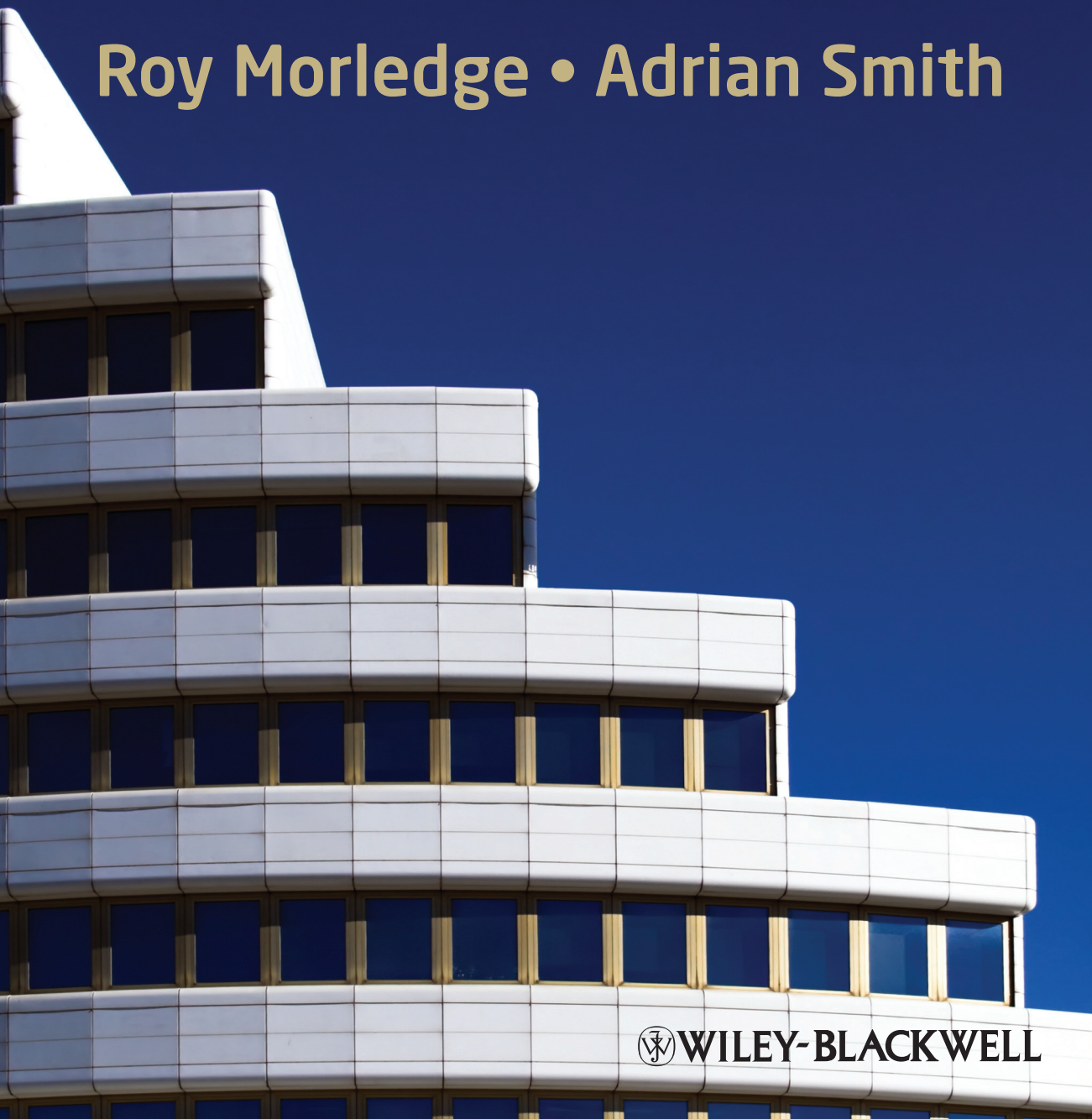
Building Procurement

SECOND EDITION

Roy Morledge • Adrian Smith



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Building Procurement

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Second Edition

Roy Morledge
Adrian Smith

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Preface to the second edition

Although the construction of buildings has been commonplace for many thousands of years, the ways in which that construction activity has been procured and managed have all too often been both time-consuming and inefficient, and the end result has frequently been unsatisfactory in its failure to meet basic time, cost and quality goals. There are many reasons for these failures, but perhaps the most fundamental arise not only because building is a very complex process but also because that complexity is compounded by the fact that most buildings are to some extent unique and bespoke, constructed in the open air by a team assembled especially for that project, which must be completed within demanding time, cost and quality parameters.

In addition, the spectrum of customers of the construction industry is arguably the broadest of any industrial sector, ranging in size from very large organisations to individual consumers, and in knowledge and expertise from organisations with substantial construction programmes and extensive construction knowledge and experience to naïve consumers with no previous experience and little or no knowledge of the process.

It is in the context of a continuing search for greater satisfaction of this broad and disparate customer base that considerable amounts of effort and expertise have been expended over many years in an attempt to ensure efficiency and economy in the procurement of construction activity. That procurement process itself is complex, requiring the mobilisation and management of an extensive range of professional, managerial, technical and financial expertise, and a successful outcome is frequently elusive. The procurement of construction work is significantly different from purchasing almost any other commodity. Most products are the result of a manufacturing process based in an environment that is permanent and controlled. The product can be designed, prototyped and tested prior to final production, quality can be readily assured, and potential purchasers can view and even try the product before making their final decision to buy. The only sector in which the construction industry comes close to this mass production approach is arguably the construction of residential developments. Projects, and particularly construction projects, generally follow a process that has few of the above characteristics and which can provide none of the benefits.

Experience over the past few decades has shown an increasing demand from regular clients of the industry for significant improvements in the predictability of construction projects in terms of time, cost, quality and fitness for purpose and

also for a substantial increase in value for money. Value for money has often been characterised by the need for projects to be cheaper in terms of capital costs and revenue expenditure, and for development and construction times to be significantly reduced whilst maintaining or improving the quality and functionality of the final product. These issues have been further complicated in recent years by the need for the industry as a whole to become 'greener' and more environmentally sustainable.

The recent upsurge in interest in building information modelling (BIM) should provide a further boost to ensure that future buildings are both more economical and more efficient throughout their useful life. Some of the possible impacts on the procurement process of the more widespread use of BIM are therefore considered.

Although significant improvements have been made and the performance of the industry in satisfying its clients has demonstrably improved in recent years, the successful completion of construction projects, both large and small, within budget, to time and to the satisfaction of customers is still by no means as common as it ought to be. There is significant evidence that, in the majority of cases, the procurement phase has been identified as being crucial to eventual project success and a significant component in project failure.

This book continues the approach set out in the first edition in that it seeks to explore approaches to improving the successful procurement of buildings, whilst incorporating recent developments in both research and contemporary practice. The importance of understanding the need to establish realistic and measurable objectives, both for clients and contractors, linked to a carefully evaluated business case and supported by rigorous post-project analysis is particularly emphasised.

It is worthy of note that purchasers of construction projects are usually referred to as 'clients' rather than 'customers'. This is appropriate since it suggests that they are purchasing services rather than products – construction is after all primarily a service industry. The distinction also hints at the possible legal position if a project does not meet the requirement of 'fitness for purpose' which is inherent in the purchase of other products. The term 'client' suggests the difference in approach that needs to be adopted for a satisfactory outcome to be achieved; clients increasingly seek a fitness-for-purpose guarantee, particularly in the case of projects procured on a design and build basis. This issue will therefore continue to impact upon the procurement process.

We have already noted that the management framework necessary for building procurement is largely temporary (i.e. it is assembled for a specific project and dissolves away once the project is complete) and the link between client and constructor is frequently fractured. Methods adopted in manufacturing industry to assure primary functions, such as communication, co-ordination and collaboration between segregated participants, are difficult to establish and maintain in the construction context – this issue has been increasingly well-recognised in recent years and is now being addressed through the adoption of formal supply chain management at both industrial and individual project levels. This movement has doubtless been encouraged by the development of enhanced levels of trust and collaboration both between clients and contractors and between main and sub-contractors. We

have seen recent evidence of that trust being threatened and in some cases eroded by the continuing economic and financial difficulties being experienced in the construction marketplace. In some sectors of the industry, self-interest and a focus on individual elements tends to continue to prevail, often to the detriment of the overall project objectives. There is, therefore, still some way to go before the maximum benefits which could be derived from such an approach are attained.

This book highlights the importance of those early project stages which are so often given insufficient emphasis or time prior to focussing upon concept design. The initiation of the project and the need for the development of a justified business case are explored along with the need to identify measurable outcomes against which the completed project can be judged. The *value* to the client of the project output, a primary driver which is often forgotten as direct project issues such as time and cost dominate the construction phase, is emphasised. Upon completion these issues become historical fact and emphasis returns to the value or performance benefit derived from the completed project.

The UK is an example of an island nation which has steadfastly hung on to the traditional procurement practices with which it is most comfortable. Historically, data regarding the relative use of different types of procurement strategy has indicated a numerical dominance of these traditional approaches with little evident sensitivity to varying client needs, although the relatively few experienced clients often do adopt different approaches. Traditionalism has historically been sustained largely through the conservatism of professional institutions, universities and colleges in terms of the nature of professional education, but this tendency towards the traditional has significantly changed in recent years with a significant rise in the use of design and build approaches and, particularly in the public sector, a growth in approaches requiring increased collaboration and trust.

This book explores and evaluates tools and techniques suitable for adoption in the case of most projects. Some considered to be innovative and beneficial have existed for many years, but their adoption has been limited largely to projects where experienced clients understand the benefit and ask their consultants to provide the necessary services.

In recognition of the increasing interest shown in recent years in many parts of the world in both the preservation and adaptive reuse of historic buildings, we have included in this edition a chapter devoted to the challenges inherent in procuring construction work to historic buildings. It should however be noted that work of this type requires skilled, specialist understanding of the issues involved and the employment of skilled, specialist expertise in its execution. The information we present here is therefore given simply as a guide; more specialist expertise will usually need to be sought. The chapter also includes an extended case study of a recent very successful project of this type that graphically indicates the particular challenges and problems which such projects may pose. We have already noted that construction clients differ widely in terms of their experience, purpose and size. Inexperienced clients dominate numerically and, on average, their projects are relatively small and short-lived. On the other hand, the minority of regular, experienced clients are by far the biggest spenders and they tend to benefit from their

experience and buying power. Nevertheless, whether the client is an inexperienced small-to-medium enterprise, a major corporate organisation or a public body, exposure to risk is inherent in the procurement of construction. The inexperienced SME is likely to be proportionately more exposed but managing that risk is a key part of the process. In particular, recent years have seen a significant increase in understanding the importance of selection of the correct procurement approach as a means of managing project risk, and a key component of this is the effective use of BIM techniques. The issues surrounding client and project risk are explored.

Even given the recent economic and financial difficulties face by the construction industry, collaborative approaches to procurement continue to gain support from experienced and regular construction clients where they can see that continuous, measurable, value-based improvement has been achieved by adopting such practices in preference to price-led traditional practices. The benefits of these techniques continue, however, to prove less attractive to inexperienced clients or those with infrequent demand for construction and collaborative arrangements, such as partnering, have therefore tended to gain less support in these areas. Procurement strategies where collaboration is enabled and the culture underlying the management of collaborative business relationships such as partnering are therefore explored in some detail.

Internationally, procurement practices in Europe, the Middle East and China are reviewed to enable some comparison to be made, not just about the practices themselves, but also about the context and attitudes of clients. In Europe, although traditional differences are still evident in the way in which construction is procured in different countries (and there may well be potential benefits for clients in some of the adopted practices, particularly the post-completion protection required in some countries), the European Union progressively imposes an increasing level of regulation in the constant search to provide a Europe-wide open market with standardised procurement procedures.

Governments commonly adopt an approach to procurement based upon long-term agreements of various kinds with project funding provided by private sector investors. Public private partnerships and private finance are therefore explored and the processes are outlined together with the benefits and the inherent difficulties of complex schemes where traditionally disparate participants have to collaborate if successful bids and outcomes are to be achieved.

The Middle East, particularly countries such as the UAE, Bahrain and Qatar continue to develop as construction markets and we have, therefore, included a brief review of construction procurement practice in this region. China continues to grow in importance as a worldwide construction market; it represents a fascinating instance of an economy developing at a tremendous pace, where procurement influences from many parts of the world (largely focused on geographical areas with extensive traditions of western influence such as Hong Kong and Shanghai) collide with traditional Chinese values and a centrally controlled state construction industry.

Our intention in revising and updating this book continues to be to provide students, researchers, practitioners and those involved in the provision of

construction services with a wide-ranging appreciation of the issues involved in the procurement of building projects. We have endeavoured to include in this edition a review of significant advances which have emerged in both research and practice since publication of the first edition. The book covers an exceedingly broad canvas and we are well aware that some areas are treated somewhat superficially. This is partly deliberate in the search for readability (this is after all not a research thesis) and partly imposed by pressures of space, but we trust that the references given will enable those seeking a deeper understanding of specific issues to explore the subject in greater depth.

Finally may we jointly express our grateful thanks to all of those colleagues and friends with whom we have debated issues and discussed techniques and points of principle over the years. Many of the outcomes from those discussions have found their way into this book in one form or another.

Special thanks to Sandie Lee, Director of Product Development at the College of Estate Management, for her contribution to the section on procurement methodologies in the Middle East included in Chapter 14. Grateful thanks are also due to the staff and students of the School of Architecture, Design and the Built Environment at Nottingham Trent University and the College of Estate Management, Reading and to the directors and staff of Stradia Ltd of Sheffield. Finally, heartfelt thanks to Chris and B for their patience and tolerance during the process of revising this book.

Roy Morledge, *Nottingham Trent University*
Adrian Smith, *Stradia Ltd*

1 Introduction

The worldwide construction industry embraces the sectors of building, civil engineering and the process plant industry. It includes projects of dramatically different types, sizes and complexity and requires extensive professional and trade skills. Groak (1994) suggested that the construction sector was more an agglomeration of projects than a discrete industry or a fixed constellation of firms. Winch (2002) suggested that construction is essentially a service industry. He argued that what is sold to the client is not a product but a capacity to produce.

However construction is described, it is an important contributor to the national economy; without adequate construction capacity, aspirations for economic growth cannot be achieved. Economic activity, self-evidently, is the primary driver for construction activity and the two are inextricably linked.

There is, however, an inherent dysfunction between demand and supply because of the extended time period between the initiation of the project procurement process and its eventual delivery. This period of time can encompass significant changes in economic activity and this may provoke changes to the initial rationale for the construction process.

There is constant demand for the construction sector to source the physical assets necessary to live and work in modern society. The building industry produces a diverse range of outputs ranging from products verging on mass production, in the construction of houses, through bespoke service facilities, such as schools and hospitals, and elements of production, in the form of industrial premises to house the manufacturing operations of organisations both large and small, to minor repair and maintenance work. Civil engineering, on the other hand, provides for many of our transportation needs in the form of roads, tunnels and bridges, railways, docks and airports, for our energy needs in the form of pipelines and power lines, and for the essentials of civilised life in the form of water and sewage treatment facilities, distribution and disposal systems. Indeed the capital assets of a country consist predominantly of built environment assets; in the UK, housing, infrastructure and other buildings represent 76% (£3800 billion) of a total asset base worth around £5000 billion at 2005 prices.

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There is therefore no doubt that construction forms a major aspect of the economy. For example, in the UK it currently contributes approximately 7% to GDP and provides direct employment for more than 5% of the working population.

History shows that, over time, construction demand is variable and is often affected by government policy changes as well as national and local economics. In *Construction Matters* (Business and Enterprise Committee 2008), the UK House of Commons suggested that as many as 95% of clients were either one-off or inexperienced clients. A significant minority of more experienced regular clients spend very significant sums on construction but there is little evidence of the cascading of knowledge and experience from these regular buyers to the inexperienced majority. Equally there appears to be little understanding by inexperienced clients of the need for that knowledge. The result is a heavy dependence upon construction professionals who tend, in the main, to limit their exposure to risk by leaning heavily towards traditional practice.

Few construction companies employ skilled craftsmen, preferring to outsource rather than to retain and train. Most skilled tradesmen are self-employed or employed in small specialist companies because the returns are greater than employment by contractors. This scenario results in huge fragmentation and specialisation, with 99.7% of firms in the industry being SMEs, most of which employ fewer than seven people and take work on a project-by-project basis (Business and Enterprise Committee 2008). Small firms rarely feel able to afford to train new people and, consequently, there are very few young tradesmen in the industry. At the same time, the role of traditional contractors has moved from one in which they manage their own men to one in which they coordinate the activities of other (small) companies and organisations.

This fragmentation of the industry means that it tends to be a diverse supply market from which clients may source their specific needs. There are subcontractors or specialists who occupy specialised niches in order to survive by avoiding direct competition with established market-leaders. There are also firms that are spanning these 'niches' in the provision of complete 'solutions' to large organisations and who act as 'integrators'. The end result is a very large number of specialists with which any client may do business in the delivery of his or her construction requirements.

A further consequence of fragmentation is that the industry takes little or no responsibility for seeking improvement in terms of either design or process. The inexperience of most clients of the industry means that they rely upon advice from construction professionals who, unless any improvement is tried and tested, are reluctant to use their client's project as a test bed.

Even 18 years after Sir Michael Latham highlighted the difference between construction and other industries, investment in construction research and development is still significantly lower than in other industries. Consequently, if there is innovation it tends to be driven by legislation, by the client or by other industries' changes in technology which can be imported to construction through specialist suppliers. Perhaps the exception is the attempts made by companies to develop new ways to deliver housing. In some cases, modern methods of construction

are proposed using off-site production. These proposals, usually adopting a pre-prepared panel system, do meet the requirements of legislation but also require a client, such as a local authority or housing association, to need a relatively large number of completed homes before the up-front investment is viable (EMDA 2011).

The construction industry is unique in the way that it responds to the need to deliver predominantly one-off products. In this sense, the industry is quite different from the manufacturing or retail sectors which have continuous demand and are thus able to construct and refine stable supply chains. These industries can focus on improving the product or streamlining their supply chain management processes. The product of construction is bespoke in nature and the supply process is more an inconsistent network than a coordinated and carefully managed supply chain. This can often cause conceptual difficulties for clients coming to the industry with a value proposition associated with the delivery of a project. Clients, who usually purchase defined and specified goods in the course of their normal business and who concentrate on price and delivery, usually need considerable assistance to purchase undefined, unspecified projects where price and delivery are both vague at the outset.

The process has been described and analysed as having six primary steps (Egan 2002), commencing with a business case rooted in the client's established need for the project. From this business case or value proposition, the client will be able to identify a multiplier from the investment. User value is usually significant as a multiplier of spend.

Whilst the benefits from the construction process can be immense in investment or business terms, the perceived performance of the construction industry appears historically poor. Many, perhaps most, projects are delivered late, over budget and with variable quality standards. Often these are unwelcome outcomes which frequently surprise the client organisation and cause significant problems.

Table 1.1 summarises the UK construction industry's performance over six years to 2011. This is based upon construction industry key performance indicators (KPIs) and indicates some improvements compared with previous surveys, such as those carried out by client groupings (CCF 1999, 2000).

At first sight, this performance does not look very good. Some improvement has been identified in relation to client satisfaction with both the product and the service and there is some evidence of improvement in project cost predictability but only a little in respect of project time predictability. Each project is, however, unique and it is very difficult to estimate the cost of a future design or when it can be delivered.

The lack of a consistent, industry-wide database of project costs and project times is a huge disadvantage and there are so many variables. Whilst the Building Cost Information Service run through the Royal Institution of Chartered Surveyors is a very useful source of information, it is limited to the extent to which data is voluntarily supplied.

It is the client who takes the initiative to start a construction project and, therefore, construction is often a customer-driven, one-off production process. Frequently the client will set targets based upon a set of expectations drawn from

Table 1.1 Summary of UK construction industry performance 2006–2011 based upon industry key performance indicators (KPIs). (Source: Constructing Excellence and Glenigan (2011).).

KPI	Measure	2006	2007	2008	2009	2010	2011
Client satisfaction – product	8/10 or better	84%	82%	83%	86%	87%	87%
Client satisfaction – service	8/10 or better	79%	75%	77%	84%	82%	80%
Predictability of construction cost	% on target or better	44%	49%	48%	46%	47%	59%
Predictability of project cost	% on target or better	45%	46%	49%	48%	52%	63%
Predictability of construction time	% on target or better	60%	65%	58%	59%	57%	60%
Predictability of project time	% on target or better	44%	58%	45%	45%	43%	45%

his or her own experience, which may well be unsuitable for a construction project. Inevitably, construction professionals and constructors will strive to meet the client's demands, often taking a much too optimistic approach, in the absence of a completed design, to what can be achieved for the price or in the time allocated.

The initiation of the construction process is usually aligned to the strategic or business need by the client for a constructed asset, e.g. a school, a factory or an office complex. After developing an appropriate brief for the project and establishing and prioritising parameters and priorities, a project organisation will be created to provide the necessary expertise to finalise the design and specification. Usually a tendering process will follow to select a contractor. In most cases, this contractor will take care of the employment of specialists and subcontractors and the procurement of materials. When contracts are signed and a sufficient amount of information is available, the physical execution of the construction project can start. This includes obtaining materials, manufacturing, engineering and assembly of elements, and finally construction on site. After the successful completion of the project, there will be a hand over and use will be made by the end user of the completed asset.

Construction is largely a site operation, confined to the specific location where the final assembly takes place, and it is important to note that construction takes place at the site of consumption unlike in the manufacturing industry, where products are produced in bulk for subsequent consumption at a distance.

Construction project organisations, in contrast to manufacturing organisations, tend therefore to be temporary. The participants involved with this temporary organisation experience frequent changes of membership but are totally interdependent on each other, operating through a variety of contractual arrangements and specific procedures.

In summary, it can clearly be seen that the construction industry is vital to the economy but that both demand and supply are fragmented, inconsistent and

complex. Collaboration and innovation are the exception, not the rule, and most purchasers of construction are inexperienced. Nonetheless its products are valuable, useful and serve their purpose, and the key to their successful production is effective procurement. This book aims to explore the factors that are influential on success in procurement.

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2 Procurement strategy: a literature review

Introduction and early history

The efficient procurement of construction work (defined here as the framework through which construction is brought about, acquired or obtained (Sharif and Morledge 1996)) through choice of the most appropriate procurement strategy has long been recognised as a major determinant of project success (Bennett and Grice 1990). Indeed, Newcombe (1992) argued that the selection of the procurement path is much more than simply establishing a contractual relationship. Rather, building on the work of the Tavistock Institute (1965) and Cherns and Bryant (1984), he argued that the procurement strategy not only creates a unique set of social relationships but also 'forms a power structure within a coalition of competing or co-operating interest groups'. In terms of quantifiable project deliverables, Gordon (1994), in an American study, reported that it was possible to reduce project capital cost by an average of 5% through selection of the most appropriate procurement methodology.

In the modern world, client satisfaction is increasingly seen by all concerned with the development and construction process to be largely dependent upon the selection of the most appropriate procurement methodology and failure to select an appropriate procurement approach was recognised well over a decade ago as a primary cause of project failure (Masterman 2002). Hibberd and Djebarni (1996) reported that whilst 64% of the clients they surveyed were happy with the procurement methodologies they were using at the time, 89% stated that they had previously been dissatisfied. Smith and Wilkins (1996) reported that, in a study of 11 publicly funded major hospital projects constructed in the UK, USA and Hong Kong, projects procured using a traditional approach consistently failed to achieve the client's objectives in terms of time or cost or both, whereas projects procured using a design and build route consistently fared much better. They did, however, point out that this was not necessarily because the design and build route is generically better than the traditional path; simply that, at the time the reviewed projects were procured, the choice of a design and build path was the result of a careful analysis of project characteristics and client expectations, whereas the traditional

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path was generally chosen 'because it's always been done that way'. This last point then appears to indicate a lack of skill or knowledge on the part of those making the procurement decision.

These issues were in fact already well recognised by early researchers in the field. Authors such as Franks (1984) and Nahapiet and Nahapiet (1985) offered critiques of the major procurement methods in common use with some advice on how to go about making the most appropriate choice, based largely upon the client's perceptions of what would constitute project success in terms of time, capital cost and quality. Nonetheless Bowen *et al.* (1997) reported that their research led them to believe that relatively few construction industry professionals fully understood the differences between the various procurement systems and that most would be unable to make sensible recommendations as to which system would be most appropriate for a specific project.

Procurement strategy selection models

Early attempts to examine the strategic procurement selection process led a number of academics and practitioners to develop structured methodologies, tools and models of various types to aid this selection process. Among the models published in the UK, one of the earliest was *Thinking About Building* (Building EDC 1985) and its approach was further developed, and made progressively more complex, by a wide range of researchers using a variety of mathematical and statistical techniques. Many early researchers proposed some form of multi-attribute decision analysis, among them Skitmore and Marsden (1988), Bennett and Grice (1990), Cook *et al.* (1993) (who proposed the use of multilevel decision trees), Chan *et al.* (1994) (who adapted Skitmore and Marsden's model to suit the Australian construction industry), Zavadskas and Kallauskas (1996), Dell'Isola *et al.* (1998) and Love *et al.* (1998b). Ambrose and Tucker (2000) continued the theme with the development of yet another multi-attribute model, but this time based on a three-dimensional matrix, and Chang and Ive (2002) carried out a critical examination of the multi-attribute approach.

Cheung *et al.* (2001) and Al-Tabtabi (2002) presented further variations on the theme with models using an analytical hierarchy process built upon the work of earlier researchers, including Saaty (1980) and Skibnewski and Chao (1992). The successful practical use of Al-Tabtabi's model was demonstrated with a live case study showing how it was used in the procurement of the Kuwait University Expansion Program, a substantial project comprising more than 40 design and construction packages and costing approximately 132 million Kuwaiti dinars (approximately US$467.5 million in August 2012). Seydel and Olson (1990) and Ng *et al.* (2002) took a somewhat different approach, presenting models based on the use of fuzzy set theory, and Alhazmi and McCaffer (2000) developed the Project Procurement System Selection model (PPSSM) based upon a four-step screening process.

In spite of all of this, not inconsiderable, academic effort, Chan (2005) wrote that 'none … [of the existing models] … has been adopted widely in practice' and proposed

yet another model based upon a combination of the multi-attribute and fuzzy set models previously published by Cheung *et al.* (2001) and Ng *et al.* (2002), respectively.

Elsie, developed under a project funded by the Royal Institution of Chartered Surveyors (RICS) and based at Salford University (Brandon *et al.* 1988; Brandon 1990), and PASCON (Mohsini and Botros 1990) are two examples of attempts to automate the procurement selection process through the development of computer-based expert systems. Again, neither appears to have been widely adopted in practice.

A rather more radical approach is the Best Value Procurement/Performance Information Procurement System (BVP/PIPS) developed over a 20-year period by Dr Dean Kashiwagi and the Performance Based Study Research Group based at Arizona State University in the USA. (PBSRG 2012). The BVP/PIPS system is described as an integrated and detailed structured methodology which includes not only selection of the initial procurement route, but also contractor selection, bidding and price analysis (Kashiwagi *et al.* 1996; Kashiwagi and Mayo 2001). The approach is claimed to have been widely used in the USA and PBSRG (2012) discusses a number of case studies. It is also claimed that the approach has been used for several projects in Botswana. Although successful projects have been run using the PIPS system within its home environment, it is openly admitted that, despite attempts to transfer the technology to other universities in the USA, the UK, Malaysia, Botswana, New Zealand and Australia, 'the PBSRG research model had not been proven to be successfully transferable to other research group [sic] or to other countries' (Kashiwagi and Kashiwagi 2011). Nonetheless Kashiwagi and Kashiwagi (2011) claim that the system has now been successfully introduced into the Netherlands.

