage.



At this early stage there should be a high level option appraisal. This should not simply be a cost exercise but should take the consequences of different design possibilities into account. Whole-life costs should be established on the basis set out in *AE7: Whole-life costing and cost management*. Client advisers with the right design skills will help to ensure that realistic design options are considered with their likely costs, timeframes, value to the business and risks. Each option should be rated for its potential to satisfy the requirements established in the strategic brief.

Decision point: Gateway Review 1: Business justification – at this point a decision is made on whether the project should go ahead, based on criteria of strategic fit, achievability and affordability.

Preparation

Procurement Strategy

Following Gateway Review 1, the brief is further developed and tested through feasibility studies. Decisions are also made about the way the project will be procured, the type of contracts that will be used and how the integrated supply team will be selected.

The project brief, output based specification

The project brief, on which design solutions will be based, should reflect the project vision and stress the importance of design quality. This should be expressed in output terms and include:

- the use to which the facility will be put
- the number of people it has to accommodate, where appropriate
- the type of equipment that will be used in the facility and the operational environment that this requires
- the sorts of customer services that the facility has to support
- performance criteria in terms of components and outputs
- any constraints in the design or specification of the facility.

The client needs to be aware of the point at which the detailed brief will be 'frozen', after which no further changes should be allowed. The exact timing of this varies according to the selected procurement route.

Design quality in the integrated project team

Sufficient time must be allowed for all stakeholders including the design members of the integrated project team to work through their ideas, communicate with the rest of the team and provide maximum added value. The client members of the team need to be clear about how they will contribute to design reviews and make sure that they have adequate design expertise available to help them do so.

Establishing a user group

Where possible, users should be directly consulted before the project brief is completed to ensure their needs are fully reflected. A panel to represent the different user groups (such as residents, occupants, staff, visitors) should be set up to gather information about user requirements as well as communicating progress. It is particularly important to deal with the difficulties of balancing expectations and reaching the under-represented. Other key stakeholders should be similarly consulted.

Stakeholder communication and consultation

Stakeholders can be consulted in a variety of ways including:

- face-to-face consultation
- meetings
- focus groups
- walkabouts or roadshows
- questionnaires
- newsletters
- exhibitions and open-days
- posters
- intranet or internet sites
- the media, especially local newspapers
- television and radio stations.

Feasibility study and value management

On occasion, opportunities offered by different design options will need to be compared in a comprehensive feasibility study. This may be carried out by design advisers and reviewed as part of a value management workshop. The client, with help from the independent client adviser, needs to keep design quality criteria in mind during this process and make sure that design is focused on improvement and enhanced value, not cost cutting. *AE4: Risk and value management* covers these areas in more detail. The procurement route and form of contract must fit the project objectives, scale and type. The recommended procurement routes under the *Achieving Excellence* initiative create integrated teams and bring construction and design expertise together to create the right design in a joint approach. *AE6: Procurement and contract strategies* describes these routes in detail and how to evaluate them, and explains how contracts may be used.

Procurement routes

It is important to determine the extent of design work required before selecting the final design team. There may be a need to test ideas with preliminary designs to establish a fuller brief. The more complex the facility and/or site the more important it is for the design to be developed before fixing the budget to achieve both functionality and design excellence. With a complex project a designer needs to be appointed early to determine the real requirements of the brief.



Wherever possible, design members of the team should be involved in an early dialogue with the client, both to develop the project brief in detail and to understand the best way to meet it. Where the procurement route does not allow early dialogue between client and designer, a special effort must be made to establish clear communication of objectives and design values to the design members of the project team. Using the DQI when developing the brief is a way to record and communicate a clear view of the things that matter most and why. The independent client adviser can also provide design advice in this situation and help the dialogue to develop once the project is underway.

Design competitions are sometimes used for major projects. The critical differences are that the brief must be thoroughly researched first and that the competition process may preclude consultation with users.

It is vital for tenderers to demonstrate their design quality and design success track record; this criterion must be stated in the OJEU notice. It is important that designers with appropriate skills and experience are selected. Only the best design teams will be capable of delivering complex projects on complex sites. Any specialised design issues for which the available expertise may be scarce will need to be understood before defining the criteria and process for selecting the team.

Decision point: Gateway Review 2: Procurement strategy: at this point the procurement strategy is approved (see *AE6:Procurement and contract strategies*).

Preparation

Investment Decision

During this stage, suitable teams to deliver the project are selected. From these teams, proposals are evaluated and an award decision is made. Design ideas are produced, refined and agreed.

Selecting a skilled team

The design members of the team must be chosen on the basis of relevant design expertise, experience and their ability to understand client requirements. Evaluation criteria for quality need to be developed and agreed, based on appropriate levels of skills and experience to match the project. Where the evaluation involves review of design concepts, sufficient weighting must be given to design capability, track record of the team members and to design quality. The criteria should consider all the features of good design such as whole-life costs, sustainability, visual impact and architectural quality as well as functionality, the need for future flexibility and how the team proposes to achieve these. Guidance on selection and evaluation processes is given in *AE5:The integrated project team* and *AE6:Procurement and contract strategies*. See also the section at the end of this document on further information.