Towards a broader view

In contrast to those who believed that a purely systems-driven, mathematically derived approach would deliver project success, other commentators recognised selection of the most appropriate strategy for large or complex projects, particularly those involving multiple stakeholders, to be a difficult and complicated process dependent upon the interaction of many variables and incorporating a high degree of subjective, and in many cases intuitive, judgment (Luu *et al.* 2003). We should also note that the problems of complexity tend to be magnified greatly where the overall complexity of the project depends not only upon the technical complexity of the work but also upon the complexity of the context in which the project is to be developed and constructed.

Issues of complexity and the difficulties of improving project success came to a head in the UK in the early 1990s, when client concerns over the generally unsatisfactory performance of the construction industry in terms of its ability to deliver on time, within budget and to the expected quality and performance standards placed the role of the client in construction procurement firmly in the spotlight.

In light of the above, it is no surprise that procurement issues featured strongly in Sir Michael Latham's government-sponsored report on the UK construction industry

(Latham 1994). Latham's recommendation that the construction industry should move towards more collaborative methods of procurement built largely upon existing experience elsewhere. In Japan, for example, it is claimed (Reading Construction Forum 1998) that partnering was part of the normal way of working. In the USA, partnering had been practiced from the mid 1980s; the term appears to have been first used to describe the Fluor Daniel/Du Pont alliance for construction work at the Cape Fear plant in 1986 (Kubal 1994), although it was not until the early 1990s that 'time and money … being … wasted in defensive posturing, case building, developing claims and litigating' in the late 1980s (ATI 2007) led the Construction Industry Institute to develop a formal partnering approach. The approach was soon picked up and used with some success by the US Army Corps of Engineers (Cowan *et al.* 1992). McGeorge and Palmer (1997) reported that trials took place in Australia, also in the early 1990s. Similar concepts were also introduced in international oil exploration projects, where alliancing as a concept was pioneered by Shell and British Petroleum in the North Sea, again in the early 1990s, as a method of sharing risk and reward in high-risk, high-cost activities (NEDO 1991; Skeggs 2004; Sakal 2005).

The need for change in the UK was also fuelled by a growing insistence by major clients that, rather than being considered simply as passive customers of construction services, they should actively participate at the very heart of the construction procurement process as a full partner. Liu (1994) understood this issue well, suggesting that successful procurement approaches would be more likely to result from a deeper mutual understanding of the organisational and performance goals of the parties involved. She clearly pointed to the importance of understanding the cultural and organisational aspirations of all stakeholders in the procurement process, in particular those based upon a collaborative relationship. A number of academics and researchers examined various facets of the client's role (see for example the work of Wilkins and Smith (1995)) and concluded that, particularly in the case of complex buildings, there was evidence that closer involvement of the client in the procurement process appeared to be a significant factor in project success. The enhanced client interest in the procurement process, coupled with demands for clearer guidance on procurement issues, led directly to the publication of *The Procurement Guide* (RICS 1996).

A second government-sponsored review of the UK construction industry by Sir John Egan (Egan 1998) set targets for improvement in construction performance designed to improve customer satisfaction; the implementation of Egan's recommendations was subsequently accepted as UK government policy for centrally funded public sector projects. The targets were also made implicit in the public sector 'best value' legislation introduced in 1997, which required all public bodies to show that they were achieving maximum value for money (defined in terms of whole-life cost not just initial capital cost) in all of their projects including construction work. The message was further reinforced by the National Audit Office *Modernising Procurement* report (NAO 1999), which amongst other things emphasised the need, particularly in the case of strategic projects, for close client involvement in allocating and managing risk and setting out effective mechanisms to incentivise superior project performance.

In the spirit of the new paradigm, Newcombe (2000) adopted a somewhat different approach to modelling procurement, and presented the development and field testing of a construction procurement simulator designed to aid the development of skills in analysing client needs and translating them into an appropriate procurement path. More recently, concerns over the environmental performance and social sustainability of the built environment have led some to question how these specific issues ought to be addressed in the construction procurement process.

Interest in the integrative aspects of construction procurement has, predictably, led to a more detailed and extensive study of the different elements of the procurement problem as part of the wider discipline of construction management. In recent years, therefore, we have seen considerable attention being paid to understanding how the individual elements of the procurement process work – individually, in combination with each other and in interaction with the rest of the construction management process. This process has been carried out largely by attempting to relate practical empirical experience of successful and unsuccessful projects to established theoretical concepts in general management, industrial psychology and motivation. A number of major threads in procurement research have emerged from this work including, in no particular order:

- More complex procurement strategy selection models (see for example the computerised decision making tool presented by Luu *et al.* (2003, 2005, 2006), which combines the use of case-based reasoning, fuzzy logic and elements of the earlier expert systems approach).
- Team relationships, supply chain management and communication and their effect on project performance.
- Defining in greater detail the role of the client in the procurement process.
- The interrelationship between the various components of the overall procurement approach (e.g. the overriding strategy, the contractor and consultant selection processes, the contractual framework and tender evaluation models) in enhancing project success (the general presumption seems to be that, for a process to be deemed successful, then the whole must be greater than the sum of the parts).
- Legal and contractual issues, including public sector procurement legislation, and their impact upon project performance.
- Comparative analysis of international procurement practice and the impact of cultural differences.
- Risk allocation and reward.
- Bid evaluation techniques.
- The impact of environmental and sustainability issues upon the procurement process.

Defining project success

It has already been shown that many attempts have been made to develop selection models designed to match a range of project performance indicators to the project characteristics with the aim of achieving improved overall 'project success'. The

problem, however, lies in the definition of 'project success' and there have been many attempts to define how success might be measured (see for example the work of Cooke-Davies (2002)). Eriksson and Westerberg (2011) point out that although many still hold firmly to what they term the 'iron triangle' of primary success criteria (time, cost and quality), in reality it is no longer adequate and additional criteria, such as environmental impact, work environment and innovation, are now assuming increasing importance.

Many construction professionals believe overall project success to be a comprehensive assessment arising out of a consensus of all key stakeholders. Others, however, appear to believe that this approach is much too complex and that client satisfaction with the final outcome is perhaps the most important indicator of whether a project can be considered successful or not. The problem here is that many complex projects are commissioned by complex and multi-headed client bodies, who may find it difficult even among themselves to agree on a generally acceptable definition of overall project success.

If the key objectives can be isolated, then there is evidence that the selection of an appropriate procurement strategy which adequately matches the objectives of the key stakeholders is an important contributor to overall project success (Akintoye 1994; Naoum and Mustapha 1995).

Kumaraswamy and Dissanayaka (1996) reviewed existing attempts to model the procurement process and suggested that the debate on what constitutes project success may be moved forward by considering not only the identified project success factors but also the linkages between them. Based on this presumption, they went on to hypothesise how a theoretical client advisory model based upon weighted client objectives might be constructed. Eriksson and Westerberg (2011) address this theme in an extremely wide-ranging study of the way in which co-operative procurement procedures (defined by them as joint specification, select tendering, soft parameters in bid evaluation, joint contractor selection incentive-based payment, quality, environmental impact work environment and innovation) impact upon project performance. They put forward a theoretical framework linking all of these concepts and describing how the various relationships may be moderated by issues such as trust, commitment and the characteristics of the project.

Team relationships, supply chain management and communication and their effect on project performance

Teamwork and team performance

Teamworking has long been recognised as a key management area in construction (see for example the work of Walker (1989) and Bennett (1991)) and, in recent years, researchers have become increasingly interested in the contribution good team performance can make to project success. The problems faced by construction project teams operating as temporary multi-organisations are well known and have

been addressed by a number of researchers including Shoesmith and Langford (1991), Mohsini and Davidson (1992) and Bowen and Edwards (1996).

Walker (1997) provided a useful review of the relevant literature concerning the effect of team performance on project timescale through a series of 64 major Australian projects (defined as projects in the range A$3–80 million). He concluded that:

> Team performance appears to be a complex balance of the management action, undertaken through planning, co-ordination and communication, to aid and inform decision making. Various team members employ different levels of task or people oriented management styles and different organisational responses in terms of rigidity or flexibility towards rules and regulations. These are undertaken in response to situational factors and different groups respond in different ways depending on their management maturity and/or willingness, as well as the perceived level of complexity of the tasks they face.

He also concluded that inhibited team management will inhibit team performance and he agreed with other researchers (Smith and Wilkins 1996) that, particularly for complex projects, non-traditional procurement methods are more likely to enhance construction time performance. Newcombe (1999) supported the idea that the chosen procurement path has considerable influence upon the project team's ability to learn, a contention for which he presented a detailed theoretical justification. Moore and Dainty (2000) examined a series of issues relating to communication specifically within design and build teams. Kumaraswamy (1998) concluded that, irrespective of the procurement system used, project success depends primarily upon the attitude, determination and capabilities of those involved.

Partnering: introduction and early development

We have already seen that partnering as a concept for improving team performance has a significant history and has been well described by, amongst others, Patching (1994), Baden Hellard (1995) and Stephenson (1996). In truth, the thinking behind the original concept originated much earlier than many realise. In the USA, in a seminal paper published in the Southern California Law Review, MacNeil (1974) foresaw collaboration as an improved contracting strategy for long-term work, although some see the origins of the concept as being earlier still and seek to draw lessons from biblical history (Lynch 1989; Ogunlana 1999). The long-running strategic alliance in the UK between Marks and Spencer and Bovis, based upon the Bovis System contract (essentially prime-cost contracting with pre-agreed fees for overheads and profit) began in the 1930s and remained in force into the late 1970s (Cooper 2000).

There can therefore be little doubt that partnering has long been the most frequently discussed institutional form of co-operative relationship (Wood *et al.* 2002; Eriksson 2010a), and, predictably, a considerable part of the academic discussion has comprised reports of its claimed success.

In the USA, Weston and Gibson (1993) reported average cost savings of 18.49% and time savings of 12.33% on a sample of 120 projects let by the Arizona Department of Transport; Larson (1995) reported significantly improved results in terms of controlling cost, technical performance and client satisfaction arising from the use of partnering on a sample of 280 projects; and Maloney (1997) reported that the use of partnering was rapidly increasing.

Uher (1999) presented a review of Australian experience and concluded that, from its introduction in 1991, despite its relatively short (and somewhat chequered) history, partnering (later re-named 'relational contracting') was firmly established as an integral part of the Australian construction industry. Lenard (1999), also commentating on contemporary Australian practice, reported that a study of 17 construction projects in and around Sydney found that a symbiotic contractual and working relationship between the client and the contractor encouraged innovation and facilitated the development of a learning environment within the project team. Kenley *et al.* (2000) provided yet another view of Australian practice in the context of the *Construct Australia* report published by the Australian Procurement and Construction Council (APCC 1997).

In the UK, partnering was strongly advocated by Sir Michael Latham in his review of the UK construction industry (Latham 1994) and was later endorsed by the government as the way public sector projects should be let whenever possible.

Partnering: a critical review

Partnering has received significant academic approval and widespread endorsement in the UK by clients, contractors and researchers alike. See for example the work of Bennett and Jayes (1995; 1998), Walter (1998) and CIB (1997). There are, however, those who question the effectiveness of partnering as an improved method of procurement (see for example the work of Cox and Thompson (1997) and Smyth and Thompson (1999)), whilst others maintain that it was merely seductive rhetoric encouraged by large corporations eager to flex their commercial muscle (Green 1999), and one would have to admit that in some supposed partnering relationships, although the parties spoke of trust and commitment, the thinly veiled threat of differential commercial muscle appeared to lurk only just beneath the surface.

Particularly relevant in this regard are the relationships between main and subcontractors. Miller *et al.* (2003) explored these issues from the point of view of small construction enterprises in the construction industry in South Wales. They concluded that although 'the degree of harmonisation between the contractor and small subcontracting firms is inextricably linked to client satisfaction', it was nonetheless 'evident that the partnering philosophy is not currently embodied within the industry in industrial South Wales despite continued attempts by policy makers to encourage construction firms to subscribe to such concepts'. They also suggested that the needs and objectives of the smaller subcontractors were frequently overlooked and that, despite exploiting partnering agreements with employers, main contractors still treated their relationships with their smaller subcontractors in an

opportunistic and somewhat cavalier fashion. Mason (2007) also reviewed the partnering experience of specialist contractors across the UK, finding that although there were some examples of successful collaboration, there was also cynicism and mistrust. He concluded that, despite some positive developments, little had changed in the decade prior to publication of his study to improve the lot of the specialist contractor. Anecdotal reports of the number of adjudications commenced by sub-contractors against main contractors under the statutory adjudication provisions brought into law in the UK through the Housing Grants, Regeneration and Construction Act 1996 (the Construction Act), and later strengthened in the Local Democracy, Economic Development and Construction Act 2005, would appear to indicate that little has changed in this respect.

Nonetheless commentators such as Wood and McDermott (2001) argued that there was significant evidence (Lewicki and Bunker 1996) that, provided the parties were able to establish even a fragile level of trust, then collaborative relationships were viable. Establishment of at least a basic level of trust is vital and is extremely difficult to achieve. Ekström and Björnsson (2002) explored the use of source credibility theory (Hovland *et al.* 1953) in building trust in an e-tendering relationship and Das and Teng (1998) explored the issue of managing relational risk in co-operative alliances.

Many academics have attempted to investigate the extent to which partnering arrangements may be deemed successful and the characteristics which influence that success (see for example the work of Black *et al.* (2000) and Yeung *et al.* (2008)). By and large partnering has been endorsed in a substantial number of studies across the world as an effective tool for the enhancement of project success (see for example the work of Naoum (2003), Wood and Ellis (2005) and Matthews (1999) in the UK; Rahman and Kumaraswamy (2002) in Hong Kong; and Kwan and Ofori (2001) in Singapore). Jeffries *et al.* (2001) take the partnering issue one stage further with a detailed case study examining how a strategic alliance model derived from the oil industry was used to structure an alliance between a number of specialist companies in order that an economically marginal project could be successfully completed.

Skeggs (2004) points out that partnering does not seem to have been successfully established in countries such as France and Germany. He speculates that this may be because 'there is a lack of effort by government and industry to reform the construction industry' and that there are inherent 'difficulties in implementing partnering under civil law systems', but Crespin-Mazet and Portier (2010) attribute the lack of enthusiasm in France to 'the resistance of purchasers who feel threatened by the structural changes it involves in their purchasing habits'.

Notwithstanding academic endorsement and the zeal of partnering enthusiasts, there are those who point out that hard research evidence on the tangible benefits and limitations of partnering is both limited and mixed (Nystrom 2008; Greenwood and Wu 2012). Phua (2006), citing Wood and Ellis (2005), maintained that the partnering literature is focused almost entirely on 'success stories which are largely anecdotal' and, together with others (see for example the work of Kadefors *et al.* (2007)), she maintains that partnering has still to achieve its

full potential. Phua is also scathing about some of those academics who have reported project success in terms of improvements in time, cost and quality, maintaining that 'no empirical evidence concerning the nature and effects of any or combination of these different aspects of partnering on project success exists.' Reports of partnering failures do exist (see for example the work of Larson (1997), Angelo (1998) and Alderman and Ivory (2007)) but they are, admittedly, thin on the ground.

Several researchers have addressed the criticism made by Phua. Yeung *et al.* (2007) derived a set of key performance indicators to measure the success of construction project partnering arrangements in Hong Kong on the basis of a Delphi study with 31 local construction experts. They concluded that the seven most important KPIs, ranked in order of importance, were time performance, cost performance, top management commitment, trust and respect, quality performance, effective communication, and innovation and improvement. Greenwood and Wu (2012) attempt to address the criticism through a rigorous examination of a sample of 44 projects against a set of clearly identified indicators of project performance using a social network analysis approach. They conclude that their study clearly shows a positive linear relationship between collaborative working and performance.

Some other commentators (for example, Bresnen (2009, 2010) and Eriksson (2010a)) believe that we still have an incomplete understanding of what partnering actually means or how it fits into an established body of management theory, and that partnering will not achieve its full potential until these shortcomings are addressed. Bygballe *et al.* (2010) review the literature with a view to identifying the main assumptions about construction partnering and conclude that improvements in performance might be achieved through a greater appreciation of the theoretical perspectives of supply chain management and the industrial network approach. Bresnen (2010), in an attempt to forge a respectable academic foundation as a basis for practice, revisits a theoretical model of partnering as an approach based upon information sharing and knowledge transformation across organisational and contractual boundaries first proposed almost two decades ago by Crowley and Karim (1995). Pemsel and Wídén (2011) examine the general issue of knowledge transfer across inter-organisational boundaries in the context of real estate companies and end users and they conclude that the successful transfer of knowledge depends largely upon an accurate and shared understanding of all participants' needs. The issue is studied in the context of a partnering relationship by Ruan *et al.* (2012), using a social network analysis approach, through a case study examination of four UK public sector projects.

Partnering variants

It has long been recognised that the term 'partnering' is frequently used as an umbrella term for a number of different arrangements. The distinction between short-term project partnering and long-term strategic arrangements has been well explored, but there has long been confusion and misunderstanding about the

meaning of the labels given to the different types of multi-party contractual arrangement. An early distinction between partnering and alliancing was set out by Walker and Hampson (2003) in the following terms:

> with partnering … partners still retain independence and may individually suffer or gain from the relationship. With alliancing the … parties form a cohesive entity, that jointly shares risk and rewards to an agreed formula.

Rowlinson and Cheung (2004) provide an exploration of the differences between partnering, relational contracting and alliancing but it is clear, eight years on, that the distinctions are still not fully understood or appreciated, since Lahdenperä (2012) again returns to the theme in an attempt to clarify the similarities and differences between project partnering, project alliancing and integrated project delivery.

In light of the fact that, notwithstanding the problems of linking collaborative approaches to a tenable theoretical base, collaborative approaches have now achieved a substantial degree of maturity and acceptance, we might expect to see further research interest in the various different ways in which the basic concept might be expressed.

Partnering dissected

Other researchers have concentrated on an examination of the contribution made by the various elements of both the partnering process and the environment in which it takes place. Some typical examples include the work of Halman and Braks (1999) (the organisational structure of the partnering arrangement), Bresnen and Marshall (2000) (the contribution made by long-term relational links), Cheung *et al.* (2003) (open and reliable lines of communication), Rahman and Kumaraswamy (2005) (establishing joint risk management structures), Ngowi (2007) (team member trust and confidence), Eriksson and Pesämaa (2007) (elements in client procurement procedures which facilitate the establishment of trust and co-operation) and Eriksson *et al.* (2008) (client perceptions of barriers to partnering).

Doloi (2009) in a study of relational partnerships in Australia considered the cumulative effect of communication, trust and joint risk management. He concluded that, counter to the prevailing Australian view at the time, successful partnering was dependent not only upon trust and confidence, but that communication based upon confidence and trust was deemed the single most important factor impacting upon partnering success, and true success was only achieved when all of these factors resulted in effective joint risk management. In a similar vein, Kaluarachchi and Jones (2007), in a case study of a strategic partnering undertaken in a social housing context, concluded that 'mutual trust, effective communication, a changed mindset from all parties, [and] the quality of the services and commitment of all stakeholders seem to be the key factors that contribute to a successful partnering process'.

Procurement and multicultural teams

Many researchers have studied the challenges which arise, and the advantages which may arise, from the use of multicultural teams on construction projects, and Ochieng and Price (2009, 2010) present a brief review of the literature.

There can be little doubt that, to be successful, partnering is dependent upon assembling a project team which already shares (or may be persuaded to share) a common set of ethical and cultural beliefs and values, and the impact of cultural differences in the project team, at the organisational, national and personal levels, is a further factor which has been considered by many researchers. Comparatively few researchers however appear to have studied the effect of a multicultural environment specifically on the procurement process.

Ngowi (1996) considered the impact of multicultural teams on project procurement in his review of the experience of procurement innovation in ten major projects in Botswana, half of which were carried out by local teams and the remainder by multinational, multicultural teams comprising combinations of British, Chinese, German, Kuwaiti, Belgian and local Tswana organisations. He found evidence that where multicultural teams were involved innovation tended to be less prevalent, whilst miscommunication and disputes tended to increase within a multicultural framework. He concluded that teams sharing the same culture tended to be characterised by lower degrees of uncertainty and anxiety than those that did not. Plainly care needs to be taken to ensure that particular attention is paid in multicultural teams to ensuring not only good communication and a clear understanding of shared language, but also that each team member has a good understanding, appreciation and acceptance of the cultural values and beliefs of the others involved.

Liu and Fellows (1996, 1999, 2001) have extensively explored the impact of culture on construction project goals, on the construction procurement process and on construction partnering. Kwan and Ofori (2001) considered the relationship between the traditional Chinese culture and partnering in the context of the construction industry in Singapore. Shiyamini *et al.* (2005) studied construction procurement methodologies in Sri Lanka and concluded that the combination of national culture and the organisational culture of the local construction industry did not favour the use of new procurement methods, although these factors were, to some extent, moderated by economic growth.

Supply chain management

The area of supply chain management (Saunders 1997) within the construction project team has also received considerable attention in recent years, with several researchers asserting that construction can learn key lessons from manufacturing and production management (Koskela 1992; Love and Gunasekaran 1996; Kornelius and Wamelink 1998; Love *et al.* 1998a; Howell 1999; Green *et al.* 2002). Lee *et al.* (2000) describe the development of a supply chain management

tool, called the Generic Design and Construction Process Protocol (GDCPP), which attempts to provide:

> a common set of definitions, documentation and procedures that provides the basis to allow a wide range of organisations involved in a construction project to work together seamlessly. (Kagioglou *et al.* 1998)

Root *et al.* (2003) explore the application of supply chain management techniques to the construction design process. Following Schneider (1993), they contend that organisational boundaries pose a significant barrier to collaboration, concluding that there is a clear need for integration within the design process and that formal supply chain management techniques can be used to overcome the problems.

Finnemore *et al.* (2000) argued for improvements in project delivery driven by improvements in management of the process of construction and reported upon the early stages of the development of a tool called the Standardised Process Improvement for Construction Enterprises (SPICE). SPICE follows the philosophies of Deming (1986) and Juran (1988) and is predicated upon putting into place continuous process improvement based upon a series of small evolutionary steps.

More recently, there seems to be international agreement that excellence in supply chain management is a crucial component of lean construction management (Eriksson 2010b) and much interest in how to make it more effective. Davis (2008) reviews contemporary supply chain management practice in Australia on the basis of a large sample of 898 construction professionals, finding a mix of relationship-based and traditional supply chain management techniques. Löngren *et al.* (2010), in a case study of a strategic alliance between German contractors and their supply chains, found that key factors for success are central co-ordination among partners employing decentralised task management, the application of appropriate IT solutions and mutual trust. They further conclude that strategic supply chain alliances are crucial for successful management within the German construction industry. Bankvall *et al.* (2010) question whether lessons from other industries are directly transferable to construction. Their study comprised an examination of interdependencies which exist between supply chain members in construction in comparison with other industries. They conclude that the application of supply chain models developed for other industrial sectors, such as the automotive industry, to construction may be problematic because of the different patterns of interdependence experience in different industries between supply chain members. They further believe that their findings bring into question traditional construction supply chain concepts, such as moving production from the site to the factory.

The role of the client in the procurement process

The role of the client in collaborative procurement has already been explored, but it is also worthwhile summarising the client's role under traditional procurement methods.

Traditional methods of contracting generally involve employers or their agents designing, or at least specifying in detail, the work required prior to competitive tenders

being invited from some group of construction contractors. The employer subsequently chooses which of the tenders submitted appears to represent the best value for money and enters into some kind of contract for the construction work. The contractual relationship that results from this traditional process is therefore essentially that of supplier and customer, where the employer decides, in theory at least, in detail what he or she wants and the contractor simply constructs the work as designed. To be successful, the method depends upon employers being able to specify their requirements in sufficient detail for the contractor to accurately price the work. Whilst this becomes progressively more difficult the more the design responsibility is passed to the contractor, it is still possible for the process to deliver acceptable results, but choice of the most acceptable tender becomes more problematic as the number of variables involved increases. Clear goal definition has long been known to be a major determinant in management success (see for example the work of McGregor (1960) and Hersey and Blanchard (1982)) and failure by employers to accurately represent their requirements to the tendering contractors usually leads to confrontation and dispute.

Avoiding confrontation and dispute leads directly to the idea of alternative methods of procurement based upon achieving congruence between the objectives of the principal stakeholders, shared risk and return, and the joint resolution of problems. Working in this way, the relationship between employer and contractor becomes less 'supplier/customer' and more like a partnership, and therefore places much more emphasis on the whole project organisation working together in pursuit of common goals.

The way in which the client interacts with the remainder of the construction team has long been seen to be a key issue in project success (NEDO 1988; Potter 1994; Green and Lenard 1999; Barrett and Stanley 2000). Whilst it is of course possible that regular construction clients with a deep understanding of the way the construction industry works can operate a supplier/customer relationship very effectively, indeed some, including some large property developers, appear to prefer to do so, it was pointed out many years ago (see for example the work of Ferry (1978)) that 'the uninformed client has an unrealistic idea of what he is letting himself in for'. Most clients interact with the construction team through the appointment of a client representative, sometimes termed a 'project sponsor', 'client's project manager' or 'project director', and it appears that project success may be significantly influenced by the level of confidence that this client representative inspires in the client team (Walker 1995).

The interrelationship between the components of the overall procurement approach: strategic procurement management

Strategic procurement management in construction has attracted comparatively little research attention. Strategic procurement management was defined by Cox (1995) as:

> the development of an external sourcing and supply strategy which links the total business plan of an organisation (public or private) so as to maintain a sustainable position for that organisation in the total value chain.

The significance in enhancing project success of each of the various elements (for example, the contractor and consultant selection processes, the contractual framework and tender evaluation models) embodied within the overall strategy has, however, been the subject of some research and debate. Kumaraswamy (1994) pointed out the need to develop synergy through informed choice of the components of the system and careful alignment of the system with the objectives of the stakeholders, but the evidence as to the particular contribution made to overall project success by individual components seems to be far from clear cut. Walker (1995), for example, concluded that contract type did not significantly alter the speed of construction. Rwelmalila and Hall (1994) found that lack of adequate management of the 'human aspects' contributed significantly to poorer performance.

These strategic issues are addressed directly in some of the procurement models described earlier, in particular those proposed by Kashiwagi and Mayo (2001), Luu *et al.* (2003, 2005, 2006) and Eriksson and Westerberg (2011).

Legal and contractual issues, including public sector procurement legislation, and their effect on project performance

Common law contractual practice has, in general, provided an adequate framework for 'traditional' client-designed construction projects, but recent years have seen the growth of design and build methods and, more recently, the encouragement of innovation through the process of inviting contractors to submit 'alternative' tenders of various kinds. Craig (1999) presented a detailed critique of the legal theory and practice surrounding the process of tendering for construction work and discussed the concept of a collateral contract arising during the tendering process, which may constrain both the employer's freedom in deciding which tender he or she should accept and the contractor's freedom to withdraw his or her tender prior to formal acceptance. Craig further pointed out that, in the light of established legal precedents, it is increasingly important for those engaged in construction procurement, particularly where innovation is sought, to design tender processes that encourage innovation, but at the same time to place sufficient limits on contractors' freedom to innovate in order to retain proper control of the tender process.

Early researchers (Emmerson 1962; NEDO 1983) found that the construction contracts in use at the time of their research provided little or no incentive for contractors to look for opportunities to add value to the client. This is not altogether surprising since the construction industry has historically had a reputation for being confrontational and 'claims conscious', and this attitude was largely fuelled by the predominant supplier/customer contractual relationship. There is some evidence that this situation was not altogether unhelpful to contractors, with one 1995 survey apparently indicating that, of the top 50 UK contractors, 25% earned as much as 10–15% of their turnover from contractual claims (Cox and Thompson 1998).

In terms of contractual relationships, Cox and Thompson (1998) showed that little had changed in 35 years. Their study of 163 construction clients revealed that,

notwithstanding a high level of customer dissatisfaction with the standard forms of contract in common use, amongst predominantly building-biased respondents, the JCT range of contracts (comprising the JCT 80 Standard Form of Building Contract, the CD 81 Standard Form of Building Contract with Contractor's Design, the IFC 84 Intermediate Form of Building Contract and the MC 87 Standard Form of Management Contract) jointly accounted for 76% of the sample. In civil engineering, however, whilst some 55% of respondents used the traditional ICE 6th Edition and the Agreement for Minor Building Works, only 9% said that they would use only the ICE forms. Their work led them to believe that 'a small minority of clients have developed rigorous techniques for establishing the most appropriate contracting strategy for their needs', whilst the remainder continued to base their choice on tradition and what they had always done before.

The theory of relational contracting was first formulated by MacNeil (1974) almost 40 years ago in his seminal *Southern California Law Review* essay in which he drew attention to differences in the kind and scope of possible contractual relationships. MacNeil made a firm distinction between 'transactional' contracts, such as buying a newspaper, which are essentially short term and where the contract is affected by no past events and concerned with no future ones and upon which the classical law of contract has been developed, and 'relational' contracts, in which the parties anticipate a lengthy relationship and where the contract attempts, in one way or another, to predict future events. He goes on to suggest a framework for extra-contractual alternative dispute resolution.

Campbell and Harris (1993) went further, maintaining that the foundation of classical contracting is based on the principle of 'presensiation', defined as an assumption that one can predict the future with some degree of accuracy and that contracts can then be drawn up that adequately apportion the consequent risks and assign strict liabilities for breach. This, they maintained, is a somewhat unrealistic view of the real world as far as complex long-term relational contracts are concerned. Their research led them to believe that, where such contracts contained strict liabilities in respect of foreseen future breach, the contracting parties, in the private sector at least, frequently compensated for the contractual inadequacy by ignoring them in favour of 'a repertoire of extra-legal strategies when liability arises'. They went on to assert that:

> Efficient long term contractual behaviour must be understood as consciously co-operative. We see a long term contract as an analogy to a partnership. The parties are not aiming at utility maximisation directly through performance of specified obligations; rather they are aiming at utility maximisation indirectly through long term co-operative behaviour manifested in trust and not in reliance on obligations specified in advance.

The growth of partnering has given rise to considerable debate about the legal significance of the partnering relationship and the undertakings given by the parties in respect of how they intend to conduct their business. Uher (1999) provided a useful summary of the issues and a detailed review of the major points of contention. Much revolves around the notion of good faith in commercial contracts. The good faith concept is widely accepted in many jurisdictions; in fact, in some legal

systems, such as the ones practiced in some Muslim countries, it is a central tenet. Until very recently in the UK, the courts have consistently avoided finding any such duty in commercial transactions, preferring to stay as far as possible with the common law doctrine of *caveat emptor*. In the recent case of Compass Group UK and Ireland Ltd v Mid Essex Hospital Services[1] the Court held that a clause in the contract which required the parties to cooperate with each other in good faith was enforceable thus perhaps offering a glimmer of hope of more general change in the future. In the USA, however, and in European law, the legal establishment has been much more amenable to the notion of fair trading including an implied promise of good faith in commercial transactions.

The issue of good faith plainly lies at the heart of any partnering relationship which purports to rely on trust; the absence of hidden agendas and full disclosure of all relevant facts are major planks in its construction and successful operation. Australian legal commentators have advised against attempting to include 'good faith' clauses in contracts on the grounds that, under the doctrine of *contra proferentem*, a court or an arbitrator would be likely to construe them against the party responsible for their insertion (Davenport 1993). In contrast however, Dagenais (2007) provided a revealing portrait of the way in which the concept of good faith has been developed in construction contracts in Canada.

Recent years have seen the development of a number of standard forms of contract specifically aligned to collaborative forms of procurement. The best known, certainly in the UK, are the NEC3 Engineering and Construction Contract suite (NEC3), which was rewritten in 1995 to incorporate the findings of Sir Michael Latham (1994), and the PPC 2000 Standard Form of Contract for Project Partnering (Trowers and Hamlins 2000), which was described by Sir Michael Latham in *Building* on 10th May 2002 as 'the full monty of partnering and modern best practice'. The author of the PPC2000 form, Dr David Mosey, has published a detailed discussion on the relationship between contracts, partnering and project management (Mosey 2009).

International procurement comparisons and the impact of cultural differences

A number of researchers have presented analyses of construction procurement practice in various parts of the world and the internationalisation of the construction industry is frequently a cause for concern and debate. In developing countries, for example, there is always the danger that projects constructed using overseas aid and resources will, whilst proving to be a successful source of income for international consultants and contractors, nonetheless fail to deliver facilities that provide maximum benefit for the host nation. The question of the impact of culture and organisation on project performance has been considered in depth by several authors including Winch *et al.* (1997), Winch (1999), Seymour and Fellows (1999), Liu and Fellows (1999), Rahman *et al.* (2002), Ochieng and Price (2009, 2010).

[1] EWHC 781 (QB)

Bin Abdul Rashid and Morledge (1998) and Bin Abdul Rashid (1999) considered the role of construction in economic growth within the framework of a rapidly developing country, Malaysia. They argued that the effective and productive procurement of construction work is an essential ingredient in maximising the contribution made by the construction industry to overall economic development in attaining the required levels of economic growth, but that this process is typically constrained by a lack of the necessary skills and resources. Bin Abdul Rashid (1999) presented a series of measures that could be taken domestically to address the problems, but there is little doubt that whilst self-development is a vital part of the strategy, few countries could attempt to solve these issues by 'home growing' alone. Considerable care therefore needs to be taken to ensure that where external skills and resources are employed, their use is carefully controlled and managed by the host nation in order to ensure that the economic and social benefits are maximised. Technology transfer is plainly an important issue here and poses serious challenges to the world construction industry as a whole.

An alternative view, again with a Malaysian focus, was put by Abdul-Aziz (1998). The issue of localisation was considered from the point of view of the company through a study of 26 Japanese contractors operating in Malaysia. Building upon the work of management theorists, such as Lawrence and Lorsch (1967), Fayerweather (1969) and Doz and Prahalad (1984), the author pointed out that while localisation can help by opening up opportunities within national markets whilst generating a minimum of local hostility, the downside for companies is that excessive localisation may lead to the company losing the benefits of integrating its activities in the international marketplace. He concluded that the mingling of cross-cultural concepts in this way needs to be carried out with extreme care if the company involved is to successfully bid for work in local markets whilst at the same time securing its future in the international marketplace.

Ngowi (1996) discussed the changes emanating from increased internationalisation of construction procurement in Botswana. He pointed out that the local culture in procurement is by nature collaborative due to the fact that 'construction activities were carried out by members of the community who owned the work'. This naturally collaborative state had, he reported, been adversely affected by increasing internationalisation caused by increasing sophistication and complexity of projects, the use of international funding and scarcity of skilled local labour. In a similar vein, Santoso (2009) discusses the problems faced by minority migrant workers from Indonesia and Thailand working in multinational, multicultural project teams in Brunei. In a deep and thoughtful paper, he highlights the important factors which need to be considered in the socio-cultural interaction of site workers and concludes that failure by company and project management to take measures to build understanding and trusting relationships between disparate groups of workers will impact seriously upon production, and thus on project success.

Dorée (1997) examined a number of factors affecting public sector construction procurement in several Dutch municipalities. In the Netherlands, the predominant method of procurement has historically been based around limited competition, supported by an 'atmosphere of co-operation between municipalities and

contractors' which was characterised by 'attitudes [which] were far less antagonistic, opposing, hostile and conflicting than were predicted in the literature'. Dorée's conclusion was that this natural co-operation had again been adversely affected by external forces, in this case by the imposition by the European Union of binding procurement legislation.

Kumaraswamy *et al.* (2002) adopted a somewhat different approach. Working from a base of recent experience (Grove 1998; HKHA 2000; Rowlinson 2001; Tang 2001) in Hong Kong, possibly the most 'international' construction industry in the world in terms of the breadth of experience and expertise carried by the construction companies and consultancy practices operating there, Kumaraswamy *et al.* linked experience from Hong Kong with experience gained elsewhere in the world to develop the hypothesis that major cultural change within the world's construction industry must be driven from within through systematic changes in construction procurement practices and processes. Whilst they admitted that 'attempts to merely "bolt on" collaborative elements such as partnering to existing cultures and contracts have rarely succeeded', they contended that cultural change can be accelerated through factors such as:

- Better briefing (Green and Lenard 1999; Barrett and Stanley 1999).
- Improved selection systems and a more careful matching of client and contractor objectives (Lowndes 1998; Crane 2001; Bayliss 2002).
- The careful use of incentives (Scheznayder and Ohrn 1997; Wright 1998).
- More effective use of information technology.
- A wider acceptance of 'lean construction' principles.

Finally, in the international arena, Lahdenperä (2001) presented the results of a ten-year study (1989–1998) covering 20 050 projects in Finland, each with a value greater than 1 million Finnish marks (about 170 000 euros). In the public sector, the balance was tilted overwhelmingly in favour of traditional procurement with separation of the design and construction functions, with minority use (14%) of design and build. In the private sector, however, the use of design and build increased to in excess of 23%.

Risk allocation and reward

Risk allocation in construction projects has long been a subject of intense debate. There is evidence that inappropriate and unrealistic risk shifting is a major cause of disputes (Wall 1994) and that risk allocation determined on sound commercial principles helps to avoid disputes (NPWC 1990).

It is often said that 'risk should be placed with the party best able to control it' but Cheung (1997), following on from work by Abrahamson (1984), asserted that a more detailed taxonomy of risk distribution is more appropriate. The taxonomy suggested by Cheung suggests that risk should be allocated using the following scale of priorities:

- The party best able to control it effectively.
- The party best able to absorb it financially.
- The party who has most information to control it.
- The party who benefits most from controlling it.
- The party for whom the risk is inherent in its commercial role.

Cheung used these principles together with a set of risks developed from the work of Casey (1979) in the construction of a risk allocation model which was subsequently tested with some success in Australia, although the sample size was rather small.

Also in Australia, Kenley *et al.* (2000) examined rewards and incentives in the context of public sector construction (APCC 1997). They provided a useful review of the literature relating to incentives and rewards and concluded that appropriate incentive and reward systems can help to change a contractor's behaviour both during the bidding process and during project execution.

Forbes *et al.* (2008) re-examine the risk allocation and management problem in considerable depth. Following a review of the literature, and taking a case-based reasoning approach, they present a reinterpretation of the political, economic, social, technical, legal and environmental (PESTLE) model in the form of a risk management matrix.

Bid evaluation techniques

It has been argued (Trickey 1982; Smith 1986) that seeking the lowest tender price on the basis of common tendering information leads to maximum value for money for the client through free and fair competition. This may well be true in an environment of perfect economic competition, but in the real world, where price is the sole criterion, the bidding problem for the contractor becomes simply to submit the lowest price. Contractors have historically derived some comfort from the fact that the forms of contract employed would provide them with the opportunity to increase their return through claims made as the result of client variations and other changes. Contractors' actions in deciding what figure to bid have therefore been largely governed by their attitude to risk and their expectations of the way the client and his or her representatives will behave during the construction process. There is also evidence, perhaps not surprisingly, that:

- Lowest initial bid does not necessarily equate with lowest out-turn cost (Pearson 1985; Dawood 1994; Pasquire and Collins 1997).
- Contracts let by open competition are often less successful than contracts awarded by other means (Holt *et al.* 1995a, 1995b).
- Lowest price exposes the client to an increased risk of post-contract claims and cost over-runs (Crowley and Hancher 1995).

In order to counter these problems, a number of alternative bid models based on price alone have been developed; they are designed to identify and eliminate 'rogue' bids, thus hopefully increasing the client's chances of project success. The work of Lingard *et al.* (1999) contains a concise review.

There now appears to be a general acceptance, in the UK at least, that bid acceptance based on price alone is unlikely to lead to improved project success, although Holt and Proverbs (2001) found that, out of a sample of 120 English local authorities comprising equal numbers of counties, district authorities, metropolitan districts and London boroughs:

- 11% believed that lowest price provided best value for money.
- Only 18% believed that best value would be delivered through a combination of price and quality.
- 50% believed that price was the most important aspect of a contractor's tender submission.

Several researchers have attempted to develop quantitative models, such as the following models, to aid the process of analysing multi-criterion bids:

- Multidimensional utility analysis (Diekman 1981).
- Cluster analysis to identify the bid representing overall utility optimisation (Seydel and Olson 1990).
- Models based on fuzzy set theory (Nguyen 1985; Wong and So 1995; Tsai 2007).
- Hierarchical decision models (Mustapha and Ryan 1990; Russell 1992; Kong and Cheung 1996).
- Expert systems (Russell *et al.* 1990).
- Discriminant analysis (Tam 1993).
- Performance ranking using a Likert scale (Assaf and Jannadi 1994).
- Composite models involving a combination of processes (Prasertsintanah 1996).

Lingard *et al.* (1999) contended that contractor selection models ought to be considered in respect of their propensity to reduce the transaction costs involved, and that this can best be achieved by multi-parameter models, since they address a broader range of sources of uncertainty and opportunistic behaviour than do the simpler comparative bid evaluation models.

As explained earlier, some clients have attempted to introduce innovation into the procurement process through the introduction of 'alternative tenders', but some commentators believe that such practices may pose significant legal difficulties (Craig 1999).

Bid evaluation is now more commonly carried out using a combination of price and 'qualitative' factors such as the contractor's attitude and proposed method of working, the strength of the contractor's team, etc. This issue becomes even more important where projects are to be conducted under some form of collaborative arrangement and it has been proposed that in these cases the price and qualitative factors should be supplemented by a series of factors concerned with aligning cultural fit between the employer and the contractor. Examples of such factors might include ethical values and principles, and common and transparent business practices.

Hampson and Kwok (1997) suggested testing the following attributes in order to indicate likely success in collaborative relationships between firms:

- Trust in one's trading partners.
- Commitment to a win–win solution.

- Interdependence and a recognition of the benefits to be gained from shared mutually agreed goals, shared risks and shared rewards.
- Recognition that self-interest requires co-operation and that co-operative working integrates self-interest in order to achieve mutual goals.
- Recognition that effective communication is essential in co-operative working.
- Commitment to joint problem solving.

Diekman *et al.* (2000) proposed the use of similar techniques to help potential developers of privatised infrastructure projects assess the relative merits of alternative projects through a series of discrete clusters of information based on:

- Political issues (legislative status, organisational structures, etc.).
- Public private partnership attributes (the nature of the partnership agreement, ownership, operational responsibility, length of concession period, etc.).
- Project scope.
- Environmental factors.
- Construction risks.
- Operational risks.
- Financing issues (debt/equity, project subsidies, etc.).
- Economic viability.
- The developer's financial involvement (including development rights, performance incentives, etc.).

A detailed set of scoring documents are also presented.

A number of authors have considered the issue of unbalanced bidding. Contributions to the debate cover a period of more than 40 years, and those advocating its use range from Gates (1959) to Cattell *et al.* (2008). Over time, the various techniques employed have become increasingly complex, but they all attempt to adjust the rates in the tender bill to maximise profit for the contractor and to reduce risk (Cattell *et al.* 2007). Approaches discussed by Cattell *et al.* (2008) include front-end loading, item-spotting, back-end loading, and complex item loading (which aims to unify the other three techniques into a single methodology). Cattell *et al.* (2010) follow up their earlier work by developing a new risk framework which enables contractors to assess the risks they face in submitting unbalanced bids. No research seems to have been reported enabling clients to assess the risks they face from accepting such bids.

Environmental and sustainability issues and the procurement of construction work

Environmental sustainability has long been a topic of intense discussion in the construction industry. Langston (1997) provided a useful review of contemporary issues, and there appears to be general agreement that increased sustainability and mitigation of the environmental impact of major projects form two of the construction and development industries' more important key performance

indicators. Some however believed that, in the wider international arena, for many construction businesses the adoption of strategies for construction sustainability may be too far from their current set of cultural values and business reality to be a practical proposition (see for example the work of Gilham (1998)).

A wide range of tools have been developed to aid in the environmental assessment of both construction materials (for example, the Green Materials Index (Shiers and Keeping 1994), the Building Materials Ecological Sustainability Index (Lawson and Partridge 1995) and the Environmental Preference Method (Anik *et al*. 1996)) and buildings (for example, Environmental Value Engineering (Roudebush 1992) and the Building Research Establishment Environmental Assessment Method (BREEM) (Baldwin and Yates (1996)). Furthermore, it has been proposed (Langston 1996) that cost–benefit analysis can also be adapted for use in this way. A combined framework incorporating both environmental assessment and environmental sustainability is presented in the *Green Building Challenge* (Larrson and Cole 1998).

A number of commentators and researchers have suggested that environmental issues should form part of the project procurement process (see for example the work of Baldry (1997) and Walker and Lloyd-Walker (1998)).

Graham and Walker (2000) reviewed a range of environmental performance assessment tools in order to explore the extent to which they were able to provide a robust process to enable the assessment of overall environmental sustainability. On the basis of their analysis, they proposed a 'triple bottom line' model for project assessment based upon financial viability, environmental performance and social sustainability, which they then suggested should be incorporated into project procurement strategies. Varnäs *et al*. (2009), in a Swedish study, reviewed the problems of, and the opportunities offered by, green procurement of construction contracts. The study found, despite both public and private sector clients taking environmental considerations into account in their procurement processes, that environmental references are often formulated as environmental requirements. In addition, environmental assessment criteria usually relate solely to the contractor's operations on site and rarely affect award decisions.

Conclusion

So what general lessons can we learn from the above, admittedly brief and to some extent selective, review of research into the process of construction procurement? It is evident that there is now considerable expertise around the world in many aspects of the discipline and there are many instances of good practice. On the other hand, there are areas where there are considerable differences of opinion and where considerably more work is required in order to establish a consensus view.

It is also heartening to note a significant shift in construction management research as a whole away from the simple evaluation of practical experience and towards a process of integrating the observation of practical experience with more mature and generally accepted existing theoretical constructs. It is only through

the development of a body of robust research data linked to established theory that we can develop a truly scientific body of reliable construction procurement knowledge.

It is true that construction researchers have historically attempted to link their work to elements of general management theory and, to some extent, to generally accepted theories of organisational behaviour, but what has become increasingly evident in recent years is a more generally accepted understanding that the construction procurement process is largely, perhaps mostly, about people and the way they interact with each other and their environment. This has led to a considerable increase in interest in the application of theoretical constructs taken from the 'softer' disciplines such as communication, social and behavioural science, cognitive and industrial psychology and the influence of culture, ethics and personal beliefs. There are, we believe, strong reasons for believing that it is from these areas that the major improvements to existing construction procurement practice will be derived in the future.

This chapter has attempted to introduce some of the major issues in construction procurement research, many of which will be explored in greater detail in subsequent chapters.

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3 Principles of strategic procurement

Introduction

The aim of this chapter is to introduce the basic concepts of strategic procurement and to review the need for a strategic approach to procurement issues across the whole construction industry supply chain. The concept is developed to provide the basis of a cohesive framework for construction procurement, which in turn provides an anchor for more extensive study of the various elements involved.

The continuing search for maximum value for money in construction work has, in recent years, increasingly focused attention upon the procurement process. The impetus for change, in the UK at least, has been driven by a number of factors, not least of which has been a growing dissatisfaction among construction clients with the quality and predictability of construction work, coupled with the development of an increasingly knowledgeable and empowered body of influential corporate and public sector clients. Similar pressures are also evident elsewhere in the world, particularly in the United States of America, South Africa, Australasia, the Middle East and the Far East, including Hong Kong, China, Malaysia and Singapore.

The need for a more strategic and cohesive approach to construction procurement has long been proposed by construction commentators and academics as a significant prerequisite for improved project success. The publication of *The Procurement Guide* by the Royal Institution of Chartered Surveyors in 1996 (RICS 1996) provided much valuable advice to practitioners. The issue was given significant emphasis in the *Rethinking Construction* report (Egan 1998) and has since been adopted as a major plank in the UK Government's procurement policy through guidance issued initially by the Treasury and the Office of Government Commerce. The Cabinet Office now publishes this best practice guidance and the RICS issues a range of advisory documents in their Black Book series, which includes advice on selecting the most appropriate procurement strategy.

Considerable effort has also, over many years, been devoted to examining the ways in which both the procurement process and project supply chains are managed in other industries, such as car and aeroplane manufacture, shipbuilding and

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oil exploration, with a view to transferring both techniques and expertise to construction. A number of relevant case studies were examined by Cox and Townsend (1998). Such efforts, however, met with limited initial success and quickly led to the view that, whilst these techniques may have considerable potential, there is a need for them to be significantly modified and adapted in order to meet the special needs of the construction industry.

In addition to these largely external influences, there has, during the past decade or so, been a significant shift in the way both commercial companies and public sector clients view their interaction with the construction and development industries. An increasing understanding by clients of their own generic supply chain relationships and the factors that drive them has increasingly led enlightened clients to recognise that the improved supply chain management techniques developed for the direct benefit of their core business can and should be adapted and applied to the construction supply chain. Consequently, we are beginning to see experienced and enlightened clients taking a much closer interest in the way their construction supply chains, once the exclusive purview of the construction contractors, are being organised and managed.

The appointment by the UK Government of a Chief Construction Adviser has enabled increased focus on how public sector construction procurement might be improved. Targets of 20% cost reduction resulting from improvements in process have been established by a Government Construction Strategy (Cabinet Office 2011) along with a Government Construction Board, the purpose of which is to ensure that improvements are coordinated and aligned.

Initiatives by the public sector have cascaded down to the private sector where these initiatives have proven their worth over time and where clients or project teams have expected, or demanded, their adoption. The Government Construction Strategy (Cabinet Office 2011) has highlighted Building Information Modelling (BIM) as one initiative it wishes to strongly support across the public sector, adopting technologies which enable all team members to share and use the same data through the adoption of a computer-generated model containing all graphical and tabulated information about the design, construction and operation of the (completed) asset.

BIM has been variously defined but a strategy paper for the Government Construction Client Group describes BIM as 'a managed approach to the collection and exploitation of information across a project' (DBIS 2011).

This type of initiative is likely to prove of particular value to complex projects but it will require a greater will to collaborate in sharing information than is currently evident: information is often simply passed on to the next operation in the process of procurement. Perhaps this is why the UK government have stated their aim to mandate BIM across public sector projects by 2016 (Cabinet Office 2011). There are implications for procurement strategies and routes which will align with the adoption of BIM. To be successful, the whole supply chain will need to buy in or a project will be hamstrung; this is a real challenge. Standard contracts will need modifying and matters relating to issues such as the ownership of models, copyright, rights of access to and modification of the model, and initial and continuing responsibility for the integrity of the model as a whole and the constituent data will need to be addressed.

It is not intended in this chapter to engage fully with the concepts, technologies and processes involved with BIM, but BIM is recognised as a further initiative to converge the activities of the fragmented project team and supply chain as well as increasing the engagement of the client in the process. These are seen as highly desirable intentions if the measured performance of the industry is to be improved and the barriers to innovation are to be removed.

Procurement: a review of theory and practice

It seems to be generally agreed that the historical development of construction procurement systems across the world has been a somewhat ad-hoc process. The gradual evolution in the UK of the 'traditional' design-led approach occurred largely as a natural development of the rise of the architectural profession throughout the seventeenth and eighteenth centuries. Initially, although predominantly design led, work was commonly procured as separate trade-based packages often carried out by individual tradesmen, in much the same form as the modern-day French *lots séparés* approach. However, this approach led to many disputes and the traditional system as we know it today was finally brought to fruition with the development of the practice of 'contracting in gross' by the Government Office of Works in the course of procuring a substantial programme of military construction required as a result of the Napoleonic Wars around the turn of the nineteenth century. Contracting in gross, coupled with the nineteenth century building boom caused primarily by the development of the railways, the rapid expansion of the civil engineering profession, and subsequent industrial and suburban development, led to the development of the modern general contractor.

Whilst the traditional approach held sway for more than 150 years, by the early 1960s problems arising from the separation of the design and construction functions, often evidenced by the difficulty of apportioning responsibility for defects in completed buildings, led to the development of what have been called 'integrated procurement systems' (Masterman 2002) generally based upon a design and build approach. The design and build family was initially relatively slow to take off in the UK, but Masterman (2002) estimates that by the start of the twenty-first century design and build approaches were used in probably 50% of UK construction projects.

The use of management oriented procurement approaches, where the primary emphasis is placed on the management of the process, dates initially from the 1920s, but the approach was progressively developed in the USA in the late 1960s, and more rapidly during the 1970s, as a direct result of government pressure to improve predictability and reduce construction delays through better process management. This development was fuelled as much as anything by contemporary developments in major projects in other industries such as military shipbuilding, oil exploration and delivery, and the American space programme. The approach achieved prominence in the UK in 1969 with the construction of the Horizon project for John Player Ltd in Nottingham and has continued to be used, mainly by

experienced clients, with varying degrees of success ever since, but its use in the UK has never achieved truly popular support.

The development of the use of private sector funding to secure public sector infrastructure has a long history and has had significant impact upon construction procurement. The use of privately financed solutions is considered in detail elsewhere, but the development in the UK of the Private Finance Initiative (PFI) and other forms of public private partnership (PPP) has had significant effects upon the way the supplier/customer relationship has been structured, and upon the way risk distribution and value for money have been perceived by employers and contractors alike.

Finally, in the closing decade of the twentieth century, we began to see a resurgence of interest in examining the structure of the relationship between the construction client and the contracting team. This process, driven largely by the desire of some clients to take a more active role in the ownership of their projects during development and construction, and particularly in the UK through a central government drive to improve the value derived from the expenditure of public money, led to the development of a class of collaborative procurement approaches.

The development of partnering, strategic alliances and other collaborative methods has led to a substantial redefinition both of the procurement process as a whole and of the nature of construction contracts, and has concentrated interest upon study of a large body of management theory and practice dealing with team motivation, behaviour, performance measurement, incentivisation and similar issues within the broader constructs of construction procurement and project management. The cumulative impact of these developments has caused some to look more critically at the management of the whole construction supply chain.

In light of the above, it is clear that the development of construction procurement approaches has historically been driven primarily by perceived deficiencies in previously popular approaches, a process described by Cox and Townsend (1998) as 'barefoot empiricism'. Despite the attempts of Masterman (2002) and others to construct some kind of theoretical framework within which to position the different approaches and the attempts of researchers such as Skitmore and Marsden (1988), Bennett and Grice (1990), Liu (1994) to link various parts of the process to an accepted theoretical base and to formalise the process of selection of the most appropriate procurement route, Cox and Townsend (1998) still felt able to write 'essentially there has been no theoretical framework on which to derive either an ideal or an optimum approach to procurement, only a reactive evolution of modus operandi.' There is no evidence that this overall position has changed significantly.