Part of the evaluation process should, wherever possible, include visits to previous projects designed and or built by members of the team; feedback should be obtained on the finished project performance and from users of the facility.

It is important to establish how much experience the potential supply teams have of evaluating their own projects, to demonstrate their understanding of how well their designs perform in use, as part of continuous improvement. A commitment to delivering excellent design quality should include an understanding of when designs succeeded and when they could have been improved.

Design development

It is desirable to develop the design brief with the selected delivery team and review it with relevant stakeholders to be sure it covers current functional and operational needs. Where the procurement route prevents this, a client adviser should help to create a full brief at an earlier stage. The team selected should be 'integrated' from the start where possible. On occasion, a detailed design may be needed before the forming of a team. In this case full integration can only happen later in the project. For some projects the scale and programme for design and construction may mean that more than one design team will be needed for the project.

Sometimes the selection/evaluation process will involve an additional investment decision, for example when a two stage design and build selection involves asking a short list of teams to provide design ideas for a fee. Here a review of the outline designs takes place as part of the selection process. Another outline design review may occur after Gateway Review 3, if further design development is needed before the project delivery team starts on the detailed design.

Decision point: Gateway Review 3: Investment decision: approval is given for the appointment of the integrated supply team.

Design – Decision point 1: Outline design

Once the decision to invest has been made, designs are further developed in response to the client brief or output specification. They will be shown in the form of sketches, architectural drawings, models or other three-dimensional representation. At least two levels of detail of design need to be agreed by the client members of the team. These are sometimes known by the terms of the Royal Institute of British Architects (RIBA) Plan of work – Stage C: outline design, and Stage D: detailed design. (In some cases Stage E: final design, may need to be signed off by the client.) These key decision points for outline design and detailed design take place between Gateway Reviews 3 and 4, as shown in Figure 2 on page 14. For some procurement routes, bidding teams have already done considerable amounts of design work in order to establish firm costs, before the decision to invest is made. In all procurement routes the design must be agreed at an outline level before full detailed design can be carried out.



Design management

Design must always be managed with a view to achieving the best possible value for money. The way this is done will depend on the selected procurement route. Development of the full design brief, outline design, detailed design and their transformation into production drawings and specifications is done at different times in the process, and by people with different relationships to the client and to other team members. Effective design management should ensure that:

- the client has communicated aspirations for quality, and made the corresponding financial commitment
- designs comply with the brief
- the brief itself does not alter (except through formal change control procedures)
- changes are strictly controlled (a cost estimate, time estimate and review of risks must be presented before the agreement of any changes)
- designs are well co-ordinated and communicated at all levels
- design is completed to programme
- cost and progress reports are issued at suitable intervals with a minimum of one at outline design and one at detailed design
- the project sponsor and user group/s are kept involved through meetings and presentations.

Outline designs

The integrated project team develops the outline design from early sketch design concepts identified during the selection of the team or created at the beginning of the design process. The design addresses the bulk – height, shape and location on a site, general layout – how spaces relate to each other, access points, and the overall standard of materials and finishes. It is important, especially for anyone unfamiliar with construction projects, to receive full explanations of drawings and all the design information provided. Once an outline design has been accepted and signed off, any changes will almost certainly lead to added cost and delay.

The need for changes can be minimised by:

- being certain that a requirement for a construction project exists
- clear leadership and a proper project process
- ensuring that the project brief is comprehensive and has the stakeholders' agreement
- taking account of current legislation
- taking account of proposed legislation (where known about)
- having early discussions with stakeholders to anticipate their requirements
- undertaking site investigations and condition surveys early in the project
- ensuring that designs are adequately developed and coordinated before construction plans are committed
- proactive project management including forward planning
- identifying and managing risks that are appropriately allocated within the integrated project team.

A formal checking process must be undertaken and recorded, to ensure that the design members of the team have properly interpreted and prioritised needs and that the design concept satisfies *Better Public Buildings* requirements. The design champion should be involved in the review. Design quality objectives need to be to the fore in any value engineering workshops to ensure that whole-life value, not cost reduction, drives the process. This clear focus on quality that considers the cost in use of the facility over its whole life will also help to reduce risk (see *AE4: Risk and value management*).

Detailed design/Final design

Basic design checklist

Does the design take account of:

- health and safety of the construction and maintenance staff as well as users and the community?
- future needs of the users and the flexibility needed to meet them?
- disposal (possibly demolition) as part of the whole-life cost assessment?
- opportunities for achieving maximised value for money through standardisation and prefabrication, where appropriate?
- sustainability issues such as the promotion of reuse, recycling and more efficient use of resources within a value for money approach?

CABE's Design Review provides further checklists of questions that test how well a design meets the criteria that form their definition of good design. Where the DQI has been used to help define the brief, the design quality criteria agreed can be used to evaluate the outline design. Stakeholders, including users, should be consulted to be sure that they understand and accept the proposed solutions.

Decision point: Outline design (Decision Point 1): the outline design is signed off when everyone is sure that the design meets the requirements, will deliver the planned business benefits and that the design quality agenda has been met.