A strategic approach to procurement

From the above discussion it is clear that, to be effective, a strategic and inclusive approach to construction procurement must provide a cohesive framework within which all of the various project objectives required by the client may be addressed in the most effective way. This then implies that the client's needs and wants must be sufficiently well articulated, analysed and communicated for an appropriate

procurement process to be developed. It must also be clearly recognised that, for major projects at least, a strategic approach to project procurement must be dynamic rather than static, in that 'formula-based' standardised approaches are likely to be less satisfactory as projects become more complex and as client needs change over time. It is therefore unlikely that any kind of 'one size fits all' approach will be entirely satisfactory in many, perhaps the majority of, cases.

Every new project is, to some extent, unique and is a product of both the client's needs and desires and the external influences operating on the client and the project at that particular point in time. It therefore follows that generic procurement processes must evolve and develop in order to meet particular sets of circumstances at specific points in time. In light of this, it can be convincingly argued that there is no such thing as universal 'best practice' in construction procurement in the sense of simply choosing one overall procurement methodology (e.g. traditional, design and build, management contracting, etc.) from a limited and predetermined menu of all-inclusive options. This then leads one to conclude that what is required, particularly for projects that are themselves complex, or those that are to be procured in a complex environment, is a bespoke approach designed specifically to address each particular set of circumstances. If this argument is accepted, then instead of viewing procurement approaches simply as a predetermined and limited menu of ready-made solutions, we must consider the overall procurement strategy to be the sum of a set of processes, some of which will be 'off the shelf' and some bespoke, all of which are integrated within an overall strategic framework designed to provide the best possible chance that the employer's objectives will be at least satisfactorily achieved and if possible exceeded.

This leads us to view the individual techniques that might be used to address specific aspects of the procurement problem simply as elements of a comprehensive 'tool kit'. The development of an acceptable overall procurement methodology then comprises selection of the right combination of tools and techniques from the practitioner's toolbox to meet specific client and project needs.

Components of the procurement process

The basic components of any procurement process will include the following:

- A functional needs analysis.
- Selection and development of an overall procurement philosophy, which will normally be based upon either a design led, construction led or management led approach.
- Analysis of the most suitable form of relationship between the demand and supply sides of the procurement equation (i.e. a supplier/customer relationship or some form of collaborative relationship, and if the latter what the precise form of that relationship should be).
- A detailed design of the specific procurement approach to be used (i.e. selection, application and, if necessary, modification of the appropriate tools).

- Formalisation of the contractual relationships in the most appropriate way.
- Selection of the most appropriate supply chain (i.e. consultants, contractors, subcontractors and other specialists).
- Implementation.

Functional needs analysis

For construction projects, the starting point for the functional needs analysis will usually be the client's brief. This issue is explored in some detail in Chapter 6, but experience shows that historically both clients and their professional advisors and designers have, in too many cases, exhibited poor briefing skills and that for complex projects, especially where clients are large and multiheaded, considerable skill, time and effort may be required to derive an acceptable brief.

Deciding precisely what the project objectives should be and the characteristics to be expected from the completed scheme is frequently difficult; whilst the overriding objectives may be derived from the business case, compromises frequently need to be made in order to fit the objectives with the available resources. Assessing and weighting the relative 'worth' of competing objectives within the overall scheme therefore frequently requires some serious consideration.

Modern construction clients in both the public and private sectors are also beginning to think more strategically about their interaction with and expectations from the construction industry, particularly in terms of the value added by construction services to their core business, and the commercial risks involved. Standard project briefing procedures will therefore frequently need to be supplemented by externally facilitated project strategy and risk management workshops incorporating input from all of the major client stakeholders. For a private sector project, such workshops would typically include end users, budget holders and those responsible for maintenance of the completed facility. For public sector projects, this list would typically be supplemented by representatives from audit and legal departments in order to ensure that the project procurement mechanisms chosen are acceptably robust in terms of public accountability.

Development of an overall procurement philosophy

The functional needs analysis should provide a set of prioritised objectives which the project is required to fulfil, complete with sets of key performance indicators and benchmarks defining how project success is to be measured. The needs analysis should also show how important the project is to employers within their overall business plan and development strategy, and will thus help to focus attention on the amount of effort that should be put into the project procurement process.

There are many ways in which the relationship between client needs and procurement strategy can be modelled. Figure 3.1 shows a very simplistic approach, modelling the relationship in terms of the likely impact on the employer if the contractual relationship between employer and contracting partner were to fail. The vertical axis indicates the effect in terms of impact upon non-cost-related

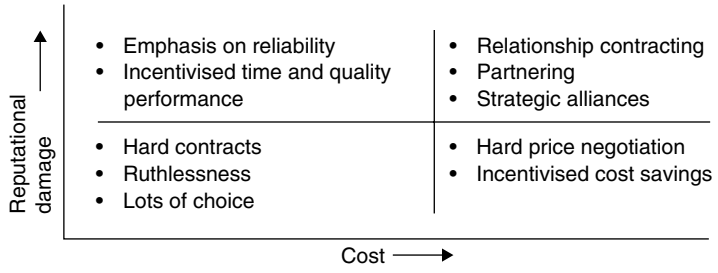


Figure 3.1 Procurement strategies to address the danger of failure of the contractual relationship.

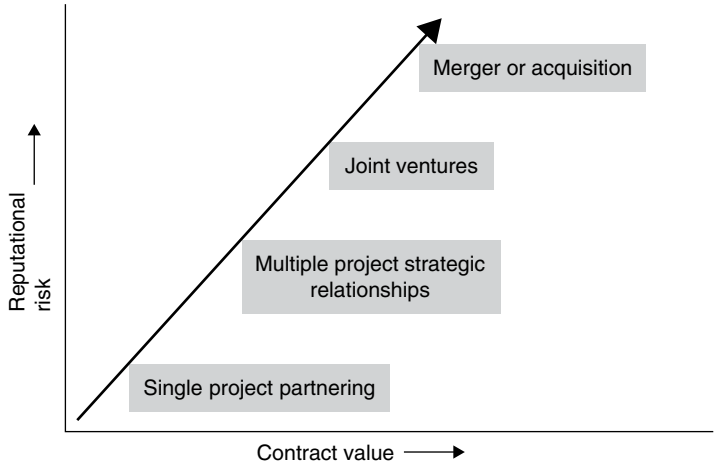


Figure 3.2 Changing collaborative trading relationships as project value and risk increase.

factors, such as reputation, whereas the horizontal axis denotes impact in terms of cost. Projects that have minimum impact in both financial and non-financial terms can be dealt with effectively using conventional procurement approaches involving little management effort (bottom left quadrant). Projects that have maximum impact should have maximum effort applied (top right quadrant). Projects that have limited impact on either reputation or cost should be dealt with through the use of a procurement strategy incorporating the appropriate incentives (top left and bottom right quadrants).

Figure 3.2 develops the concept of collaborative methodologies as they might be affected by increasing project complexity and an increasing impact on the employer's core business. Plainly as projects or commercial relationships become more complex and more fundamental to the employer's core business, so the nature of the relationship needs to change, and increasing effort needs to be devoted to ensuring that they work properly and support the employer's key business aims and project objectives. As project significance increases, and as the possible consequences of

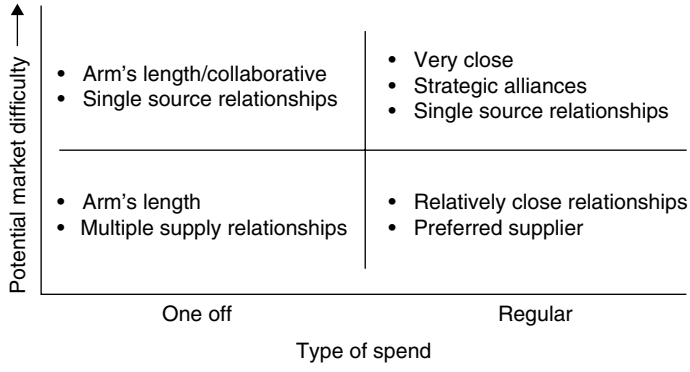


Figure 3.3 Procurement strategy as a function of market difficulty and type of spend. (Adapted from Cox A. and Townsend M. (1998) *Strategic Procurement in Construction*. With permission of Thomas Telford Publishing.)

failure become more significant, we might therefore expect to see a progression from the simpler single project partnering relationships, through more complex multiproject strategic alliances, to true joint ventures where both parties have a financial stake. The limit of the model, where projects or relationships become absolutely fundamental to the employer's core business, might ultimately involve bringing the operation in house often through a merger or acquisition route.

Figure 3.3 recognises that other external influences may also have a bearing on the procurement decision and thus on a model's procurement strategy as a function of potential market difficulty and type of spend.

Here the contention is that any trading relationship incorporating multiple projects ought to be based on collaborative strategies, whilst those involving only a single project might be better based upon more traditional 'arm's length' arrangements. Others may, however argue that complex issues involving a high degree of market difficulty should also be based upon collaborative arrangements.

As with Figure 3.1, the most important relationships, and thus the ones to which the most effort should be devoted, are those in the top right-hand quadrant of the diagram. Similarly those in the bottom left-hand quadrant are the least important, and therefore justify rather less management effort.

Components of a collaborative relationship

The development of successful collaborative relationships will depend upon alignment of the objectives of the various organisations involved in the project and this will, in turn, be dependent upon successful agreement of both the commercial and cultural elements of the arrangement. The cultural and commercial issues upon which attention should be focused are illustrated in Figures 3.4 and 3.5.

It terms of cultural issues (Figure 3.4), the central issues to be addressed are those of trust and team working, and these areas are conventionally addressed in a 'workshop' environment, generally using an external facilitator. Many different

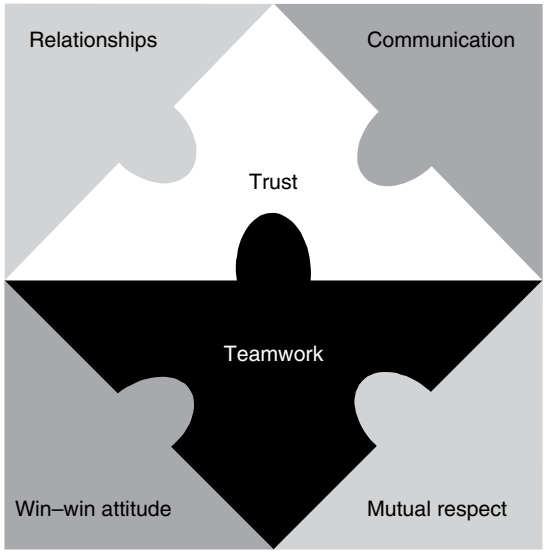


Figure 3.4 Cultural issues. (Reproduced with permission of Knowles Management and Stradia Ltd.)

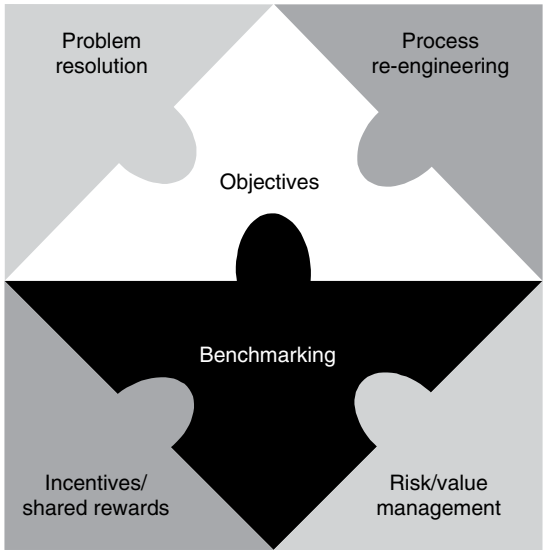


Figure 3.5 Commercial issues. (Reproduced with permission of Knowles Management and Stradia Ltd.)

types of management development techniques have been created to deal with these issues, ranging from outdoor-based activities where people learn to work together to solve problems in an environment perceived by the participants to present some physical hazard or challenge to purely academic desk-based problem solving tasks often incorporating some element of role play.

Development of the other cultural issues illustrated in Figure 3.4 (relationships, communication systems, a 'win–win' attitude and mutual respect) will all follow from the development of a strong team culture. A more detailed examination of these issues is given in Chapter 12, in the section headed 'The management of relationships'.

Equally important is the development of the commercial aspects shown in Figure 3.5. Central to this is the development of a joint set of mutually agreed project objectives, which each party to the agreement is prepared to support and work towards. The objectives must be measurable, and thus need to be supported by a robust set of key performance indicators and benchmarks designed to indicate the extent to which the objectives are being achieved as the project proceeds.

The development or selection of robust procedures for both risk management and value management are crucial to project success, and must support the achievement of the mutual objectives. Also important is the development of a fair and timely dispute resolution methodology which will allow potential problems to be resolved before they escalate into full-blown disputes. A detailed discussion of dispute resolution methodologies is beyond the scope of this book, but selected aspects of dispute resolution practice are considered in outline in later chapters.

Achievement of the mutual objectives will be further aided by commitment of all of the parties to a critical re-examination of the processes conventionally used for the management of projects, with a view to seeking improvement through innovation and process re-engineering. This will in turn be aided by the development and introduction of suitable incentive mechanisms designed to enable those bringing forward innovative ideas to share in the potential rewards.

Detailed design of the procurement approach

Once the form of the overall procurement methodology has been derived, then development of the detailed design will generally comprise selection or development of those tools best suited to achievement of the project objectives. Note that not all projects will require use of the whole tool kit and that there are significant advantages to keeping the detailed design as simple as possible, consistent with ensuring adequate project performance.

The use of collaborative procurement methods may not be appropriate for all projects and the use of sophisticated risk and value analysis tools may not be justified in all cases. The important issue is to ensure an appropriate selection of tools to meet the needs of the particular client at that specific point in time.

Formalisation of contractual relationships

An important part of the procurement process is to ensure that the chosen procurement route, and the relationship between the parties, is formalised in an appropriate way. The majority of construction projects use one or other of the generally available standard form contracts, of which there is now a bewildering array available. What is important is that the chosen contractual arrangement should supplement and support the chosen procurement route. Advice provided

by the Office of Government Commerce (OGC), that 'the form of contract used has to be selected according to the objectives of the project to meet the needs of *Achieving Excellence in Construction* principles' (NEC 2005), ought logically to lead to more variety in the choice of public sector contracts. OGC however also endorsed NEC3 as the preferred form of contract for public sector works, and this form does at least support a wide range of alternative procurement options. For the private sector, however, the range is much wider.

Whilst it would appear that the majority of contracts let in the UK outside central government still use one or other of the Joint Contract Tribunal (JCT) Standard forms, these forms have in the past been regarded as less suitable than others for collaborative arrangements. Despite the fact that the JCT issued a Practice Note explaining how these forms may be used in a partnering context, they have still been seen by some to be rather confrontational in nature and as encouraging a supplier/customer style of relationship that is at odds with partnering and other similar techniques. The partnered style of relationship is generally considered to be better supported by some of the more modern alternatives, of which there are several available. The Engineering and Construction Contract (also known as the NEC Form), now in its third edition (NEC 2005), is probably the most popular, but for those wishing to bring the partnering process firmly within the contractual ambit, the PPC2000 Standard Form of Contract for Project Partnering (Trowers and Hamlins 2000), of which several variants are now available, is becoming a popular choice.

It is important to note here that this is not to say that a partnered relationship or some other collaborative arrangement is generically better or worse than the more traditional supplier/customer approach, merely that once the most appropriate approach is selected for a particular project then it should be supported by the most appropriate form of contract. In this context, and as an example, reference might be made to the JCT Major Project Construction Contract, which is specifically designed for employers who wish to have minimal involvement in their projects. The Guidance Notes to the document state that the form is designed such that 'having defined its Requirements, the Employer should permit the Contractor to undertake the project without the Contractor being reliant upon the Employer for anything more than access to the site, the review of Design Documents and payment'. Its use in a partnered context might therefore be questionable.

Selection of the most appropriate partners

Selection of the most appropriate trading partner is of paramount importance in achieving successful project delivery. Contractor and consultant selection procedures are dealt with elsewhere, but it should be noted that, in the case of more complex projects, particularly perhaps those requiring a collaborative approach, quite complex and detailed selection processes are likely to be required to ensure the necessary 'cultural fit' between the trading partners. This issue is explored in more detail in Chapter 12 in the section entitled 'Establishing the "cultural fit"'.

Contractor selection processes usually involve bringing the potential partners together in an interactive way. At the lower end of the scale, the interaction has

historically consisted simply of an interview lasting perhaps an hour or an hour and a half, during which potential trading partners (contractors or consultants) are given the opportunity to explain their approach to the project, and in return the employer has the opportunity to ask questions. Whilst the concept of interviews of this kind has some merit, experience shows that many contractors have approached the interview primarily as a marketing opportunity. They have therefore put forward their marketing team rather than the team actually responsible for delivery of the project, and this has led in some cases to considerable client disappointment when the project team subsequently fails to fulfil the promises made.

More recent developments in the case of larger projects, and particularly where multiproject strategic alliances are involved, have seen the use of assessment centre techniques largely borrowed from human resources management. Here the contractor's proposed project team is required to work with the employer for an extended period of time (perhaps a whole day) in a structured and highly interactive way. Typical assessment centre activities might include a combination of business games and simulations, small group discussion sessions and mini-workshops, some of which might be designed and run by the contractor, in addition to a more formal presentation by the contractor.

Implementation

The successful design and implementation of a workable procurement strategy is plainly a highly skilled process, and the increasing attention being paid to this has led to the development of specialist procurement advisors. Whilst initially these people tended to come from within the construction disciplines, increasingly this area is becoming the focus of attention by procurement specialists from other industries.

In summary, the following might represent the skills and knowledge required of a construction procurement advisor:

- Clear understanding of the generic management issues posed by the organisation and operation of complex supply chains.
- Knowledge of the factors governing the management of relationships.
- Clear understanding of the nature of organisational structures, their boundaries and the factors affecting communication between them.
- Comprehensive knowledge of the nature and function of the various standard contract forms commonly used in the construction supply chain.
- Clear insight into the way the construction industry is structured and the industry-specific factors affecting the working of the construction supply chain.

Conclusion

It is clear that the present advances being made by commercial companies in understanding the ways in which supply chains work will lead to significantly enhanced expectations of those responsible for commissioning, procuring and managing construction work. This will lead directly to the need to develop more sophisticated

approaches both to the 'front line' procurement of construction works and services and to the management of construction supply chains by the industry itself. It is also clear that increasingly well-informed corporate employers will not shrink from direct involvement in construction supply chain management in the event that the construction industry fails to actively engage with the challenges posed.

There are also serious implications here for those involved in project management. Project success is increasingly being seen to be less to do with detailed management of the technical issues such as time, cost, quality, etc., and more to do with managing the relationships between the organisations involved in the extended supply chain. This extended supply chain is increasingly seen as spanning the complete range of project participants, from end users at one extreme through client budget holders, main contractors, subcontractors and suppliers to those responsible for facilities management at the other extreme. Indeed some are beginning to consider project success as being directly related to successful relationship management and the successful project as being the aggregate of a series of successful relationships.

This is not to say that traditional project management skills will become redundant, rather that employers will, in the future, take such skills for granted and will, in addition, require project managers to be able to understand and implement the additional softer management skills inherent in a modern strategic procurement environment.

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4 Public sector projects

Introduction: why should public sector projects be different?

This chapter explores the procurement of construction works and services in the public sector. Note that, in this context, the 'public' sector refers specifically to work carried out wholly or partly with public funds. Public companies, which by and large must only satisfy their own shareholders, therefore constitute part of the 'private' sector. Public private partnerships (PPP) using some combination of public and private sector funds, such as those being developed under the UK Government's Private Finance Initiative (PFI), are subject to their own particular body of regulation and are discussed in detail in Chapter 13.

There are, of course, many common areas between public and private sector projects, and the underlying principles of contract law and of 'best practice' in procurement set out in this book and elsewhere do, of course, apply equally to both. There are, however, further issues to be taken into account when working with the public sector, in that the public sector must be seen to be accountable to the taxpayer in respect of:

(1) The way in which projects and services are procured: Public sector contracts must be seen to be awarded fairly and without discrimination. The award process must be both transparent and accountable.
(2) The expenditure of the public funds involved: Public accountability is usually of paramount importance. Taxpayers, in a democracy, have the right to be shown that their money is being spent in accordance with the approved published policies, standing orders, financial regulations, etc., and that adequate safeguards are in place to prevent the misappropriation of funds. The need for good audit control and the provision of a clear audit trail are therefore of paramount importance in the selection of the public sector project procurement strategy.
(3) Maximising value for money: Value for money has often, in the past, been equated in the layman's eye with lowest price. This is no longer the case in the public sector, and current UK Government advice now supports the

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> principles of good practice elsewhere in advocating seeking the optimum combination of price and quality for each specific project or service. The Government has also imposed a legal duty of 'best value' upon a substantial portion of the public sector, with the aim of securing continuing improvements in the standards of public services. This issue is discussed in detail later, in the section headed 'Best value'.

These obligations, particularly those in respect of transparency and fair competition, go far beyond those placed upon either private sector companies or individuals contracting between themselves, and a substantial body of legislation and regulation has therefore been developed in an attempt to ensure that these objectives are consistently met. Consultants working with the public sector for the first time are frequently both confused by and contemptuous of the apparent bureaucracy involved. One must, however, understand that the obligations imposed upon the public sector involve employees and consultants in a significantly higher level of responsibility, transparency and accountability than is conventionally the case in the private sector. Failure to comply with the letter of the law may render individuals or the client body as a whole liable to actions at civil law or to possible criminal prosecution. In some extreme cases, failure to meet the requirements could result in administration of the authority's services being taken over by central government.

In addition, much of the legislation, particularly in relation to larger projects, has emanated from the European Union's (EU) drive for a common market in goods and services. Serious breaches of the law may therefore result in the European Commission (EC) taking action against the responsible organisations or governments, and the Commission has the power to impose fines and to require organisations to modify their practices to ensure compliance.

A final influence upon the procurement of supplies and services by some sections of central government is the Government Procurement Agreement (GPA) which arises out of the UK's membership of the World Trade Organization (WTO).

The procedures required to ensure compliance with EU Regulations and the GPA are considered in detail in the section on 'Procurement rules: European Union principles and procedures'.

What constitutes the public sector?

For the purposes of EU legislation, contracting authorities are defined in EU directives as being all bodies governed by public law. These are then subsequently defined as:

> any body established for the specific purpose of meeting needs in the general interest and not having an industrial or commercial character, which has legal personality and is financed for the most part by the State, or is subject to management supervision by the latter.

For the purposes of the GPA, the WTO defines public authorities as being confined to central government and its agencies.

The public sector in Britain therefore comprises a wide range of organisations including, but not limited to:

- Central government.
- Local authorities (including police and fire authorities, etc.).
- The National Health Service.
- Public utilities (the majority of which have now been privatised but are still subject to some public sector procurement legislation).
- Housing Associations where schemes are partially funded by the public purse.
- Other entities, including quasi-autonomous non-governmental organisations (QUANGOs) and higher education institutions.

Central government

Central government in the UK has historically been accused of taking a somewhat autocratic attitude towards its role as a client of the construction industry, imposing upon contractors its own unilaterally written standard forms of contract with little attempt to make any rational allocation of risk between the parties to the contract.

Over the past two decades however, a number of government reviews of both the construction industry and procurement practice have done much to reinvent government as a 'best practice' construction client. During this time, the Government has been an enthusiastic supporter of client empowerment through bodies such as the Construction Clients' Forum (CCF) and the Construction Industry Board (CIB), both of which have done much to strengthen the role of the client in the procurement process, and to advocate a less adversarial and more collaborative approach to both procurement and construction. Government has also actively encouraged and supported the use of collaborative approaches such as partnering in their own procurement practice, in the form of both single project agreements and long-term strategic alliances with a small number of 'prime' contractors. Consistent with these initiatives, the government now endorses the new Engineering and Construction Contract Edition 3 (NEC3) (NEC 2005) as its contract of choice. The GC/Works suite is still available for purchase but is no longer supported and appears to be being left to 'wither on the vine'.

Government and the construction industry

Most recently, in response to the National Infrastructure Plan (HM Treasury 2010a) and as an element of budgetary austerity measures, the UK Government has taken a major interest in the cost of construction work. In December 2010, the Treasury published the report of its review (HM Treasury 2010b) into how the cost of major civil engineering infrastructure could be reduced. The review concluded that savings of at least 15% (approximately £2–3 billion per year) were achievable through enhanced public procurement procedures and better management of

budgets and risk. Specifically, the following factors have been highlighted as being contributory to infrastructure costs that are higher than necessary:

- Stop–start investment programmes and the lack of a visible and continuous pipeline off orward work.
- Lack of clarity and direction over key decisions at inception and during design. Projects are started before the design is sufficiently complete and the roles of client, funder and delivery agent become blurred in many public sector governance structures.
- The management of large infrastructure projects and programmes within a quoted budget, rather than aiming at lowest cost for the required performance. If the budget includes contingencies, the higher total becomes the available budget.
- Over-specification and the tendency, more prevalent in some sectors than others, to apply unnecessary standards and use bespoke solutions when off-the-shelf designs would suffice.
- The interpretation and use of competition processes not always being effective in producing lowest outturn costs, with public sector clients being more risk averse to the cost and time implications of potential legal challenges.
- Companies in the supply chain typically investing tactically for the next project, rather than strategically for the market as a whole.
- Lack of targeted investment by industry in key skills and capabilities, limiting the drive to improve productivity performance.

The government subsequently prepared an Implementation Plan (HM Treasury 2011) which aims to:

- Provide improved transparency and certainty around the infrastructure forward programme.
- Group projects into more efficient longer-term programmes with clear outcome-based objectives.
- Encourage innovation and allow for earlier and integrated supply chain involvement through improved competition and procurement processes.
- Seek the best whole-life outcome rather than seeking the lowest cost for a given specification.
- Select supply chain partners on the basis of their ability to deliver innovative solutions set against transparent and affordable cost targets and long-term outcomes.
- Develop appropriate client technical expertise and intelligent commissioning capability and make better use of infrastructure data to support decision making and the setting of cost targets.
- Create the environment for industry to invest in new technologies and skills improvement to deliver greater outcome-based efficiencies.

Annual reports of progress against the infrastructure plan are published and, in 2011, the Government produced a new Government Construction Strategy dealing with construction procurement across the whole of the public sector (Cabinet Office 2011). The strategy pushes forward still further the Government's determination to become a better client, to replace adversarial industrial and contractual

structures with collaborative ones, to drive greater innovation in the supply chain and consequently to improve efficiency and secure cost reduction. In short, it is Government's stated aim (Cabinet Office 2011, Executive Summary) to secure:

> a profound change in the relationship between public authorities and the construction industry to ensure the Government consistently gets a good deal and the country gets the social and economic infrastructure it needs for the long term.

The Government Construction Strategy sets out to re-engineer the model for construction by public bodies in such a way that:

- Clients issue a brief that concentrates on required performance and outcome; designers and constructors work together to develop an integrated solution that best meets the required outcome.
- Contractors engage key members of their supply chain in the design process where their contribution creates value.
- Value for money and competitive tension are maintained by effective price benchmarking and cost targeting, by knowing what projects should cost, rather than through lump sum tenders based on inadequate documentation.
- Supply chains are, where the programme is suited to it, engaged on a serial order basis of sufficient scale and duration to incentivise research and innovation around a standardised (or mass customised) product.
- Industry is provided with sufficient visibility of the forward programme to make informed choices (at its own risk) about where to invest in products, services, technology and skills.
- There is an alignment of interest between those who design and construct a facility and those who subsequently occupy and manage it.

In order to drive the strategy forward, the Government reconstituted the Construction Clients' Board as the Government Construction Board to be chaired by a new Chief Construction Adviser. Whilst all of this makes perfect sense, the cynic might argue that none of the basic concepts are particularly revolutionary or new and it remains to be seen how effective the new structures will be in practice.

Building Information Modelling (BIM)

A further requirement of the Construction Strategy which is new, at least in the UK, is a commitment to ensure the adoption of 'fully collaborative 3D BIM' as a minimum by 2016. The proposals follow the production of a strategy paper prepared for the Department of Business, Innovation and Skills in March 2011, but not actually published until July 2011 (DBIS 2011).

The idea of BIM is based upon computer-aided design (CAD) technology to link an integrated database of building information, thus allowing the automated extraction of:

- Drawn information in various forms.
- Quantities.

- Specifications.
- Construction programmes.
- Building services design data (heat losses and the like).
- Cost data (both for initial estimates and whole-life purposes).

Something like this has been proposed for more than 40 years – see for example the work of Patterson (1980), Koskela (1985), Day *et al.* (1986) and Atkin *et al.* (1987) to name just a few of the early proponents. Early commentators often used the examples of the automobile and aeronautics industries as examples of what should, in theory, be possible. The rapid pace of development of computing technology at the time meant that the possible size and complexity of the databases required was never considered to be a serious long-term issue. More serious problems in the application of these techniques in construction were generally considered to include:

- The cost of equipment, training and specialist resources required for both the initial preparation of the model and its subsequent maintenance.
- The fragmented nature of the industry and the supply chain.
- The responsibility for compiling and updating the model during the initial design and construction stage.
- Maintenance of the model during the building's life cycle.
- Copyright issues.
- Professional negligence, indemnity and insurance issues.

Some of these issues have already been resolved or can now be resolved, but for many commentators serious issues still remain – see for example the work of Harris (2010), Bingham (2011), Harris (2011) and Tolson (2012).

DBIS (2011) recommends that the initial UK Government requirement for BIM by 2016 should apply to centrally funded projects exceeding £50m and that models should comply with at least Level 2 of the BIM maturity model developed by the British Standards Institution. The model defines the following four levels of BIM model maturity:

- Level 0: Unmanaged CAD probably 2D, with paper (or electronic paper) as the most likely data exchange mechanism.
- Level 1: Managed CAD in 2D or 3D format using BS1192:2007 with a collaboration tool providing a common data environment, possibly some standard data structures and formats. Commercial data managed by standalone finance and cost management packages with no integration.
- Level 2: Managed 3D environment held in separate discipline BIM tools with attached data. Integration on the basis of proprietary interfaces or bespoke middleware – proprietary BIM (pBIM). May utilise 4D programme data and 5D cost elements and feed other operational systems.
- Level 3: Fully open process and data integration enabled by 'web services' compliant with emerging standards, managed by a collaborative model server. Could be regarded as integrated BIM (iBIM), potentially employing concurrent engineering processes.

In reality, level 2 compliance requires little other than that all participants should use a computer system to generate their own data and that the various different systems should be capable of interacting with one another through an intermediate, and probably stand-alone, medium. Issues of responsibility, negligence and copyright are therefore avoided, in that each participant organisation remains responsible for the accuracy and veracity of their own data. In view of the present, and increasing, level of internationalisation of the construction industry in general and specific major construction project teams in particular, it is plain that real success in the use of BIM will be dependent upon international agreement on data interchange standards and protocols, and a model agreement is proposed by DBIS (2011).

Note that the link between the various elements of a Level 2 BIM model need not necessarily be electronic. DBIS (2011) reports that a multipage spreadsheet indexing tool, termed the Construction Operations Building information exchange (COBie) (East 2012), initially developed in the USA by the Department of State, the Army Corps of Engineers, NASA and the Veterans Association, is now suitable for use worldwide and is already in international use.

The proposal by the UK Government to mandate the use of BIM is, in principle, a brave one, but we believe that the limited level of application proposed should not pose too many practical difficulties. The real prize will be to use the application of BIM to improve the construction industry's response to client's needs and to improve client and end user skills in the way in which they use and maintain their building stocks.

Responsible agencies

Virtually every branch of central government is involved in some way with placing contracts for construction projects and services; in general, procurement and property management advice in the UK is provided through two major bodies. The Defence Infrastructure Organisation (DIO), based within the Ministry of Defence, provides services to the military estate, whilst the Cabinet Office provides advice and guidance in respect of the civil (i.e. non-military) estate. In 2011, a new Major Projects Authority was established to oversee all government projects, including those which require Treasury approval. The Authority, established under the Cabinet Office Efficiency and Reform Group, is a partnership between the Cabinet Office and the Treasury and aims specifically to improve the Government's record in the delivery of large projects.

The Gateway process

The Gateway process, initially developed by the Office of Government Commerce (now subsumed into the Cabinet Office) from the PRINCE2 project management system, is a simplified structured project management methodology which is now widely used within the UK public sector as a review tool at critical stages in a project's life cycle in order to provide assurance that it can progress successfully to the next stage. The process is based on well-proven techniques and, if correctly followed,

should lead to more effective delivery of benefits together with more predictable costs and outcomes. It is designed to be applied to a wide range of project types and the intention is that all major central government schemes are now subject to Gateway review.

In simple terms, the Gateway process consists of a series of project reviews carried out at key decision points in the project life cycle by an experienced team of specialists independent of the project team. It therefore provides a useful and unbiased reality check on project progress and likely project performance. A 'traffic light' system is used at the end of each Gateway review. A green light allows the project to go ahead to the next stage, an amber light indicates that although the project may proceed to the next stage there are serious concerns which the project team must address as a matter of urgency and a red light means that the project will not be allowed to proceed until the review panel's concerns have been addressed and the project reassessed.

There are six gateways at which reviews may typically be carried out:

- Gateway 0 – strategic assessment: establishes the business need for the project and considers issues such as:
  - Does the project comply with sustainability criteria?
  - Is the designer clearly defined?
  - Is the allocated timescale adequate to meet the need?
- Gateway 1 – business justification: examines the business case for the project and considers issues such as:
  - Is the brief sufficiently well developed?
  - Are stakeholders' requirements likely to be met?
  - Is there an outline risk allocation and management strategy in place?
  - Is the project team clear and agreed on what the project is to deliver?
- Gateway 2 – procurement strategy: examines whether an appropriate procurement route has been chosen to procure the integrated project team and whether the proposed commercial arrangements will deliver value for money. Also considers questions such as:
  - Is sufficient attention being paid to health and safety?
  - Are sustainability requirements adequately addressed?
  - Is appropriate weight being given to design quality?
  - Does the procurement route comply with government guidance, i.e. PFI, prime contracting or design and build?
- Gateway 3 – investment decision: examines whether the project makes sense as an investment. At this stage the scope of the project is finalised and a maximum budget based on a whole-life cost basis is fixed. Key questions will include:
  - Does the project team have appropriate health and safety provisions in place, together with a clear commitment to zero accidents?
  - Are on-site processes sustainable?
  - Does the design optimise whole-life cost and time as far as possible?
  - Is the project buildable?
  - Is the project team, including the contractor, integrated and committed to continuous improvement?

- Gateway 4 – readiness for service: after construction, when the facility has been commissioned and is ready for use, considers key questions such as:
  - Were health and safety risks properly managed?
  - Does the completed project comply with health and safety requirements?
  - Is a health and safety file available for use by the facility manager?
  - Does the completed project meet or exceed sustainability targets?
  - Has continuous improvement been achieved?
  - Is all necessary operating documentation available?
  - Have key lessons been disseminated to inform subsequent projects?
- Gateway 5 – benefits evaluation: checks whether or not the expected business benefits have been, or are being, achieved. There may be several Gateway 5 reviews during the life of the project and sensible use of this provision should be used to inform facilities management (FM) decisions and future investment decisions during the operating life of the facility. Key issues will be concerned with the following:
  - Is the facility safe and compliant with health and safety legislation?
  - Are sustainability targets being achieved?
  - Does the completed facility meet stakeholder expectations?
  - Has the project team completed a post project review against the agreed project KPIs?
  - Has a post implementation review been carried out and the results appropriately acted upon?

Local government

The ability of local authorities to enter into contracts is governed generally by the provisions of their standing orders and financial regulations. These regulations, which may vary significantly in detail from one authority to another, although generally not in substantive content, are drawn up to guide both officers and elected members in the performance of their duties and to ensure that the authority meets the requirements of all applicable legislation and of the district auditor.

In the past, standing orders and financial regulations have often been extremely prescriptive, leaving little scope for officers or elected members to use their professional judgement. However, obligations imposed by Government under the 'best value' regime (see below) and other associated legislation required authorities to adopt much more flexible ways of delivering their services and of dealing with their contractual partners. Accordingly most local authorities have now revised and updated their standing orders and financial regulations. In most cases, a primary objective of the review has been to move away from a prescriptive set of regulations which must be slavishly followed towards a minimum set of regulations designed to uphold the basic tenets of transparency, public accountability and value for money, whilst at the same time allowing the authority's officers and members to use their professional skill in developing innovative ways of improving performance.

Local authorities historically used the Joint Contracts Tribunal (JCT) suite of contracts, generally unamended, and many local authority property departments have

historically prided themselves on their even-handedness in the way contracts have been administered. However, endorsement by the government of the Engineering and Construction Contract (NEC3) has now persuaded many authorities and other public sector bodies to move away from their historical allegiance to JCT. Other standard forms of contract which have secured substantial use in the public sector include the Standard Form of Contract for Project Partnering suite (Trowers and Hamlins 2000) and, to a lesser extent, the Public Sector Partnering Contract suite (PSPC).

Best value

In 1997, the UK Government replaced the previous Compulsory Competitive Tendering (CCT) regime by a strategic 'best value' initiative designed to encourage public sector organisations to maximise value for money in their procurement of works and services. In short, the best value regime imposed upon local authorities and many other public bodies a duty to demonstrate that they are achieving 'best value' for the taxpayer, in accordance with published and auditable criteria.

In the case of property and construction, government advice stated that:

- Procurement should support the principles established by the 1994 Latham review (Latham 1994), and should aim to achieve the targets set out in the subsequent Egan review (Egan 1998).
- Procurement on the basis of price as the only choice criterion was unlikely to secure best value.
- Overall value for money should be assessed on the basis of whole-life cost not initial capital cost.
- Project delivery mechanisms should encourage innovation by all concerned in the search for more flexible and cost-effective project delivery mechanisms.
- Delivery mechanisms should incorporate partnering principles supported by good risk and value management.

These basic principles are reiterated in the government's Construction Strategy (Cabinet Office 2011). The imposition of the best value regime gave rise to seismic changes in the way construction work is procured and led directly to the development of projects based upon partnering, target cost contracts, the use of 'pain and gain' share strategies, benchmarking and key performance indicators to promote continuous improvement.

Procurement rules: European Union principles and procedures

Non-discrimination and transparency: the role of the EU

A key objective of the original European Economic Community, enshrined in the Treaty of Rome and confirmed in the Maastricht Treaty, was the expansion of trade both within the community and by community members with the rest of the world.

It was believed that achievement of this objective required the creation of an internal market which presented a 'level playing field' for all community members and, accordingly, the European single market was finally established in 1993. The primary aim was to create 'an area without frontiers in which the free movement of goods, persons, services, and capital is ensured'. This in turn brought forward the need to abolish restrictive trading practices, to encourage the free movement of capital and labour within Europe, and to establish closer ties between the community members. In economic terms, it was envisaged that harmonisation of the market in this way would bring about benefits to the public sector amounting to around 0.5% of GDP, or 20 billion European Currency Units (the ECU is a standard accounting unit applied within the EU to overcome the problem of members trading in different currencies) (Commission of the European Communities 1988).

Public sector construction output has historically constituted a significant component of the total value of public sector procurement and the economic significance of the construction industry has therefore ensured that it has received considerable attention. Harmonisation of the procurement of public sector construction works and services has thus long been seen as a major plank in the successful achievement of a common market.

The principal objective of the European Commission in attempting to regulate the procurement of public services and works has consistently been to eliminate unfair competition within the European Union through the establishment of a legal framework which abolishes: (1) discrimination on the grounds of nationality and (2) preferential treatment through the favouring of 'national champions' or the use of narrowly defined national standards.

Regulation has therefore concentrated purely upon the demand side of the market, by attempting to force all purchasing authorities into a consistent common procurement framework whilst completely ignoring the supply side of the market place. This strategy is not without its critics (see for example the work of Bovis (1998)).

EU Directives

Problems of disparity between the public law systems of the members of the EU meant that simply introducing primary legislation to regulate procurement issues would have been highly unlikely to achieve the required result, and the Commission therefore introduced the measures as Directives. EU Directives are unique legal instruments which carry binding force within each member state to which they are addressed, and which must, under the EU 'rules for membership', be incorporated into member states' legal systems. They are, however, highly flexible in terms of their implementation. In essence, although the Directives specify the objectives to be achieved and the time frame within which they must be brought into force, individual states are allowed considerable freedom to determine the precise form in which the required legislation is incorporated into their own individual legal processes.

The EU has published a number of Directives to regulate public sector procurement, the primary objective of which is to ensure that the European market for public sector works and services operates in an acceptably open and transparent

way without favouritism or discrimination on the grounds of location, race or nationality. In addition to the Procurement Directives, other Directives that have a major impact upon the construction industry are those concerned with: (1) the free movement of labour and mutual recognition of qualifications and (2) the harmonisation of construction standards and specifications.

It must be clearly understood that the EU's purpose in introducing the legislation is solely concerned with the need to uphold the functioning of the single European market. The legislation is not intended to ensure that customers necessarily get maximum value for money for any specific project. Indeed questions have been raised as to whether compliance with the rules aids or obstructs public sector clients in this respect, either with individual projects or across their construction programmes as a whole.

The Directives concerning public procurement have as their prime objective the co-ordination of national procedures for the award of public contracts. However, the intention is not to prescribe every detail of a rigid procurement process to which everyone should conform, but rather to put in place sufficient safeguards to enforce the common market principles of fair trade, transparency and non-discrimination.

The procurement Directives collectively and individually have at their core three fundamental principal requirements:

(1) EU-wide advertisement of all public contracts above a predetermined threshold value.
(2) Harmonisation of technical specifications such that discrimination on the grounds of national standards alone is abolished.
(3) Consistent application of transparent and objective criteria in tendering, assessment and award procedures.

The principal Directives are considered below.

The Supplies Directive and amendments

Public supplies contracts are defined as:

> contracts for pecuniary consideration concluded in writing between a supplier (natural or legal persons) and public authorities, which include the state, local and regional authorities and bodies governed by public law, having as their objective the delivery of goods.

The Works Directive and amendments

Public works contracts are defined as:

> contracts for pecuniary consideration concluded in writing between a contractor (natural or legal persons) and public authorities, which include the state, local and regional authorities and bodies governed by public law, having as their objective the completion of works/construction projects.

Note that the Works Directive includes management contracts for the design and execution, or the execution only, of works projects. The relevant requirements were enacted in the UK by the Public Works Contract Regulations 1991. For construction projects, 'contractors' comprise any legal or natural person engaged in construction activities whilst 'contracting authorities' include all bodies governed by public law; the UK Government has decided that this should include publicly funded bodies responsible for social housing, such as housing associations and arm's length management organisations (ALMOs). Note, however, that the WTO provisions define 'public authorities' simply as central government and its agencies.

Note also that a project does not have to be completely funded by the public sector. For certain civil engineering work, hospitals, sports, recreation or leisure projects, school or university buildings and administrative buildings there is an obligation to comply with the Directives in respect of any contracts that are directly subsidised by more than 50%. However, the rules only appear to apply to direct financial subsidies. Projects that benefit from subsidies in kind, for example the free provision of land, are excluded.

There are a number of other exclusions including:

- Works contracts in the defence sector that are declared to be secret or where the state's basic security interests may be compromised.
- Contracts awarded under certain international agreements or in accordance with the established procedures of an international organisation such as NATO.
- Concession contracts, which are subject to a special procedure and only need to comply with the regulations for advertising.

Note also that this Directive does not attempt to create a common public procurement procedure within the EU; instead it establishes a common set of rules to govern the advertisement and notification of qualifying projects, tendering procedures, selection of contractors and the award of contracts.

The Utilities Directive and the Utilities Remedies Directive

In construction terms, these Directives are concerned with public sector supplies and works contracts in the water, energy, transportation and telecommunications sectors, and with ensuring that affected parties can seek redress in cases where the Utilities Directive has been breached.

The Utilities Directives are in many ways the most complex. In theory, construction works and services in these sectors could have been covered by the Works and Services Directives but the large number of private sector operators in this area would have meant that the definition of 'contracting authorities' would have become unacceptably broad. On the other hand, the public service nature of this sector of the market meant that to leave it unregulated was not acceptable either. Hence a separate directive was developed simply to control the utilities. Some major problems with this are as follows:

- The legal status of many public utility undertakings is often unclear in that they may act both as statutory undertakings and as private companies. The nature of

their contractual obligations may therefore vary depending upon whether or not they are acting in the capacity of statutory undertaker.

- There are many exemptions from the Directives including, for example, radio and television broadcast systems; bus, rail and similar transport operating companies: research and development organisations; companies engaged in prospecting for gas, oil, coal, etc.; and utility services companies supplying less than 30% of their output to the public.

The Services Directive

Public services contracts are defined as:

> contracts for pecuniary consideration concluded in writing between a service provider (natural or legal persons) and public authorities, which include the state, local and regional authorities and bodies governed by public law, having as their objective the provision of services, as defined in the United Nations Product and Service Classification nomenclature.

This classification incorporates virtually everything, including 'design contests' such as architectural competitions with or without prizes.

Services are classified into priority and non-priority services. Priority services are subject to the full rigour of the public procurement regime, whereas non-priority services are subject only to the basic rules of non-discrimination and publicity of the results of the award. Maintenance and repair services, architectural, engineering, urban planning, landscape design and associated scientific and technical consultancy services are classified as priority services. Note that management contracts for the design and execution of projects are excluded and fall under the scope of the Works Directive.

Specific exemptions relating to the construction and property industries include:

- Contracts for the acquisition of land, existing buildings or other non-moveable assets or rights therein. Note, however, that any associated financial services contracts are subject to the regulations.
- Contracts for arbitration or conciliation services.

The Public Sector Directive

The Directives described above were heavily criticised for their complexity, and the fact that certain provisions, for example framework agreements, were included in some Directives and not in others. Following an extensive consultation period, new Directives were published in April 2004, with the provision that they must be transposed into national legislation by 31 January 2006.

The major revision included in the new provisions was the consolidation of the three previous Directives for public works, supplies and services into a single new text termed the Public Sector Directive. Many of the basic provisions in the previous Directives, including overall methodology, timescales and thresholds, remained in

place, although the actual threshold values and timescales were altered by the new provisions. The new Directive did, however, introduce major new provisions in several specific areas relevant to construction including:

- Framework agreements.
- Central purchasing bodies.
- Electronic auctions.
- Sustainability and environmental issues.

In addition, a new tendering procedure, termed competitive dialogue, was introduced to supplement the existing open, restricted and negotiated procedures. These issues are considered in detail in the remainder of this chapter.

Tendering

All qualifying public sector construction projects, and the procurement of services to the public sector, must be advertised (free of charge) in the *Official Journal of the European Union* (OJEU). Individual contract notices are required for each project as it arises and timescales are specified for various phases of the tendering process. The timescales are considered in detail later. Contracting authorities may, however, publish a single prior indicative notice (PIN) giving an annual forecast by category of service of all their qualifying requirements for the following 12 months; where this is done, the timescales for individual schemes may then be reduced.

Advertisements must include basic details of the project, the form of contract to be used, the identity of the employer and information such as key dates, an estimate of the likely cost, details of the tender award criteria and the documentary evidence that will be required in order to make the necessary financial and technical appraisals. Once a tender has been accepted, a tender award notice must be published within a specified time. Standard model forms of advertisement and tender award notification can be downloaded from the EU website.

Note that the regulations do not prohibit authorities from advertising projects whose value is below the threshold in the OJEU if they wish to do so in order to improve the competition by seeking tenders from European sources. Provided the project value is estimated to be at least £66 000, authorities may advertise the project through the issue of a voluntary notice.

In addition to the printed OJEU, the EU offers a tenders electronic daily (TED) service. This subscription-based service provides an on-line database of current contract notices updated daily.

Value thresholds

Only projects in excess of certain specified values are subject to the EU requirements. EU threshold values are expressed in euros and are reviewed every two years. The UK Treasury calculates annual conversion to sterling values, which are available on the Treasury website from 31 January each year.

Note that, in general, the rules apply to single contracts where the value exceeds the threshold. It is, however, illegal to subdivide a large project into a number of small contracts simply to avoid the regulations. Where a contract is let in this way, the value of all of the separate contracts must be added together in order to ensure that the rules are not circumvented, and the general principle is that each of the separate contracts must be let in accordance with the rules.

A typical example would be the use of a construction management procurement route where the project as a whole is subdivided into a series of work packages, each of which is let as a separate contract. Similar arrangements occur in a number of European countries, the most common being variations of the French *lots séparés* approach. In this case, the criterion for assessing whether or not the project falls within the regulations is the value of the whole project not the value of each of the individual packages. It is, however, recognised that the use of this type of approach may give rise to some small contracts which it would plainly not be sensible to advertise in a pan-European arena, and the regulations make special provision that such work packages may be exempted provided that the total of all such contracts in any specific project does not exceed 20% of the estimated value of the project as a whole.

Tendering procedures

From January 2006, the Public Sector Directive has permitted open, restricted and negotiated tendering arrangements and the use of competitive dialogue. However, the Directive limits the circumstances in which the restricted and negotiated procedures may be used for the procurement of works. The Directive does allow prequalification of contractors, leading to competitive tendering on the basis of a selected list.

Open tendering

Open tendering should, wherever possible, be the norm since it maximises competition. Contracting authorities are, however, free to opt for restricted procedures if they wish, provided that the decision can be justified on the grounds of the nature of the work and the administrative cost involved in assessing tenders. Construction work is therefore most often let under the restricted arrangements.

Restricted tendering

Restricted tendering permits contracting authorities to invite only specified contractors to submit final tenders. The process takes place in two rounds. In the first round, all interested contractors may express an interest and from this group the contracting authority may then select a smaller number of contractors to submit detailed tenders. In principle, the minimum number of bids invited is five, but there may be occasions when a smaller number can be justified.

Negotiated tendering

Negotiated tendering, where a contracting authority negotiates directly with one or more bidders, is permitted by the Directive, but is subject to a more rigorous set of

procedures and conditions. Negotiated procedures may take place with or without prior notification.

Negotiation with prior notification must be justified on the grounds of irregular or unacceptable tenders received in response to an earlier call for bids. In this case the selection process takes place over two rounds. In the first round, any interested contractors may submit an expression of interest and from this pool the contracting authority chooses one or more companies with whom to negotiate. In principle, the minimum number of firms passing through to the second round is three, provided that there are sufficient acceptable firms arising from the first round.

The regulations governing a contracting authority's ability to negotiate directly with a single firm with no prior notification are very restrictive. The cases where single tendering is allowed are limited to:

- Where no suitable supplier was found in a previous open or restricted tender because no, or only irregular, bids were received, or because the bids submitted were unacceptable under national provisions that are consistent with the Community rules on public sector procurement. There is also a proviso that the original terms of the contract (e.g. financing, delivery dates and the technical specifications of the products) are not substantially altered. If these conditions are not met then the whole procedure must be recommenced with a re-advertisement of the tender.
- Where, for technical or artistic reasons, or because of the existence of exclusive rights, there is only one supplier in the Community able to supply the product.
- Where the product is manufactured purely for the purposes of research, experiment, study or development.
- In cases of extreme urgency resulting from unforeseen circumstances not attributable to the action of the purchaser, where the time limits laid down in tendering procedures cannot be observed.
- For additional deliveries by the original supplier required either as part replacement of regular supplies or equipment, or to extend existing supplies or equipment, where a change of supplier would compel the contracting authority to purchase equipment having different technical characteristics which would result in incompatibility or disproportionate technical difficulties of operation or maintenance.
- For goods quoted and purchased on a commodity market in the EU.
- Where supplies are classified as secret or where their delivery must be accompanied by special security measures under the law of the member state of the purchaser, or where the protection of the basic interests of that state's security so requires it.

Competitive dialogue

Competitive dialogue is intended for use when contracting authorities believe that use of the open or restricted procedure will not allow them to award a satisfactory contract. Examples of such a case may include particularly complex contracts,

where authorities may know what their needs are, but may be unable to decide the most appropriate technical, legal or financial solutions. Contracting authorities may also wish to encourage innovative solutions or may be unable to objectively assess what the market has on offer.

In cases such as these a competitive dialogue between authorities and providers may be useful to identify the most appropriate solution. The Commission also envisaged the competitive dialogue procedure being used for many public private partnerships where contracts are complex and the legal and financial structure cannot be determined without dialogue with suppliers.

The procedure works by allowing contracting authorities to call for proposals on the basis of a functional specification of their needs. Submitted proposals are then assessed, following which authorities may choose to enter into a dialogue with a number of selected providers. The purpose of the dialogue is to enable authorities and bidders to achieve agreement over precisely what is to be provided; once this position is reached, potential providers are invited to submit tenders. Tenders are then assessed in the normal way using the assessment criteria specified in the original contract notice.

Note that the competitive dialogue process may be carried out in successive stages in order to progressively reduce the number of potential solutions by applying the particular award criteria, and clarification may be sought by either party either before or after the final assessment, provided that this does not distort competition and is not discriminatory.

The procedure may only be used with the 'most economically advantageous' award criteria and a statement of the award criteria to be used, together with the statement of the contracting authority's needs, must be included either in the contract notice or in the accompanying documentation. Where a prior indicative notice has been issued, then use of the competitive dialogue procedure should be considered before authorities consider use of the negotiated procedure.

Framework agreements

Framework agreements in construction are typically used in the case of continuing programmes of work where the contracting authority wishes to enter into an arrangement with one or more contractors to set up a kind of standing offer under which packages of work may be procured at some time in the future but where the scope, value or timing of the work packages cannot presently be defined with any degree of accuracy. The primary advantage of framework agreements is that the contracting authority can greatly reduce the transaction costs that would otherwise be incurred in a number of different tendering exercises.

Although only the Utilities Directive mentioned framework agreements, their use became well established. This was recognised by the Commission in the Public Sector Directive. Framework agreements in the context of the Directive are agreements to agree, and they may be used in conjunction with any procedure. They are not therefore contracts in themselves, but, primarily in construction contracts, set out the terms of price and quality under which future contracts, which will be

subject to EU rules, will be formed at the call-off stage. Note that this does not mean actual prices should be fixed, but merely that the framework should be capable of establishing a *pricing mechanism*. It should also be possible to establish the scope and types of goods and services that will need to be called off.