Design – Decision point 2: Detailed design

An overview of the way in which the facility will work has been set down in the outline design but there are still many decisions to finalise. The team needs to be aware that buildability, maintainability and flexibility are fully incorporated amongst other things and that innovative approaches or standardised elements are used where appropriate. Integrated working across the project team is especially important at this stage, so that details can be related to the overall design. This stage may involve some suppliers or manufacturers (for example those supplying mechanical systems) providing very detailed designs for their part, while other ideas may be less well advanced. Timely decisions regarding fit-out and installation of furniture and equipment are required. These may have been included from the start as part of the work of the integrated project team but they may need a separate, more detailed, briefing process. The design skills required need to be brought in early enough to ensure that detailed design takes fit-out issues into account.

Detailed designs need similar consultation, review and sign off procedures as for outline designs, to establish that the design is complete. At the final design stage documents must be sufficiently detailed for construction information to be prepared. After this point no further changes should be allowed. Any changes that are introduced can be very expensive, involving not only abortive design work but possibly wasted construction time and materials, and the danger of a loss of direction.

Decision point: Detailed design (Decision point 2): the client approves the detailed design.

Construction

Construction may start before all the detailed design is completed. Much detailed design is carried out by specialist subcontractors and suppliers and increasingly by manufacturers. The project sponsor and the design champion must find a way that fits with the procurement route being used, to maintain contact with ongoing design solutions and how well they interpret the project requirements.

Design quality does not stop being an issue during construction. Health and safety considerations are important as part of the design of the site processes as well as of the finished facility. Elimination of accidents on construction sites is a priority. Specification of sustainable materials for a facility designed to have sustainable functionality over time must be matched by good site practices that eliminate waste and pollution. The quality of the finished construction also needs to be properly monitored throughout. For example some decisions about materials and finishes may be made fairly late in the process that will have a significant impact on users and on the effect of the overall design, particularly in the interiors. Checking is needed to see that designs are implemented as expected. Any problems should be discussed and resolved as early as possible in the process. The fit-out timetable must be coordinated with the construction period to achieve maximum efficiency.

Readiness for service

Once construction is completed, systems such as heating and ventilation are 'commissioned' and become active. It may take some time for these systems to settle down in use. The integrated project team should assist in adjusting them until the design specification is met.

Post project review

A post project review (PPR) is carried out by the project team after construction is completed and focuses on how well the project was managed. It considers how well the project performed against clients charter key performance indicators such as cost and time predictability, safety and client satisfaction. It also considers lessons learned from the teamworking/partnering approach taken.

Decision point: Gateway 4: Readiness for service: the client approves the facility as ready for occupancy.

Benefits Evaluation

Post implementation review

A post implementation review (PIR) is commissioned by the business when the facility has been in use for long enough to determine whether the business benefits have been achieved and to learn lessons from the business focused aspects of the project. A post occupancy evaluation (POE) forms part of this review. For more information on PPRs and PIRs, see *AE8: Improving performance*.

The immediate need from a business point of view is to establish whether the project has met the original business needs and stakeholder requirements. The objectives and vision as expressed in the brief should have been met. The criteria used for design reviews should be revisited to ensure plans have fulfilled their promise, making use of DQIs as appropriate. The results of design reviews can be used to make adjustments, to inform the team of what went well and badly in design terms, and critically to disseminate information to others.

Facilities are rarely used exactly as conceived: organisations and individuals change, new processes develop during a project's lifetime. Such changes foreshadow the inevitable need to accommodate new demands in a flexible way throughout a facility's life. Just as needs change over time, so reviews should be carried out regularly over the life of the facility, to ensure that it continues to meet the business need.

Decision point: Gateway Review 5: Benefits evaluation: the client confirms that the business benefits have been achieved as set out in the business case.





Case Study

Bournemouth Library

Winner of the Prime Minister's Better Public Building Award 2003

This contemporary structure has provided a new 'public living room' for the residents of Bournemouth. Its architecture exudes an air of informality. The fully glazed north facing elevation opens the library interior to the street, inviting people in as well as enabling people to look out. Glass roof panels and south westerly facing windows allow light to flood into the library spaces, reducing the need for artificial lighting and cooling and thereby ensuring that energy costs are minimised. The internal layout is designed in such a way that the public can move easily between activities.

Built on a former derelict site, the library has seen a threefold increase in visitor numbers since it opened, with more than 3,500 people visiting during its first Saturday of operation. The library was financed via the Private Finance Initiative, and its success is due to the commitment of the borough council, developer, contractor and design team to provide the best possible library for the people of Bournemouth.

Further information

Reports and guidance

CABE

Better Public Buildings: a proud legacy for the future (2000)

Improving Standards of Design in the Procurement of Public Buildings (2002)

Celebrating Innovation

Creating Excellent Buildings: a guide for clients (2003)

NAO

Modernising Construction

Construction projects: How auditors can help

Websites

Better Public Buildings: www.betterpublicbuildings.gov.uk

Commission for Architecture and the Built Environment: www.cabe.org.uk

Construction Excellence: www.constructingexcellence.org.uk

Construction Industry Council: www.cic.org.uk

Design Quality Indicators: www.dqi.org.uk/DQI/default.htm



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