The UK has, in the past, taken the view that the only sensible approach to such agreements is to treat them as if they are contracts in their own right and to apply the EU rules accordingly. The usual practice has therefore been to advertise the framework itself, in the OJEU, and to follow the EU rules for selection and award. The framework therefore establishes the fundamental terms on which subsequent contracts will be awarded with an acceptable degree of transparency, and removes the need to advertise and apply the award procedures to each call-off under the agreement. This practice is now essentially confirmed in the Public Sector Directive; normal timescales and threshold values apply, but there are some important points to note, as set out below:

- Framework duration: The duration of a framework agreement is limited to four years unless there are exceptional circumstances that would allow a longer term to be justified. In most cases this will depend upon the subject matter of the framework agreement. It has been proposed by some that framework agreements for construction projects that are in themselves of comparatively long duration might meet this criterion, but the issue of what constitutes 'exceptional circumstances' has not, at the time of writing, been definitively stated. The contract notice must state the planned duration of the framework.
- Number of framework suppliers: Where there is only one framework supplier, work may be awarded directly provided the terms of the framework agreement are applicable. Where a single appointment has not been made, then the minimum acceptable number of framework providers is three, or the number passing the selection criteria if fewer.
- Call-offs: Where only a single framework supplier is appointed, or where the framework is sufficiently precise to allow one particular supplier to be identified to fulfil a particular need, then the work can be called off from that supplier. If, however, there are a number of framework suppliers all of whom could meet the need then a mini-competition is required to identify the most appropriate supplier.
- Framework conditions: In general the original framework terms and conditions must be used to award work. If, however, in a particular case, there is the need to refine or supplement the original conditions, a further mini-competition will be necessary involving all those companies in the framework who are capable of providing the goods or services. Existing framework suppliers must be consulted in writing and bid periods must be reasonable, taking account of the particular circumstances. The award criteria for the mini-competition must be based on the criteria used to set up the original framework agreement.

Framework agreement call-offs can extend beyond the life of the framework agreement itself provided that the period is reasonable and is consistent with the trend established throughout the life of the framework agreement itself.

However, there is no obligation on contracting authorities to place any work with framework suppliers. They may use the framework to procure specific parcels of work if they wish, but they are at liberty to go elsewhere, provided that if they do they then comply with the normal EU rules to place the contract for the work.

Note also that the Public Sector Directive explicitly recognises that contracting authorities may purchase through central buying organisations. Contracting authorities that act as central buying organisations (for example consortia of housing associations or local authorities) may therefore set up framework agreements on behalf of other contracting authorities. The contracting authorities entitled to call off under the terms of the framework agreement must, however, be identified in the documents used to set up the agreement. Authorities permitted to use the agreement can be named or a generic description may be used, for example government departments, local authorities, utilities or all-UK contracting authorities.

If the framework establishes contractual rights and obligations, for example by guaranteeing a specific volume of work to a supplier, then it is a framework *contract* not a framework *agreement* as defined by the Directive. Framework contracts are permissible and must be treated as any other contract for the purposes of the EU rules.

Electronic auctions

Electronic auctions are on-line auctions in which selected bidders submit offers electronically against the purchaser's specification. Such systems have been used in industries such as oil exploration and development, but their use in mainstream construction has, to date, been limited. They do, however, offer substantial promise for certain types of construction work provided that the various elements of the auction can be reduced to numerical values. Electronic auctions may also be used on the reopening of competition within a framework (see 'Framework agreements' above).

Electronic auctions are supported by the Public Sector Directive for goods, services and works, and any of the basic tendering mechanisms may be used. It is, however, a requirement of the Directive that all communication following and including the invitation to prequalified bidders to submit new prices or values must be electronic and instantaneous. The Public Sector Directive discourages the conduct of electronic auctions for intellectual services.

Where contracting authorities elect to use the 'most economically advantageous' selection criteria, the invitation to participate must be accompanied by the outcome of a full initial evaluation of the first expressions of interest and the mathematical formula to be used in the auction to determine automatic re-rankings. The formula used must be based on the declared weightings which, if they were initially expressed as a range, must be reduced to a single value. Separate formulae must be provided for variants where these are permitted.

The auction process is basically carried out in two stages:

- Stage 1: A contract notice is placed, inviting expressions of interest in accordance with the selected tendering procedure, setting out the criteria against which they will be assessed. The contract notice must state that an electronic

auction is to be held. All expressions of interest are evaluated and admissible bidders then proceed to stage 2.

- Stage 2: Electronic invitations to participate in the auction are sent to the bidders including the criteria to be subject to auction. It is self-evident that, for electronic auctions to work effectively, only criteria that can be expressed as numerical values suitable for incorporation within a formula can be used. The invitation should also set out:
  - — the assessment formula;
  - — details of the process and the conditions of bidding, including arrangements for bringing the auction to an end. The most common arrangement for closing the auction is to set a fixed closing date and time, but other arrangements, for example closing the auction when minimum price difference criteria between consecutive bids are reached, are also permissible;
  - — connection details;
  - — date and time of the auction. Note that the auction cannot start sooner than two working days after transmission of the invitation.

Bidders then bid electronically against each other on all of the bid criteria. During each phase of the auction, sufficient information to enable bidders to ascertain their relative ranking in relation to the predefined selection values must be communicated instantaneously. Other bidders' prices and values may also be communicated provided this is stated in the specification and provided that they remain anonymous. As an alternative, the simple number of participants bidding may be given. Bidding continues until the conditions set for closing the auction are reached.

Sustainability and environmental issues

The Public Sector Directive addresses a number of issues relating to sustainability and the environment. Those of particular interest in construction are discussed below.

Specifying sustainability requirements and the selection of tenderers

Relevant environmental and social requirements may be specified in the tender documents and used in the assessment of tenderers provided that:

- They are sufficiently well defined to allow bidders to understand the requirement and for the factors to be appropriately assessed during contract award.
- They are compatible with Community law.

Typical environmental issues may include things like the need for contractors to be ISO 14000 accredited, specification of environmentally sustainable materials or the incorporation of appropriate principles within design and build schemes. Typical examples of social issues within construction contracts which have been used in the past include requirements to promote the use of local labour, to provide local training opportunities or to provide community facilities, but contracting authorities need to be careful that such provisions do not fall foul of EU antidiscrimination legislation.

Environmental and social issues may also be relevant to the tenderer's track record, grave misconduct findings and technical capacity and ability.

Sheltered workshops

Provided that appropriate provision is made in the contract documentation, relevant contracts or the supply of materials may be limited to sheltered workshops, employing mostly disabled people unable to gain normal employment. At the time of writing, work is under way to define the term 'sheltered workshops' more precisely in order to avoid the possibility of discrimination.

Use of variant bids

Contracting authorities are permitted to encourage tenderers to submit a range of offers through use of the provision for variant bids, which may include comparison of different levels of environmental (and other) performance related to the subject matter of the contract. Minimum requirements including environmental and other criteria must be specified in the tender documentation by the contracting authority, and higher standards of performance are then specified in the form of variants against which a range of offers can be generated. The 'most economically advantageous' award criteria must be used.

Use of contract award criteria

The 'most economically advantageous' contract award criteria may include environmental and other characteristics provided that these are linked to the subject matter of the contract and are economically advantageous from the point of view of the contracting authority.

Timescales

The EU regulations stipulate mandatory minimum time periods for various key activities in the tendering process. Accelerated procedures may be used in certain circumstances where the time limits laid down in tendering procedures cannot be observed. Primarily these will be cases of extreme urgency resulting from unforeseen circumstances not attributable to the action of the purchaser. The minimum time periods that apply under the Public Sector Directive are shown in Table 4.1.

Award procedures

All tenderers who meet the specified prequalification criteria must be considered to be suitable for tender award unless there are grounds for exclusion. Acceptable grounds for exclusion are few, and the principal ones are:

- Any supplier who:
  (a) is bankrupt or being wound up, has ceased or suspended trading, or is operating under court protection pending a settlement with creditors, or is in an analogous situation arising from national proceedings of a similar nature;

Table 4.1 Public Sector Directive timescales.

Procedure	Text	Days
Open	Minimum time for receipt of tenders from date contract notice sent	52
	Reduced when a PIN is published (subject to restrictions) to, generally…	36
	and no less than…	22
	Electronic transmission reduces all of the above by 7 days so that 52 becomes…	45
	and 36/22 becomes…	29/22
	Full electronic access to contract documents reduces 52 by 5 days so it becomes…	47
	This can also be added to the reduction for 52 days to 45 for electronic transmission so it can become…	40
Restricted	Minimum time for receipt of requests to participate from the date the contract notice is sent	37
	Electronic transmission reduces the 37 days by 7 days so it becomes…	30
	Minimum time for receipt of tenders from the date the invitation is sent	40
	Reduced when a PIN is published (subject to restrictions) to, generally…	36
	and no less than…	22
	Full electronic access to contract documents reduces 40 days by 5 days so it becomes…	35

(b) is the subject of proceedings for bankruptcy, winding-up or court protection pending a settlement with creditors, or national proceedings of a similar nature;
(c) has been convicted of an offence concerning his or her professional conduct;
(d) can be shown by the contracting authority to have been guilty of grave professional misconduct;
(e) has not fulfilled obligations relating to payment of social security contributions under the statutory provisions of his or her country of residence or of the country of the contracting authority;
(f) has not fulfilled obligations relating to payment of taxes under the statutory provisions of his or her country of residence or the country of the contracting authority;
(g) has been guilty of serious misrepresentation in supplying information about his or her current standing or past record or his or her financial or technical capacity.

- Where the burden of proof rests with the tenderer (i.e. in all of the above cases, except (d) and (g)), the procurement authority is bound to accept as satisfactory evidence:
  - for (a), (b) and (c), the judicial record on the supplier or an equivalent document issued by a judicial or administrative authority in the supplier's country of origin or residence showing that none of these cases applies;
  - for (e) and (f), a certificate issued by the competent authority in the member state concerned.

If such documents are not issued by the country in question, or if they do not cover all the cases referred to, then the supplier may instead produce an affidavit sworn before a judicial or administrative authority, notary or any other competent authority in the member state concerned.

The regulations permit tenders to be awarded on the basis of either lowest cost or most economically advantageous tender (MEAT). Tenders awarded in this way will take into account a wide range of factors, but they must all be stated either in the advertisement or in the tender documents. The EU and the European Court of Justice (ECJ) have both consistently supported the view that the range of criteria permitted to be used will be drawn very widely.

Unexpectedly low tenders cannot be rejected without proper enquiries being made to establish the validity of the price quoted. The regulations include a non-exhaustive list of example criteria that might be considered, including price, time and technical quality. Life-cycle cost may also be used as a criterion in the case of projects let on the basis of most advantageous solution.

Authorities are required by the Public Contracts Regulations 2006 to apply a compulsory waiting period (the Alcatel period)[1] of 10 or 15 working days, depending upon whether the notification is sent by e-mail or by post, between their decision to award a contract and the date on which the contract is signed in order to allow unsuccessful bidders to seek remedies if they are dissatisfied with the procurement process. It is illegal to enter into a contract before the end of the standstill period. Once a contract has been awarded for either works or services, a written tender report must be prepared showing the contract details, names of the tendering contractors, reasons for selection and rejection, name of the successful contractor and the reasons for the tender award. This report must be submitted to the EU if required.

The Remedies Directive

This major new Directive was introduced into English law through the Public Contracts (Amendment) Regulations 2009, which came into force on 20th December 2009. The Directive provides remedies for unsuccessful bidders in the event that a contracting authority has committed breaches of the procurement rules. Additionally, even if a contract has been awarded after the standstill period, unsuccessful bidders may seek to have the contract declared ineffective by the courts through a Declaration of Ineffectiveness.

It is, of course, good practice to offer all unsuccessful bidders the opportunity of a face-to-face or telephone debrief, but the Remedies Directive imposes an explicit duty to debrief all unsuccessful bidders upon completion of the assessment of the pre-qualification submissions. It also imposes new requirements in respect of the

[1] Named after Case C-81/98 *Alcatel Austria and others, Siemens AG Österreich and Sag-Schrack Anlagentechnic AG v Bundesministerium für Wissenschaft und Verkehr*.

letter contracting authorities must send to every unsuccessful bidder. Such a letter must explicitly set out the award criteria and also give:

- The reasons for the decision.
- The scores of the winner and the relevant loser.
- The name of the winner.
- Precise details of the standstill period.

If it is found that unfair or discriminatory procedures have been used, then aggrieved bidders may sue for damages in the European Court.

Enforcement of EU Directives

Effective enforcement of the EU Directives is plainly a fundamental requirement if the common market is to work as planned. Accordingly the EU framework includes the Compliance Directives which state that member states must ensure that any infringement of public procurement provisions must be effectively and expeditiously reviewed. Anyone who risks being harmed by the alleged infringement and who has an interest in obtaining a public supply or works contract is entitled to seek a review before national courts. The EU has also enforced compliance with the procurement Directives by withdrawing Community funds from defaulting member states, an action that is supported by a decision of the ECJ.

It has also been held, by the ECJ, that failure of individual states to implement Directives may give rise to actions for compensation by individuals. *Francovitch and Bonifaci* v *Italian Republic* (cases 6/90 and 9/90) provided that, in order for such a claim to succeed:

(1) The result of the Directive must be to grant rights to an individual.
(2) The specific rights must be identifiable in the Directive.
(3) There must be a clear link between the failure of the state to implement the Directive and the damage caused.

The EU has taken out proceedings in the ECJ against a number of member states accused of non-compliance with the procurement directives. Of particular interest is the Dundalk Pipeline case (*Commission* v *Ireland*, case 45/87) which concerned the incorporation in a contract of particular Irish specifications. The Court found that this was in contravention of the Treaty of Rome in that compliance with the contractual provisions would effectively exclude non-Irish contractors. It was considered that the inclusion of the words 'or equivalent' in the specification would have been sufficient to comply with the regulations.

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5 Project initiation

Introduction

Construction projects are responses to business needs identified by clients. They tend to have 'one-off' characteristics with a clear purpose, clear beginnings and clear ends in the eyes of the client and constraints within which they have to be executed.

The decision to construct a new building is usually taken as part of a strategic review that has also considered alternatives such as renting, leasing, extending or adapting existing property.

Male (2002) referred to the corporate value of a project aligned with business mission and the business level value of a project aligned with project needs, as delivering primary drivers. The development of a business case is an essential activity for project success. It provides justification for the project in terms of its alignment with the objectives of the organisation within the framework of associated risk; it also evaluates viability and provides the basis for establishing the time, cost and functional parameters for the project. It will also address whether the project is affordable within the financial structure of the business.

The business case is an evolving document throughout the procurement processes involved with realising the project outcome. It starts as a high-level summary of possible options to meet the business need, developing into a business case with indicative costs and maturing as project details are developed. The following questions should be addressed as part of business case development:

- Strategic fit – how does the proposed project meet the organisation's objectives, anticipated markets and current priorities?
- Payback – how will the project pay back the client's capital investment?
- Options – has a wide range of options been explored?
- Achievability – can this project be achieved with the organisation's current capability and capacity?

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- Affordability – is the budget available sufficient to enable the delivery of a suitable project?

These five key aspects of the business case are considered below.

Strategic fit

This aspect of the business case addresses how the proposed project fits within the client's existing business strategies or strategic plans. It will identify the need for the project; its contribution to the organisation's objectives; the appropriateness of its timing; the key benefits to be realised; the anticipated key risks; and those elements of the project which can be identified as critical success factors. Key aspects of the business case include whether the project is to contribute to functional efficiency, to provide a solid investment over time or to contribute to the fixed asset base of the client company.

Project initiation stems from a belief that construction is the solution to a problem or is in itself a profitable venture, having considered the available options. Construction projects are initiated within a local or national economic environment and there is often a causal link between the construction activity and the economy. For example, where a buoyant economy stimulates property transactions, construction can be a way of seeking to benefit through development. Construction itself can also stimulate economic growth, particularly where the construction of infrastructure such as roads, schools and hospitals is required to enable that growth to occur. For example, RICS (2010) estimated that every £1 spent on construction output generates an additional £2.84 of total economic activity.

Other solutions should be considered as part of the development of the business case for the specific project, including renting, leasing, buying an existing facility and extending or altering existing premises. Each of these will affect the client's corporate plans in different ways and may not offer the solution achievable by new construction, but they should be considered at an early stage in project development.

Most clients tend to be corporate organisations, large or small. Numerically, small-sized clients dominate, but in terms of expenditure on construction the minority of larger clients are responsible for a significant proportion of total expenditure. Only relatively few construction clients procure buildings regularly or may be considered to be experienced clients (Business and Enterprise Committee 2008).

Payback

This aspect of the business case considers the proposed expenditure on the project against the value of the completed project to the client. In some cases the value contributed to a client will include improved functional efficiency or increased asset value greater than initial project cost and these aspects can be considered

against the potential risk of carrying out the project. The client will normally be able to calculate the net benefit to the business and the resulting budget available from the expected asset value added.

Corporate worth is a concept that accepts that 'value' can be seen to exist in more than one way. If a construction project is part of a business expansion programme or one targeted at improving business efficiency then its true worth will be to do with greater or better productivity. If the purpose is to build and sell on for a profit then its worth may relate to its market value.

Sometimes the construction of a new facility will also enhance the written down fixed assets of a company and strengthen its balance sheet. Cheaper and more easily obtained corporate borrowing will then be consequently available at times of cash-flow need. As an investment, commercial or residential property has also shown itself to be a largely reliable source of continued income. Thus corporate worth can be related to market value but should also be closely linked to corporate strategy and business need.

No project can logically proceed unless a specific business case has been developed justifying the project's viability and identifying the risks associated with its initiation. Typically, where a project is related to market value, that value should be sufficiently greater than the cost of the project in order to return a profit that reflects the inherent risk of the development process. Where greater or more efficient productivity is the aim then quantification and evaluation of the business gain will be required to justify the commitment being made. As part of this process the period over which the project will pay back its cost is an issue. This will typically be 6–20 years dependent upon the level of risk and stability of the particular market.

Following the verification of business needs and the assessment of options a more detailed business case for the project should be developed to evaluate payback. This part of the process will require return on capital investment to be considered against anticipated benefits and the effects that project realisation will have upon the client organisation. This will require evaluation of the likely benefits to operational efficiency or associated balance sheet benefits of the facility being considered. These considerations will help both to verify the need for the project and to set down initial assessments of physical and financial impacts of the project on the client's current business. Independent advice from construction professionals from this early stage should be sought in relation to the costs of the options being considered, the likely programme for the projects and any real estate values where these are part of an investment appraisal.

Consider a very simple example: a client owns a factory producing 20,000 units per annum at a unit cost of £1000. In addition overhead costs amount to £2 million annually. Resultant profits are £4 million annually. He has assessed improved markets for his product up to 30,000 units per annum which will mean additional overheads of £800,000 per annum, but has estimated that the increased production associated with a more efficient factory layout will result in a decrease in unit costs to £800 per unit.

Current costs: 20 000 @ £1000	20 000 000
Overheads	2 000 000
	22 000 000
Profit	4 000 000
Turnover	26 000 000
Projected costs for more units 30 000 @ 800	24 000 000
Overheads	2 800 000
Profit at current level	4 000 000
Additional profit: 30 000 × £200	6 000 000
New turnover	36 000 000

The additional profit anticipated on the greater output will generate £6 million annually gross of corporation tax, which can be adjusted by present value calculations to enable strategy decisions to be made. Nonetheless on the basis of, say, a six-year payback, the client may wish to expend some £20–30 million on the development of the new facility depending on his taxation position, any capital allowances achievable and any tendency for caution. After the payback period he will then realise the additional profits as well as having any additional fixed asset value on the balance sheet. This is an oversimplified example to illustrate how the initiation of a new facility can be beneficial but it is incomplete – the impact of the expenditure on the company's existing financial structure will need to be considered. Loans taken out to pay for the new building will need to be repaid and the use of company reserves, which are likely to be part of the funding package, will change the financial characteristics of the company.

A developer, on the other hand, does not identify value in terms of what a new facility will do to improve future efficiency or productivity. In this case, it is the predicted future demand for office space, retail space or warehouse space which will be the motivating factor. If there is demand then the developer will be able to charge rental for the proposed premises for extended periods of time on the basis of rental agreements or leases. Once the building is fully let it will be attractive to investors on the basis of the building's long-term worth and income flow from rental agreements or leases. The developer will then realise a profit from the development.

The income flow will be attractive to investors who, if they buy the building from the developer, can realise an on-going return for their investment as well as an asset which should, over time, grow in value. In addition, where the demand for such property remains as good or better, increased rentals can be charged. The value of a building to an investor will therefore be related largely to current and predicted future rental income.

Establishing the likely value of the completed building to future potential purchasers is very important to a developer. Without this, the developer will be unable to forecast whether constructing the building will be profitable – the developer will

have to cover all associated costs including buying the land, designing and constructing the building, and meeting all funding costs before a profit can be realised.

There are a number of ways of calculating the capital value of a development; all take account of its location, the anticipated future demand for the space and potential rental values. An investor considering purchasing the development will consider these factors as well as competing developments and local economies in order to evaluate the benefits and risks of purchase. Typically the value of such a building will result from a multiplier of the total rental income. The multiplier will reflect all these factors and will often be expressed as a percentage which represents the percentage of total value received in rental each year (the yield). For example, where annual rental is £90,000 and it is considered that the building yields 8% of its value, then its value is £1,125,000 (90,000 ÷ 8 × 100).

The yield for a potential development is driven both by local market factors and national economic factors. The developer will not establish the yield, it will be identified by commercial property agents acting for the investor. Developers will have an idea of rents and yields but will themselves consult with commercial agents to enable them to carry out their calculations with some confidence.

Consider a developer building an office block on land adjacent to a town where outline planning permission has been granted for such a development. The land is to be auctioned in the near future. How much can the developer afford to pay for the land and achieve a 20% profit on the cost of the development? A typical but very approximate example is shown below. Plainly the amount available to pay for the land and its associated costs will be the residual when costs are deducted from anticipated value. Maximising the lettable space within the building design whilst at the same time minimising construction cost within acceptable specification parameters will plainly affect both value and cost – there is, therefore, an inherent incentive to maximise the efficiency of the design so that the residual left to buy the land in competition with other developers increases.

Initial concept design indicates that 8000 m^2 of office space for let is achievable at an annual rental of £180/m^2. (8000 m^2 is the net lettable area.)

Annual income	1 440 000
Yield at 8% total value	18 000 000
Deduct	
Construction costs @ £1100/m^2 x gross floor area	9 900 000
Consultants' fees for construction @ 9%	891 000
Cost of funding construction at 6%	600 000
Contingencies	500 000
Allow for inflation	350 000
Total construction costs	12 241 000
Developer's profit 20% on costs	2 448 200
Available for land purchase (including fees and funding costs)	3 310 800

This may result in the developer being able to bid up to £2.7 million for the land and be sure to cover all costs – more if there is tight competition.

Assessment of options

Construction is not a simple solution. It requires the successful co-ordination of contributions from different people and organisations, ranging from designers to specialist contractors, and it is a demanding process. As indicated above, other solutions should usually be considered by the client as part of the development of the business case for the specific project, including renting, leasing, buying an existing facility or extending or altering existing premises. Each of these will affect the client's corporate plans and financial structuring in different ways and may not offer the solution achievable by new construction, but they should be considered at an early stage in project development.

Building new will facilitate a bespoke solution developed for the specific need in terms of function and design. It will also enable a company's balance sheet to be strengthened in terms of the proportion of fixed assets against current assets, enhancing company worth even where a significant proportion of loan capital has been used to obtain the new real estate. Ownership (and in particular the cost and extent of borrowing) will constrain cash flow, but it will also enable the extent of available loans to be expanded on the basis of the greater fixed assets. Capability to borrow when needed is increased where balance sheets are stronger, provided borrowing is contained.

Ownership will enable the benefits of investment where there is growth in the property market and consequential increases in real estate value. It will also enable an income flow to be realised if the property, or part of the property, is itself leased or rented out.

The downside of ownership is that overall borrowing capacity is reduced where loans are obtained for construction and also that the costs of ownership, including insurance, maintenance and repair, can be extensive. Additionally flexibility is limited and relocation in the short term is likely to be expensive and disruptive.

Buying existing business premises gives control over a major financial investment without the difficulties associated with the construction process. For owner–occupiers, there is the choice to stay in the premises forever or, if need be, to raise money through selling, taking out an additional mortgage or letting part of the premises. Putting down a large deposit may seem expensive, compared with the low start-up costs involved in renting, but if tenure is likely to be of a long-term nature, there may be good reasons to buy.

Some clients will not need to have the level of control over real estate that is available through ownership. They may only need to purchase the use of the property, rather than its freehold. The majority of economic activity in the UK is in the service sector where ownership is unnecessary in most cases. This sector of the economy is likely to be attracted to rental or leased property which provides an income flow to investor owners and landlords.

Whilst renting or leasing property is less burdensome on capital and borrowing capacity, it usually means that there are fairly strict constraints upon the ability to alter or adapt the property to specific needs. Rental property does not occur as a fixed asset on a company balance sheet and consequently corporate worth and borrowing capacity may be seriously affected.

Following the verification of business needs and the assessment of options a more detailed business case for the project should normally be developed. This part of the process will require return on capital investment to be considered against anticipated benefits and the impacts that project realisation will have upon the client organisation. This will require evaluation of the likely benefits on operational efficiency or associated balance sheet benefits of the facility.

Achievability

The feasibility of the project being completed within the desired time will need to be addressed. Some types of project, if delivered late, can become expensive burdens, particularly if they are constructed to meet particular market conditions.

If possible, evidence of similar projects that have been successful should be obtained to support the estimates of time for completion. If no similar projects are available for comparison, these estimates will need to be updated from time to time as the design is developed. The Building Cost Information Service (BCIS) provides a useful database which gives helpful guidance on construction completion times, but this is only a relatively small part of the overall project programme which will need to incorporate an extended period for the design process.

Similarly initial estimates of projected total costs will be needed at this early stage to assess whether the project is likely to be achievable within the budget, although initial estimates at this stage are of low reliability. Nonetheless, if a decision to progress is to be made, initial estimates of the time and cost involved are required and their provisional nature accounted for by a risk analysis and some emphasis on contingency allowances.

Affordability

All aspects of the project's direct and indirect costs, including to what extent borrowing is necessary, will need to be addressed and the cost and impact of that borrowing upon current credit rating and cash flow considered. With commercial projects the extent of funding from current reserves will also need reviewing in terms of the overall impact of their use. Usually clients will need to contribute 10–30% of total project costs from reserves or perhaps the sale of additional shares in the company.

Project expenditure occurs at different times, often not on a regular pattern, and the funding package developed needs to enable the funds to be available when they are needed. An initial cash flow forecast is essential to enable the funding pattern to be planned.

Project initiation

The decision to initiate a construction project is rooted in a viable business case in terms of its long-term 'worth' and achievability in terms of its initial cost and

planned duration. Usually the client will see the new project as a solution to the challenge set by the business case and will need to decide quickly whether the decision to go ahead with the project is justifiable.

A successful construction project outcome can provide increased efficiency, greater borrowing capability and payback, that is, long-term worth. This is not, however, always the purpose of the project. Sometimes it is there to serve a short-term need or to be sold on as a completed development. In those cases, short-term value rather than long-term worth may be the primary criterion identified in the business case.

Since the business case underpinning a project will vary from client to client, and each client's experience and willingness to take risk will be different, it is logical that the key parameters and objectives should be quickly identified in relation to each project.

This is often referred to as 'defining the project' and can be a challenging process, particularly for the inexperienced client, since information on all aspects of function, cost and time has to be collated and considered.

Prioritisation of objectives

The definition of the project should clearly address the client's overall business objectives and indicate the relative priority of each objective. There is a tendency to want a high-quality project delivered fast, at a cheap price. This is rarely, if ever, achievable and many construction projects suffer from poor definition due to inadequate time and thought being given at an early stage. This is often because there is a sense of urgency fuelled by the desire for an immediate solution.

The relative importance of time, cost and functionality in relation to any project will affect the choice of the most suitable procurement strategy for the project, as will the extent of exposure of the client to risk.

Usually when the business case is developed the most important criterion is identified as that which, if not realised, is the greatest risk to corporate strategy. For example, where building use is most important, functionality in design will be vital; where the building is being constructed to enable a particular market to be served, time may be critical; and in cases where the client has a precise or limited budget, cost control will be most important. Usually, however, more than one criterion is likely to result from the business case. Owner–occupier clients may emphasise function and price certainty; developers, cost and speed; and investor clients, design and speed.

Figure 5.1 illustrates the classic interaction of the three criteria. Where one is emphasised, the others will be affected. In the case of the owner–occupier, the emphasis on function and price will mean that the process will be more protracted in terms of time; developers may find that, as the result of the importance of speed and cost, design is compromised and the investor client may have less control over the cost where speed and design are prioritised.

As the project progresses the emphasis may be affected inappropriately. This is illustrated in Figure 5.1, where position 1 shows the emphasis at an early stage for an owner–occupier. This emphasis may change to position 2 as the design

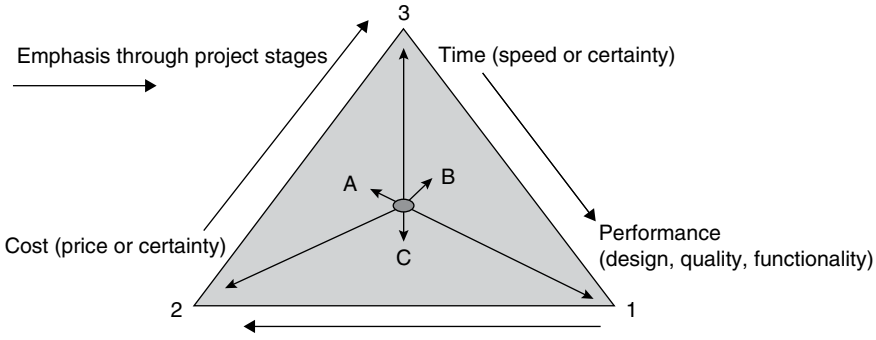


Figure 5.1 The interrelationship of client needs.

Table 5.1 Examples of prioritised criteria by client type.

	Owner–occupier (%)	Developer (%)	Investor (%)
Time (certainty or speed)	20	50	40
Cost (certainty or price)	30	30	20
Performance (functionality/quality)	50	20	40
Total	100	100	100

progresses and cost becomes a primary issue and then to position 3 as design is completed and the construction stage commences. Upon completion the client will again concentrate upon the functionality of the design realised in the completed project, which will have to be used and maintained to support the original business case. It is too easy to lose sight of the initial objectives as the project itself becomes a distraction.

Decisions taken at this early stage will drive all future decisions and strategy. It is a key but complex stage carried out at a time when both client and consultants wish to progress quickly but when the pace of co-ordination and synergy of the issues and ideas is dictated by the ability to predict, foresee and design. Often the client will be best advised to appoint a member of the organisation as 'sponsor' to co-ordinate the client function from this stage, or to appoint a project manager to overview the whole process where the project is particularly complex.

There is a danger that, when the process of defining the project is carried out, the primary needs of the business case can, as illustrated above, be given less prominence as short-term objectives relating to cost and time are seen as increasingly important to the project team. The definition of the project should clearly set down the client's overall business objectives and indicate the relative priority of each objective. The Project Execution Plan (highlighted in Chapter 6) is a valuable document in ensuring that the key decisions made at this stage form the basis of on-going review of project progress.

Table 5.1 considers three types of client and makes general assumptions about their likely objectives. These criteria are interdependent and none of the

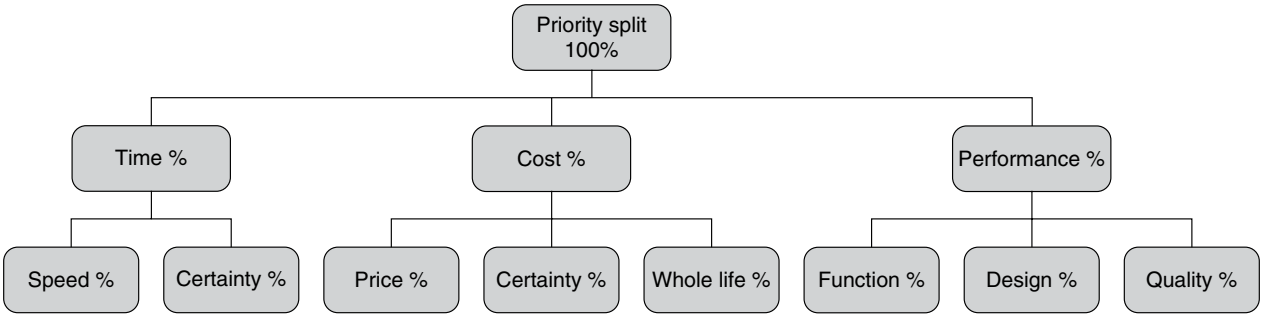


Figure 5.2 Priority distribution. (After Walker 2002.)

currently adopted procurement strategies will facilitate the delivery of all of them as high priority.

By adopting a technique of initially distributing priorities within parameters (in this case, total percentage points) the natural tendency to want performance, time and cost all to be high priority is countered. Consequently prioritisation is necessary. Walker (2002) showed how this can be achieved by further developing the concept of prioritisation (see Figure 5.2).[1]

By discussing with the client organisation the relative importance of the key objectives, the relationship between the initial business case and project priorities can be highlighted. Whilst fast-track solutions deliver speed, other criteria such as cost certainty and functionality may be less achievable, and similarly where cost certainty or performance are considered to be of highest priority the other criteria are affected. Consequently the distribution of prioritisation within parameters is a useful tool. It is a reasonable precept that the greater the concentration on defining the project and linking the prioritisation of objectives to the business case, the greater is the likelihood of the client's objectives being achieved.

Designing and constructing a new building is rarely straightforward. It is subject to a series of risks and uncertainties and involves a number of organisations especially assembled for the project. The way in which the client and the various designers, contractors and suppliers work together as a team is determined by the procurement strategy and the forms of contract entered into between the project participants and the client.

Conclusion

The initiation stage is critical to ultimate project success. Time is well spent at this stage to ensure that both client and design team achieve a shared and common vision of the objectives and important characteristic of the proposed scheme.

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[1] The outcome of this process is a key factor when developing an appropriate procurement strategy. This is highlighted in Chapter 7.

6 Briefing and the design process

Introduction

Project success or failure may be judged in a large number of different ways. Examples might include:

- Delivery within the agreed time frame and budgets.
- The contribution the development makes to the built environment as a whole.
- The functionality of the building as judged by the end users.
- The extent of critical architectural acclaim.

However, the most important judgement will ultimately be that made by the client in respect of how well the building satisfies the purposes for which it was commissioned – in short, the extent to which the client believes that 'value for money' has been achieved. A fundamental aim of the briefing process must therefore be to identify not only the employer's functional needs and wants, but also the critical success factors that must be achieved in order for the project to be judged a success. This in turn requires a searching and critical evaluation of the employer's value system.

This chapter considers the nature of the briefing process in defining the purpose and scope of the project and the role played by the client within it. The importance of the project execution plan (PEP) is emphasised as the highest level project control document forming a major plank in the management and control of the project. It is a document that is initiated at the briefing stage; it reflects client objectives and defines the project strategy, organisation, control procedures and responsibilities.

Project briefing: an overview

Clients of the construction industry worldwide have long believed that the industry is inefficient and untrustworthy, particularly when it comes to the timely delivery of projects within agreed budgets. This is illustrated in the UK by industry performance reports (Constructing Excellence 2011). The UK construction industry has attempted to overcome this perception through a number of innovations designed to increase

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integration and improve efficiency, quality, reliability and cost effectiveness through better management and an improved understanding of the client's needs.

Central to this re-engineering process has been a critical re-examination by experienced clients of the way in which buildings have traditionally been procured, and this has led to the development of a variety of alternative procurement philosophies. Among the early developments was a move towards 'one-stop shopping' and the use of procurement routes in which design and construction are more intimately combined; more recently, perhaps the most significant innovation has been the development of various types of collaborative procurement approach in which the demand and supply elements of the procurement process are more intimately connected than has historically been the case. The approaches are known by a variety of names including Project Partnering (PP) (see for example the work of Bennett and Jayes (1995)), Project Alliancing (see for example the work of Sakal (2005)) and Integrated Project Delivery (see for example the work of AIA California Council (2007)). These methodologies are discussed further in Chapters 7 and 12, but the issues which gave rise to their development led directly to a fundamental reassessment of the traditional roles of the various parties involved, including that of the construction clients themselves.

Particularly for large and complex projects, ultimate success or failure is often determined not only by the skill and flair of the design and construction team, but also by the active input of the client body, especially during the initial stages of the procurement process. This philosophy is, however, by no means acceptable to all clients, and we now see a polarisation between those clients who wish to be intimately involved in the genesis of their project and who wish to play a full and active part in the process and those who wish to have no involvement other than to set the initial parameters at the briefing stage. The fact that the JCT publishes the Major Project Construction Contract, aimed at precisely this group of clients, is testament to the fact that they exist in relatively large numbers. Particular considerations relating to the various types of construction client are considered in more detail below.

Regardless of the philosophies espoused by particular clients, a client is unlikely to judge the project to be ultimately successful unless the design and construction team and the client share a common view of what the project is expected to achieve. The initial briefing process is crucial in establishing this understanding. It is therefore clearly essential that clients and their consultants thoroughly understand both the process and their role within it.

History shows all too clearly that in many high-profile cases, often involving complex buildings and complex corporate clients, the necessary 'meeting of minds' has not been successfully achieved, and time after time the post mortem reveals that a major contributor to the failure of the project has been an inadequate or misunderstood briefing process.

Examples are not hard to find. Williams (1989) chronicles the development of Norman Foster's headquarters building for the Hongkong and Shanghai Bank. It was completed in 1985 in record time but at a cost of some 250% of the original budget, on the basis of a brief that said little more than that the bank required 'the best bank headquarters in the world' and that it was to provide total flexibility to cope with any future changes. In this case it would appear that the client did actually

have a mental picture of what was wanted, but was unable to clearly define its needs and constraints in a way the architect could understand.

Walker (1994a, 1994b), on the other hand, explores the genesis of the Hong Kong University of Science and Technology, another building built in record time but which again considerably exceeded the original budget. In this case the Hong Kong government's original brief clearly stated that it wanted a university 'emphasising science, technology, management and business studies'. Walker contends that 'in academic circles there is no doubt that the perception of a new university concerned with science, technology and management would be in the tradition of Massachusetts Institute of Technology (MIT), Carnegie Mellon and Imperial College, University of London' (Walker 1994b). He concludes that the implications of such a perception were not fully understood, even by the appointed client body representatives, let alone by anyone else involved in the project's design and implementation, and that therefore the original budgets were grossly inadequate.

The problem is not, however, limited either to Hong Kong or to high-profile projects. In the USA for example Stephenson (1996) writes that 'lack of a good statement of the owner's and users' needs is one of the most frequent causes of flawed and troublesome construction efforts' and in the UK Latham (1994) considered the briefing process to be 'crucial to the effective delivery of the project'. There is no doubt that, in the UK at least, things have improved during the past decade and that these kinds of project failure, at least where major projects are concerned, are now less common. Anecdotal evidence would however seem to confirm that problems still remain, particularly in the case of smaller projects with naïve or inexperienced clients.

Types of construction client

The construction industry has a very broad spectrum of client types, ranging from highly experienced clients who build regularly and understand the industry very well to very small, inexperienced clients who may only ever build once in their lives.

Plainly, the client's level of experience and understanding will have a serious impact upon the briefing and procurement process. Inexperienced clients need to be led by the hand and given advice and guidance on every aspect of the process, whereas experienced clients may well drive the process themselves on the basis of what they know has worked well in the past. Furthermore, where clients are largely ignorant of the demands of the process then simply understanding construction terminology might be a serious challenge. The House of Commons Business and Enterprise Committee (2008) highlighted that the majority of construction clients fall into the inexperienced and naïve categories.

Looked at from a slightly different perspective, clients may also range from the single owner–occupier with only themself to satisfy (for example, a small-scale manufacturer building an industrial unit for his own use) to complex corporate organisations with a need to satisfy many stakeholders (for example, a hospital trust building a new hospital). In the case of individuals, it is easy to see who should be making the decisions but where complex, multiheaded clients are concerned the

status of the various stakeholders is often unclear to the outsider, and there is often little attempt made within organisations to resolve internal conflict and co-ordinate the various inputs to the briefing process. Clearly, a complex organisation will require a very different approach in terms of the development of the brief, and the management of the process as a whole will be much more composite and demanding.

Construction is a complex process carrying more risk for the parties involved than many other activities of similar value, but often rewarding the developer or initiator well for taking the risk. Construction clients tend to have a wide variety of reasons for initiating the process. The rationale will tend to follow the nature of the client and his or her core activity. Each time a construction client identifies the need for space he or she will need also to develop a business case that identifies the nature of the need and the characteristics of the payback underpinning the endeavour.

As indicated in Chapter 5, achieving a successful project outcome depends upon verifying the business need for the project that is being considered, in the context of business strategy. This process will need to involve the stakeholders who are driving that need, those who will take the risks associated with the project and those who will be directly involved in the use of the completed facility.

The decision to build will usually be based upon a business strategy that has reviewed the aims of the organisation, the projected life of the planned building and its corporate 'worth'.

The variety of construction clients is extensive but can be partly categorised in order to assist an understanding of their varied motives or reasons for construction, as well as their likely attitude to project priorities. Typically public sector clients will seek functional projects giving provable value for money at low risk. Some private clients will have the same aims but will not have to justify expenditure in public accountability terms. Alternatively some private clients (usually the more experienced) will be prepared to take some risk to obtain the forecast gain arising from a particular market opportunity or other demand need.

Most clients are inexperienced since they build as a consequence of their primary function, so they build infrequently and depend heavily upon professional advice. Relatively few clients are frequent purchasers of construction and consequently they are both more experienced and can use their buying power to demand exactly what they need.

Masterman (2002) categorised clients into public and private sector clients; experienced and inexperienced clients; and primary and secondary clients. Primary clients were those who built for a business and secondary clients those who built as a consequence of their business. These categories are probably becoming oversimplistic in the increasingly complex construction market but are still helpful in enabling an initial view to be taken.

Duffy (1992) identified different types of client value propositions:

- *Use-value* building: custom designed for the owner–occupier to maximise the use value for the end-user organisation.
- *Exchange-value* building: developed speculatively and designed to maximise the exchange value of the building as a commodity to be traded.

- *Image-value* building: designed to maximise the image value of the building (often at the expense of efficiency or other qualities).
- *Business-value* building: where use, exchange and image are synthesised into a building where technology is fully exploited to maximise the range of options for the end user.

The following examples classify clients using the categories of both Masterman (2002) and Duffy (1992):

- The major retail chains in the UK have been major spenders on new stores. They can be described as private, secondary, experienced clients, with a business-value proposition.
- Public clients, by the nature of their activity, may be experienced or inexperienced. They will have a use-value approach.
- Property developers are likely to be experienced, private, primary clients with an exchange-value or image-value proposition dependent upon the particular case.

The outcomes that must be achieved in order to satisfy each client will vary with their mission and the primary objectives for the project they have initiated. They can be quite different. For example, owner–occupiers will want a facility that is functional, aesthetically pleasing and relatively inexpensive to run and maintain; developers, on the other hand, will aspire to speed and simplicity; whilst investors in property will look for buildings with a long functional, physical and economic life which retain their marketability. Most clients will also want low initial cost but only if a valuable output is achieved. This variability of criteria will impact upon ultimate client satisfaction and the briefing process is critical in ensuring that individual client needs are satisfied.

Questions to determine the type of client

Every client presents unique problems but, as a guide, the following questions will provide a starting point in determining the project implementation plan. However, it should not be forgotten that securing maximum value for money from a construction project often requires a fundamental re-evaluation of the client's underlying value system. This is frequently a difficult and time-consuming task, which many clients find very challenging, but is nonetheless essential if the project is to be ultimately successful.

Time

What is important about time? Does the client require the project to be completed as quickly as possible? Does he or she have a date by which the project *must* be completed (for example the start of a school year)? Or does the client simply want certainty of time (that is, the client is not particularly concerned about having the project completed for a specific date, but once he or she has been given a date, it must be kept)?

Cost

Similar questions arise in respect of the project budget. Is the client concerned primarily with initial capital cost (for example, a speculative developer who intends to sell the project on after completion) or is he or she concerned about the costs that will arise throughout the project's life cycle? Does the client have a fixed budget which cannot be exceeded, or does he or she simply want certainty of price once the project budget has been agreed?

Quality

Quality is arguably the most difficult attribute to define, and upon which to reach a common understanding. Typical items for discussion might be to do with:

- The client's concern with image and building style (i.e. overall design quality).
- The quality level to be achieved in terms of building finishings and fittings (most often expressed in comparative terms, e.g. a five-star hotel, a high-quality office block or standard factory construction).
- The quality standards required in terms of materials and workmanship.
- The quality assurance procedures required.

Likelihood of post-contract client changes

How firmly is the client able to articulate his or her needs? What is the likelihood that the client's needs will change before the project is completed?

Degree of accountability required

To whom does the client have to justify his or her expenditure? Will the client have to account for every last penny (for example, in a publicly funded project) or are his or her requirements less stringent?

Project complexity

All clients will be keen to achieve good value for money, but few outside the most experienced group are likely to truly understand what the concept means or how it might be measured. It is common for inexperienced clients to ask for the highest quality at the lowest price to be completed in the shortest time – and the client's project manager may have to devote considerable time and effort to arrive at a workable compromise that meets the client's real objectives.

It is also worth noting here that projects vary widely, both in complexity and in degree of innovation. Innovation is inherently risky and, although little definitive research has yet been reported, experience seems to show that, of the following two extremes, the first might be more difficult to manage, more likely to run over time or budget and generally less likely to be successful than the second:

- *Complex projects* incorporating a high level of innovation, where the client is inexperienced and the building complex (for example, a large and prestigious company headquarters or a major performance venue).
- *Simple projects* with little or no innovation, constructed by simple or experienced clients (for example, the speculative development of industrial units).

The briefing process: a historical perspective

Historically the process of briefing seems largely to have been regarded as almost unworthy of any serious attention. Turner (1945) for example, in the third edition of his *Architectural Practice and Procedure*, ignores the topic almost totally, save to give budding architects the advice that:

> One of your most important rules should be to endeavour to give a client what he wants. . . . It is no doubt often the case that a client has but a dim notion as to how his ideas can be carried out, and it is then the architect's privilege to guide him with expert advice.

Quite how this process is supposed to occur is not explained and there is no doubt that, at the time Turner formulated his advice, both buildings and clients were rather less complex, but even so we might speculate that, in many cases, a successful end result came about largely by chance. This attitude towards briefing plainly persisted for some time. O'Reilly (1973) highlighted deficiencies in briefs for housing work, noting not only that the brief commonly lacked essential information, but also that both the client and the architect often failed to appreciate the significance of the omission.

Later work resulted in a number of guides for clients (Goodacre *et al.* 1982; Murray *et al.* 1991) and architects (Newman *et al.* 1981; Salisbury 1990). Kelly *et al.* (1992) critically reviewed the briefing process. The client's role in the briefing process has, however, been seen to be crucial to the success of the project for more than 20 years. Salisbury (1990) for example summed up the issue well:

> [Briefing] is the most important contribution the client can make to the building project. It is as creative as anything the architect or any other designers subsequently do. This does not mean that it is a short term activity to be got out of the way quickly. It should never be rushed or done in a cursory fashion.

Kometa *et al.* (1995) and Walker (1996) examined the client's role and responsibilities in communicating project objectives, but Pilling and Lawson (1996) expressed serious doubts about architects' brief-taking skills. Best and Lenard (1997) provided comment upon contemporary developments in Australia.

There has long been debate about how the briefing process should interface with that of design. Early commentators (see for example the work of Pena *et al.* (1977)) were firmly of the view that briefing preceded design and that they were

separate processes, but later commentators regard this view as far too simplistic. Green (1995) for example argued that clients may not be capable of articulating their exact requirements until they have seen some preliminary concept designs, whilst Barrett and Stanley (1999) go further and argue that briefing should not be seen as a single event but as a process which informs all technical work throughout the project. This then leads commentators, such as Blyth and Worthington (2001) and Kamara *et al.* (2002), to regard briefing as more of a problem-setting than a problem-solving process. Gribble (2007), in her detailed academic study of contemporary briefing practice, investigates how well client briefs articulate issues to do with the spatial relationships required in the finished building. Finally, in stark contrast to the approach taken by Turner (1945), Chapell and Hyams (2001) present a compact and accessible architects' guide to contemporary briefing practice.

Recent years have also seen the introduction of a number of client guides to getting the best from the modern briefing and procurement process. Examples include *The Procurement Guide* (RICS 1996), *Briefing* (Constructing Excellence 2004) and *Briefing the Team* (Construction Industry Board 1997b). This latter document is described as:

> written for clients and potential clients of the construction industry. It is designed to help potential clients to work out whether or not they need a construction project, and if construction is the option chosen, to improve the briefing they give so that the project team fully understands their needs and they secure the product and outcome they require.

This document, for the first time, makes a clear distinction between the strategic brief, as a statement of the client's needs and objectives, and the project brief, in which these strategic objectives are refined and translated into an architectural brief defining how they might be met. The process is divided into five key stages as follows:

(1) Getting started.
(2) Defining the project.
(3) Assembling the team.
(4) Designing and constructing.
(5) Completing and evaluating.

Advice on each stage is presented in the form of questions and check lists. The document forms part of a co-ordinated portfolio of documents based upon the Board's code of practice for construction clients (Construction Industry Board 1997a).

This approach is valuable in that the process is carefully subdivided into manageable chunks which even inexperienced clients should be able to understand, but research appears to show that understanding the mechanics of the process is only part of the problem. Equally important is understanding how to successfully *manage* the process and this aspect takes on a particular significance in large and complex projects with complex, multiheaded clients.

Developing the strategic brief

No project is initiated without a clearly identified purpose. This may relate to the need for a more efficient facility in which the client will do business, the wish to increase the client organisation's fixed asset base, or both. The development of the strategic brief, which will form the foundation upon which the procurement strategy is built, must therefore begin with a clear statement of the needs to be met. The definitive statement of need arises out of the initial project initiation and option appraisal studies and represents the agreed 'best option' to meet the client's requirements. It contains, and clearly discriminates between, 'needs' (defined here as fundamental issues which must be satisfied for the project to be successful) and 'wants' (defined here as things that are not essential but which it would be nice to have if possible). The statement of need therefore summarises the client's rationale for the project and contains the essence of the issues that will subsequently become the key indicators of successful project performance.

Once the definitive statement of need is developed, the economic feasibility of the project needs to be checked and further tested through the formulation of a definitive detailed business case to explore the payback from the project in terms of both capital investment and overall value for money. Contemporary concern with sustainability will often mean that the business case will be prepared on a whole-life cost basis, taking into account not only the initial capital expenditure but also the costs and benefits, often both economic and environmental, incurred throughout the project life cycle.

An essential part of the business case will be an early attempt to identify and evaluate the risks embodied in the project; a robust business case based upon a clear and unambiguous statement of need will form the basis for the prioritisation of the relative importance of speed, cost and quality within a framework of clearly defined functionality in terms of design and performance. Among the risks to be considered is that arising from innovation. Contemporary thought would appear to advocate that innovation is, of itself, good, but the bespoke nature of construction inevitably means that innovation frequently comes with attendant risks and at a price. Anecdotal evidence would appear to show, however, that the potential risk and cost of innovation is rarely appreciated by the client.

Issues arising from the business case may require reconsideration of some elements of the statement of need and, at the end of this process, the statement of need and the business case together are combined in a strategic brief from which the overall procurement strategy, set out in the project implementation plan, will be developed. Experience seems to show that the development of a reliable and comprehensive strategic brief is at the root of achieving a successful outcome, particularly where the project is complex in design or where there are external influences on the design and management process from, for example, end users and funders.

The project execution plan (PEP)

The project execution plan (PEP) sets out how the project which has been defined in the strategic brief will be procured. It is the document that defines the project strategy, organisation, control procedures and responsibilities. It is, therefore, the highest level project control document and forms a major plank in the project management and control (PMC) system. Remember however that it is a plan – a framework for action. It must therefore evolve as the project proceeds and as decisions are made and confirmed. It should be flexible, not carved in stone. A fundamental element of the project execution plan will be the project brief.

The function of the PEP is to ensure that the client's objectives as identified in the strategic brief are carried through to reality. It is therefore the primary tool used to ensure that the project is completed to the satisfaction of the users, on time, within budget and to the required quality standards. Remember also that the PEP is intended for the use of all members of the project team – it should therefore be written in an appropriate style and should assume no prior knowledge of the client organisation or administrative procedures.

The issues the PEP needs to address, when and how it should be prepared and who should prepare it need to be considered.

What issues does the PEP need to address?

To some extent, the detail of the PEP will be dependent upon the chosen procurement approach and the format of the plan may well be dictated by the client or the constraints of specific projects. The form and detail of the plan will also change as the project evolves and the key objective at all times should be to ensure that the plan both documents what has gone before, in terms of decisions that have been taken, and looks ahead to set a framework for future action.

The following is a generic list of the topics that any PEP ought to include:

(1) *Overview*: a short summary defining the objectives and scope of the project in functional terms. It should specify the big problem that the project is intended to address, the project goals and how the project fits into the client's business and his or her future plans.

(2) *Specific objectives*: what are the specific functional objectives to be achieved? These should include time, cost and quality constraints as well as an outline description of the kind of accommodation required and the functional standards to be achieved. The plan should also define any constraints arising from the need for transparency and accountability, and should specify how much flexibility there is in respect of the time and cost constraints. These objectives need to be refined and further developed to form the Project Brief, which forms the basis upon which architectural design decisions will be made. The detailed form and extent of the Project Brief as a design development document will vary depending upon the procurement strategy adopted. In the case of a traditional design–bid–build approach, the Project

Brief will be further developed, expanded and refined throughout the design process in consultation with the client's design team. In the case of a design and build approach, however, the Project Brief will form the basis for the preparation of the Statement of Employer's Requirements against which each of the selected design and build tenderers will prepare their proposals. Note that in the case of a develop-and-construct approach there will be the need for some design team input, the extent of which will vary dependent upon the point at which design responsibility is to pass from the client to the contractor.

(3) *Proposed procurement strategy*: most construction projects will present a choice, ranging from a traditional approach through some variant of the design and build family to management-based approaches, such as construction management or management contracting. Choice of an appropriate procurement route is perhaps the most important decision in the entire process, and the plan should document not only what procurement strategy has been chosen but also the underlying rationale.

(4) *Project control mechanisms*: this section of the plan provides details of the administrative, contractual and financial mechanisms through which the project will be controlled. In short. it defines how the project will be managed. It therefore needs to specify things such as:

- reporting structures, together with any key dates for committee meetings, etc.;
- procedures to accommodate ongoing project reviews, changes, etc.;
- any particular client requirements or restrictions (for example on the use of subcontractors);
- value, quality and health and safety management procedures (note the requirements of the Construction Act with regard to Health and Safety plans, etc.).

Of particular importance are the procedures for project completion and the handing over of the completed facility to the client. The PEP needs to specify things such as who will be responsible for taking possession of the building and its future management, what documentation will be required, and what training needs to be provided.

In the event that the procurement approach is based upon some form of integrated project delivery mechanism incorporating a Building Information Management (BIM) system, then the Project Control Mechanism must also document information such as:

- the BIM system to be used;
- where responsibility lies for maintaining the accuracy and integrity of the model;
- model updating and access protocols, rights and privileges.

Note that the precise details to be included will vary depending upon the level of BIM to be used (see also Chapters 4 and 7).

(5) *Project time schedule*: this section defines all aspects of the project timescale including critical dates and milestone events. The project schedule will plainly

evolve as the project proceeds and will eventually comprise both outline long-term and detailed short-term programmes. The proposed timescales must, of course, meet the client's delivery requirements, but they must also be realistic. Imposing unrealistic time constraints simply increases the risk to the client of failure to meet key targets.

(6) *Project budget*: these normally include not only capital construction costs but also ongoing and recurrent expenditure during the project life cycle. The budget will normally become progressively more detailed as the project proceeds. The PEP should include details of funding sources and should document cost monitoring and review procedures.

(7) *Personnel and lines of responsibility*: who is responsible to whom and for what? The PEP should define the limits of authority and responsibility for all of the key players.

(8) *Evaluation methods*: the PEP should document the criteria against which the completed project will be measured and how the measurement will be carried out. It is important that these issues are considered at an early stage in order that the project team know where the goal posts are. Project evaluation is impossible unless the evaluation criteria are fixed, but it is a fact that clients' objectives frequently change between initial project initiation and project handover. If major changes are likely to occur, for example as the result of rapidly changing technology, then the PEP should make provision for them.

(9) *Potential problems*: potential areas of risk which might compromise successful completion of the project must be identified, together with appropriate risk management strategies.

When should it be prepared?

The preliminary feasibility studies which, together with the preparation of the strategic brief, form part of the initial project inception stage must obviously include:

- Preliminary consideration of how the proposed project might be executed, including an outline budget and programme.
- Consideration of the potential risks and uncertainties which might prevent successful completion, together with strategies that could be used to manage them.

All of these issues need to be collected together in a preliminary project execution plan, which should form part of the feasibility report. Many issues at this stage may remain to be resolved; where this is the case, the plan should document potential alternatives. The plan should subsequently be revised as decisions are progressively firmed up.

Once the client is satisfied that the project is feasible in outline, a decision must be made regarding the procurement route. Much of the definitive PEP will be

dictated by the procurement route decision. Two questions are important: (1) which procurement route and (2) is a specialist project manager required?

In making these decisions much will depend upon the technical capabilities, expertise and workload of the senior client representative and his or her team. This person must decide whether he or she is competent and has sufficient time to be able to adequately advise the client, or whether he or she needs to seek independent professional construction advice (for example from a project manager, quantity surveyor, architect or engineer).

Choice of an appropriate methodology will depend upon factors such as:

- Client constraints in terms of time, cost and accountability.
- The type of project (e.g. the level of technology required, the likely extent of innovation and the client's objectives in terms of project aesthetics and design impact).
- The extent to which the client is able to define what is required and the likelihood of design changes during the construction stage.

Who prepares the PEP?

Again much will depend upon the details of the project, the capabilities of the personnel involved and the chosen procurement route. If an external independent project manager is appointed then preparation of the plan will normally form part of his or her duties. In this case, input from the client representative may vary from virtually nothing to co-authorship, depending upon the circumstances of the particular project. If no independent project manager is appointed then the initial plan may well have to be prepared by the client representative. It should, however, be stressed that the preparation of a PEP requires considerable technical expertise. A workable PEP is of vital importance and it is, therefore, imperative that the client should be very aware of the limits of his or her technical skill and that outside assistance may be required.

How is the PEP prepared?

Preparation of the definitive PEP consists of:

- Summarising in clear and unambiguous terms the decisions that have already been reached. This may not be easy in the case of complex multiheaded clients and, in this case, one of the senior client representative's most important tasks will be to resolve internal disputes within the client body in order to present a single point interface to the external project team.
- Collecting and analysing the cumulative knowledge and expertise of the project team, and finally synthesising a feasible PEP.

In order to be considered valid, the completed definitive PEP must be explicitly approved by the client and accepted as realistic by the external project team.

Project briefing: the case of hospitals

Hospital projects are generally complex and expensive. In the public sector, modern clients, many of whom are now hospital trusts, tend to be both corporate and inexperienced. These projects therefore tend to illustrate, and often to magnify, problems with both the briefing process and its management. These projects have, in the past, often tended to enjoy very extended gestation periods, giving apparently ample time for the briefing process to take place; in many cases, detailed manuals of procedure are available. Gray (1994) discusses the process of drawing up the 'ideal brief' for hospital projects.

Despite these apparent advantages, however, research would appear to show that the project outcome is not always successful. Wilkins and Smith (1996) discuss the management of the briefing process on the basis of results from a comparative study of the procurement methodologies used for 11 major hospital building projects in Britain, the United States and Hong Kong. The majority of the projects were in the public sector. Five of the projects studied display significant failures to meet time targets (between +16% and +150%) or cost targets (between +3% and +14% of the tender figure). In each of these cases, a major cause of the failure was identified as client changes initiated as a direct result of inadequate briefing. This was despite pre-contract gestation periods of between five and eight years. These time spans are not unusual and are confirmed by other researchers; Loosemore and Davies (1994) for example report one project in South Wales with a ten-year pre-contract period.

Wilkins and Smith (1996) do, however, also report several projects, generally those procured using non-traditional procurement methodologies, where the gestation period is much shorter and the project outcome has been much more successful.

A major factor in determining success or failure appears to be that of effective management of the corporate client body during the briefing stage. Loosemore and Davies (1994) examine the interfaces that commonly occur both inside and outside the client body, and conclude that the main problems lie in communication and co-ordination. Wilkins and Smith (1996) similarly identify the 'multiheaded client' as a major problem. They summarise the problem as follows:

> End users are represented by medical consultants each of whom typically takes a narrow and specialist view of their particular unit, and administrative department heads each of whom take a broad and increasingly commercial view of the whole enterprise. Our research shows that both groups expect to act as the client for 'their' part of the building, and that individuals may have exaggerated and somewhat idiosyncratic views about the importance of 'their' part within the project as a whole. Each therefore expects to have an equal voice in the briefing and design process. This group of end users, which may consist of up to 100 individual experts, is uncoordinated and largely uncontrolled by higher levels of authority, and has traditionally expected to be able to instruct the design team during both design and construction. During briefing, the design team, and in the 'traditional'

procurement model specifically the project architect, is left to interpret and to arbitrate between the often conflicting requirements of individual consultants and department heads.

The use of non-traditional procurement approaches such as the design and build family sharply focuses the multiheaded client problem. With a traditional procurement approach the management of the multiheaded client problem takes place largely through the project architect in the conventional briefing stage, but this may no longer be so in the case of a non-traditional procurement route. Yet it is in precisely this situation that the production of clear, comprehensive and co-ordinated strategic and project briefs are essential in ensuring that tenderers know precisely what is required of them (Dix 1995).

The need for client changes during construction can be seen as merely an extension of the briefing process into the construction phase. Changes introduced at this point have long been known to be unduly disruptive and expensive, particularly where non-traditional procurement methods are employed. Inaccuracies in the client's brief and subsequent changes have been identified as a significant cause of dispute in design and build projects (Ndekugri and Turner 1994). The briefing process therefore plainly needs to be managed by someone close to the client's organisation, and needs to consider not only the competing demands of the various parts of the client body, but also the most appropriate choice of procurement methodology given the likely degree of certainty embodied within the final briefing document.

The role of the client's project manager in hospital projects of this type was explored by Wilkins and Smith (1995). A number of projects were examined using various models of project management, including managers drawn from within the client organisation, external consultants and a combination of the two, and using various traditional and non-traditional methods of procurement. It is unlikely that a project manager drawn from within the client organisation will have sufficient knowledge of the construction industry to be successful acting alone. They therefore conclude that those projects that have had the benefit of skilled project management during their early gestation and that use a combination of in-house and external consultant project managers appear to have greatly improved chances of ultimate success. Some commentators (for example, the Arts Council of Great Britain (1993)) discriminate between the client's representative, termed the 'project sponsor', and the external consultant, or 'project manager'.

Critical factors for success in the briefing process

The Construction Industry Board (1997b) has identified the following essential qualities of a good strategic brief:

- Embody the mission and convey this to the reader.
- State what is expected, by when and from whom.

- Define the context.
- Set out the perceived problem unambiguously.
- Establish requirements on cost, quality and time.
- Be clear about the required lifetime of the project.
- Tease out the assumptions of the people involved.
- Do not leave any 'big' questions unanswered.
- Be honest without raising unrealistic expectations.
- Be able to respond to change.
- Be flexible so that different options can be explored.
- Be explanatory, stating the reasons for the requirements.
- Include success factors and measurements that can be used to test the result.
- Set out potential conflicts so that the project team can respond.

In addition, the following factors are seen to be critical to success:

- Clear and agreed objectives.
- Carefully thought out requirements.
- Provision of essential information at each stage.
- A flexible approach that balances the requirement for quality with the concern to freeze requirements in order to control costs and meet deadlines.
- Trusting relationships.

Given that effective management of the briefing process is generally considered to be a major determinant of project success, the following issues appear to be crucial if the 'ideal strategic brief' set out above is to be achieved, particularly in the case of complex multiheaded clients:

- A project management system must be designed and implemented. The principal goals of the system should be to:
  - co-ordinate the various parts of the client body, broker negotiations between competing factions and present a unified and single-point interface between the client and the design and construction team;
  - assist the various parts of the client body to identify their real needs, to consider and evaluate options and to transmute initial 'wish lists' into clearly identified and measurable desired project outcomes;
  - advise the client on the most appropriate form(s) of procurement, bearing in mind the degree of certainty embodied in the brief at each stage;
  - advise the client on the assessment of competing bids.
- The project manager must be a manager, not merely a co-ordinator. He or she must take the responsibility for guiding the client through the strategic briefing process, but must also be given the necessary authority to enable him or her to broker negotiations between competing factions.
- Establishment of the project management system may require input from an external consultant.

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7 Procurement strategies and procurement routes

Introduction

It is probable that, in the UK, the dominance of the public sector in the 1950s and 1960s in terms of capital spend established an approach to building procurement which became accepted as the norm. Design was completed for the planned project by a selected architect prior to tender documents being prepared and bids sought based upon those documents, usually from a selected list of contractors. In most cases the tender documents included a bill of quantities prepared by a quantity surveyor, identifying precisely the extent of work to be done for a lump sum bid. Until the 1980s the selection of architects and quantity surveyors was based upon reputation with fee scales being mandatory but, once these were outlawed, the selection of consultants was also based upon submitted bids.

This process adopted the nomenclature 'traditional procurement' and was for many years the mainstay of procurement activity, the default approach, but latterly the traditional approach has become less appropriate for some projects with the advancement of integrated approaches including design and build, management contracting and construction management.

Whilst the established construction professions have co-operated in *discussions* about change, the primary drivers in *achieving* change appear to have arisen as the result of client pressure caused by increasing frustration at the apparent inability of the construction industry as a whole to deliver the projects needed on time, to budget and to acceptable quality standards.

Consequently there is evidence over the past two decades of some change in the procurement of construction projects in the UK, but this has been relatively slow and seemingly driven by a combination of major private sector clients and central government.

The latest data available to indicate the relative usage of different procurement strategies show that in overall terms there has been a significant reduction in the use of Bills of Quantity in recent years. The Royal Institution of Chartered Surveyors (RICS 2010) states that in 2007 (the latest year for which data is available):

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> The use of Bills of Quantities dropped to its lowest level in the survey's history. Firm BQs were used on 20% of contracts in the sample. . . . By value, the proportion of contracts using firm BQs dropped to just 13.2% – the first time this measure has dropped below 20%.

In contrast, RICS (2010) shows that the use of design and build procurement appears to be rising fast, at least in terms of the number of projects:

> The design and build route has shown a significant increase. . . . 21.8% of all contracts used a D&B route, up from 13.3% in the 2004 survey and the highest figure so far recorded in the survey's history. . . . However, in value terms, 32.6% of the sample employed a D&B route, which was the lowest level since 1995.

There appears to be little general movement in terms of other procurement approaches, except that it appears likely that, from 1998, government pressure led to an increase in the number of projects procured through collaborative routes such as partnering. In 2011 the UK Government published a construction strategy (Cabinet Office 2011) which appears to favour framework agreements and a guaranteed maximum price approach for public sector projects.

There is also evidence of the increasing adoption in the UK of projects procured through franchising opportunities to capture income flow, such as Private Finance Initiative (PFI) schemes, driven no doubt by government's view over the past decade that every major project should be tested for suitability as a PFI scheme before any other procurement routes are examined. PFI and public private partnership (PPP) are considered in detail in Chapters 13 and 14.

In a telling interview given to the RICS *Business* magazine (RICS 2003), Lord Digby Jones, Director General of the Confederation of British Industry (CBI), commented that the construction industry:

> is not yet exploiting its chance to reinvent itself and become an example to the rest of business . . . [it] talks the talk about change but walking the walk is a lot more difficult. And because it's such a disparate business full of self-employed, temporary staff and conservative people, change is exceedingly hard. It brings insecurity and a feeling of isolation.

On the basis of the collected data this appears to continue to be the position at the time of writing and change is still difficult to achieve. In procurement terms changes which have occurred mainly affect the way that capital projects are purchased. Traditional approaches reflected a time when the public purse dominated construction expenditure – they facilitated excellent accountability and relative price certainty. Deterioration of standards seems to have become an acceptable reality, with bills of quantities being prepared and often deemed to be 'firm quantities' in contractual terms when often in reality they are not (Kings 2002). This may be because of the incomplete state of design when detailed drawings are required but at the same time clients are pressing for earlier and earlier starts on site with faster and faster completion. Extensive post-contract changes also appear to have

become the norm. RICS has now published new rules of measurement (RICS 2012a, 2012b) which may, as they become generally adopted, instigate change and engender a more positive attitude to the value of measurement in the procurement process.

A move to non-traditional approaches that are faster but give some level of price and time certainty was perhaps inevitable given the decreasing confidence created by lower standards, particularly at periods of buoyant economic growth or strong property markets. This may not, however, be in the long-term interests of those clients whose primary criteria or objectives are related to building performance or functionality.

Egan (1998, 2002) argued that integrating design and construction would facilitate improved value in projects for clients. Whilst it is probably true that an increase in the use of design and build will enable integrated design and construction, whether this will translate into improved value for money or functional performance is a matter of judgement over time. The shift to design and build also means a shift of the responsibility for the design function away from direct client control to organisations whose core businesses are profit-focused.

Other ways to achieve integration seem to generate less enthusiasm from the client sector or the construction professions, as evidenced by the very low adoption of strategies such as management contracting and construction management. According to the latest available statistics (RICS 2010), in 2007 construction management contracts accounted for only 1.1% of the number of contracts awarded in the UK (9.6% of the total value of contracts awarded), with management contracting accounting for 0.7% and 1% respectively.

The construction industry is complex and the demand for construction is variable and fickle, with an experienced minority of clients accounting for most of the expenditure and an inexperienced majority accounting for least spend and most projects. The experienced group are able to influence and encourage change using the advantage of their spending power, while the inexperienced group are often at the mercy of construction professionals who have historically appeared largely to resist change and to defend traditional practices.

These problems are compounded by the fact that the supply side of the construction industry is fragmented in terms of both design and construction. Advances in technology have resulted in specialisation structured in such a way that traditional practices often do not enable specialist designers and contractors to contribute to the design, costing and programming elements of a project. For example, those involved in constructing the specialist elements of a building, often very significant elements, frequently do not become involved until so late in the process that their ability to contribute is severely curtailed.

This is counter to the way most integrated manufacturing industry processes work, but the construction industry has historically displayed few characteristics similar to manufacturing industry, being mainly project-focused rather than process-focused. There are, however, indications that those collaborative procurement practices which have been adopted along with improved supply chain management processes, such as partnering, slowly change and improve the way things are done.

A further example is the development of Building Information Modelling (BIM). An integrated database of coordinated information using digital technology requires the contribution of all participants in the project process. Thus the design element of a building is supplied by CAD by all those involved and is held in one place and coordinated along with other relevant data. The extent to which it will enable contribution towards a fully integrated resource will depend upon the skills and abilities of the participants.

BIM has perceived advantages for clients in the design of buildings, particularly the saving of time and money, reducing claims and increasing the quality of performance. It should enable a coordinated approach to design and ensure an ongoing record of the as-built structure. It is created at an early stage in terms of general acceptance and as such it also carries risk and uncertainty in terms of the liabilities and duties of the many participants in construction. Errors or omissions can prove a minefield.

BIM will provide a platform for new duties for consultants and contractors in terms of procurement, but as yet the representative bodies are still working on what duties and how contracts will change to accommodate BIM. Few are BIM ready. The intellectual property rights and liabilities which go with them can get confused so the difficulties under current standard contracts are enormous and will require change. Project managers may assume the role of BIM manager ensuring that the model is working but not as owner of the intellectual rights of the contributors.

The government's construction strategy (Cabinet Office 2011) acknowledged that at the industry's leading edge there are companies which have the capability of working in a fully 3D environment with a shared platform with reduced transaction costs and less opportunity for error. But it recognises that construction has lagged behind other industries in the adoption of the full potential offered by digital technology. In highlighting a lack of compatible systems, standards and protocols and the differing requirements of clients and lead designers as a primary cause of inhibition, it has acknowledged that the implication of alternative design proposals cannot be evaluated with any form of certainty or ease. The move of RICS in developing a suite of rules for measurement is plainly a move in the right direction (see also Chapter 4).

However, with a few exceptions the team constructed to design and construct a project is temporary, and projects have therefore been largely unable to benefit from established supply chains or prototype testing. There are indications that this too is changing. The increasing use of long-term collaborative arrangements and an increase in the use of multi-project framework agreements, again largely but not exclusively driven by central government, is beginning to change the way continuous development is viewed.

Comparison of the industry key performance indicators (KPIs) with perceived performance over the last five years (Wilén 2010) shows some improvement in client satisfaction, industry productivity and time predictability, although cost predictability remains disappointingly poor. Client dissatisfaction in the private sector may result from the fact that most clients (by number) are inexperienced and have unrealistic expectations of an industry of which they are largely unaware.

These expectations are often not discouraged by a project team setting targets with little or no involvement of those specialists whose work will have a major effect on costing and programming. Alternatively perceived poor performance may result from design teams agreeing to unreasonable client targets in ignorance, or in order to encourage the client to progress, or an acceptance of such targets by construction companies unwilling to point out unrealistic outcomes, if that may result in losing the opportunity to obtain the contract.

There is clearly a remaining challenge to seeking further improvement. As observed above, however, the construction industry is still largely project-focused, not process-driven, and whilst desirable, the opportunities to adopt and benefit from collaborative techniques are probably limited to those clients who have a continuing relationship with particular constructors, specialists or design teams. The majority of clients, who buy one-off projects occasionally, are less likely to benefit from the adoption of such techniques. Other strategies will need to be developed to improve perceived construction performance in this demand sector.

The Construction Clients' Forum (CCF) (latterly the Confederation of Construction Clients and now the Construction Clients Group) published, as long ago as 1998, a document which included a suggested 'pact' with the construction industry, setting down what was felt to be a way forward (CCF 1998). This 'pact' sought improvement from the industry by suggesting that the construction industry:

- Present clients with objective and appropriate advice on the options and choices to meet their needs.
- Introduce a 'right first time' culture, with the projects finished on time and to budget.
- Eliminate waste, streamline processes and work towards continuous improvement.
- Work towards standardisation in components where this provides efficiency gains.
- Use a properly trained and certificated workforce and keep skills up to date.
- Improve the management of supply chains.
- Keep abreast of changing technology by innovation and investment in research and development.

An objective view of these demands from customers in other industries would probably conclude that they are not unreasonable.

Clients, on the other hand, were to accept as part of the 'pact' that they had responsibility to become 'intelligent clients', and since then the concept of a client's charter has progressed, even if it is only understood and progressed by experienced clients.

Most of the focus, then, over the last few years has been on strategic issues with the industry and its professionals 'talking the talk'. There is indeed (as Digby Jones suggested (RICS 2003)) much less evidence of them 'walking the walk' in relation to the adoption of improved strategies, as indicated by the actual strategies adopted and the relatively low use of innovative processes or products.

Progress *can* be achieved and measured through the implementation of known tools and techniques. Where and when measured improvements follow they will be used again. Typical examples may include:

- The adoption of simple techniques to enable project objectives to be prioritised and client needs and risks to be clearly defined.
- An increased focus on preplanning to reduce late changes.
- The adoption of value management at an early stage.
- A balance between capital cost and long-term 'worth' in terms of the business case for the project.
- An increase in the early appointment of specialists through collaborative strategies to enable their input into design and costing.

Such techniques can very quickly improve predictability and value for money. Their adoption moves aspiration towards implementation. One key area identified by clients (CCF 1998) was that they did not like unpleasant surprises, although there remains clear evidence from industry-wide KPIs that these still occur.

In summary the industry is unique and complex. It is predominantly project-focused in producing its output but frequently seeks to adopt process-manufacturing terminology, often in an inappropriate way. Whilst clients usually benefit significantly from their completed process, performance is often seen to be sub-optimal. Whilst this may not be a true reflection of the industry's recent achievements, opportunities for improvement in procurement processes do exist, particularly by increasing the objective advice available for clients and the adoption of simple techniques already available within the sector.

Other improvements cannot simply be achieved through the application of techniques and this must be trusted to the representative groups and institutions at the heart of the industry. Although there has been some acceptance in the UK of so-called modern methods of construction, many still continue to design buildings requiring traditional skills whilst at the same time observing a constant reduction in the availability of skilled tradesmen and training places. Innovative processes and products may be an alternative solution if the skilled workforce continues to shrink, but investment in research and development in the construction industry is still only about 10% of that of other industries. The innovative products and processes available are resisted by more-conservative designers and professionals and appear to be less popular with real-estate funders.

These and more strategic procurement issues may be resolved over time. In the meantime clients will expect some of the improvements that are achievable by the professional application of available techniques in the procurement of their projects.

Procurement strategy

A construction project is one way of delivering a solution to the particular business needs of clients, whether for investment, expansion or improved efficiency. When new build solutions are selected, rather than renting, leasing or purchasing existing

real estate, there is usually the need for a bespoke solution which aims to meet particular objectives.

New build projects are frequently complex one-off projects with unique designs on unique sites, and a successful outcome is only achievable only where the complexity of the processes involved are recognised and addressed appropriately. Unlike the processes adopted in manufacturing, construction activities are not an ongoing production line and the management of projects requires different skills. The team drawn together for the project will disperse at its completion and members are unlikely to form the same team again. If they do, the project will be different.

Design is largely segregated from the project construction process which itself will need to integrate specialists from a wide range of fields of activity.

In such a scenario the role of the client is vital and includes developing a strategic brief for the project based upon a functional needs analysis and rooted in a clearly established business case. Also the client must ensure that necessary decisions are made and resources are available throughout the project. Procuring construction as a business solution can involve high risk to the client organisation. That risk will require managing and will involve client intervention in both strategic and implementation terms, usually with the assistance of a team of construction professionals.

Most clients will want to ensure as far as possible from the outset that they can achieve the solution they require within affordable cost and by an acceptable date in the future. This will be best achieved if the client seeks independent advice on these matters from the outset from an experienced construction professional, arguably one who will not become part of the final project team, and who can therefore perhaps adopt a more objective viewpoint. Where, in meeting the needs of the business case, there is particular focus upon building function or running costs, speed to completion or capital cost, an appropriate strategy for procuring the building while reflecting this focus must be adopted.

The establishment of a procurement strategy that identifies and prioritises key project objectives as well as reflecting aspects of risk, and establishing how the team will be selected and how the process will be managed, is vital to a successful outcome. On a procedural front, and with the intention of standardising processes, the British Standards Institution has published a new British Standard for procurement, BS 8534, aimed at procurement on a strategic level, seeking to collect in one document all the guidance towards best practice that has been issued (BSI 2012).

The unique and bespoke nature of most construction projects does increase the inherent risks. These risks include completing a project that does not meet the functional needs of the business; a project that is delivered later than the initial programme; or a project that costs more than the client's ability to pay or fund. All of these risks could potentially have a high impact on the client's core business, and a procurement strategy should be developed that balances the risks against the project objectives established at an early stage.

Most clients will want a high-quality functional building, fast, for a low price. This is rarely, if ever, achievable since it is likely that these requirements are often in conflict with each other, and unless there is a priority of criteria, disappointment or worse may follow. The nature of the client's business and the business case

underpinning the project will enable consideration to be given to which of the criteria – time certainty, price or function – is of the greatest importance. The identification of which factor will constitute the greatest risk to the business if it fails to be achieved will assist in the development of a weighted list of priorities.

The strategic brief will enable the development of a procurement strategy for the project that establishes how the team will be selected, how the project will be designed and what the parameters are; the project execution plan (PEP) will define how project delivery will be implemented. Because the strategy is based upon the unique needs of the client, the key parameters will be clearly communicated to the project team. A key role for the client is to ensure that the strategy established at the outset is not lost sight of as the immediate priorities of the design and construction processes are progressed. The PEP is a key document in ensuring that decisions made at this stage are embedded in the progress of the project. This is referred to in some detail in Chapter 6.

Establishment of an appropriate project team to deliver the right project at the right time for the right cost given the adopted strategy is a vital role for the client, who again should take independent advice. In the selection process better out-turns are usually experienced where selection is based upon quality as well as price. Where the running costs of the building or the design itself are of particular complexity or importance, procurement routes enabling the maximum amount of collaboration within the project team are desirable.

The role of the client in construction is a vital one to success and involves a number of functions, which most clients have to adopt infrequently:

- Developing a vision and confirming its viability.
- Funding a single project throughout its progress.
- Buying the skills of construction professionals.
- Responding to requests for decisions at key stages.

Whilst each of these functions are complex in themselves and will need to be carried out in parallel with the usual activities of the client organisation, they are achievable if an appropriate strategy is developed at an early stage and adopted throughout the project. Such a strategy will encompass a separate selection methodology for designers and for constructors or a selection strategy for companies who will offer an integrated approach.

Procurement routes

There are procurement routes which can be adopted that will align with the selected strategy and will achieve:

- Certainty of cost and time for a design developed by an architect employed by the client – but this traditional procurement process is sequential and consequently slow, and is open to disputes as to responsibility if serious defects become apparent either during construction or after completion.
- Relative speed and cost certainty – but the design will be to a greater or lesser extent the responsibility of a contractor (develop and construct or design and

build) and consequently the client will lose some degree of control over the design process. These processes will however substantially overcome the problem of a potentially divided responsibility for defects.

- Speedy completion for a design developed by an architect employed by the client (either management contracting or construction management) – but in this case cost may be very uncertain until close to completion, and there is little scope to incorporate client-inspired changes during the construction process.

The procurement route will establish contractual relationships between the parties. The choice of an appropriate procurement route is a key decision if project success is to be achieved. Mistakes made at this stage may have unfortunate consequences later and it is worth taking time to ensure that the prioritisation of objectives and attitude to project risks are understood and accepted. As soon as possible after this initial stage the general parameters associated with the project will need defining, such as time constraints, budgets for all associated costs and issues that are critical to the suitability and functionality of design.

For complex buildings, and particularly where complex and multiheaded clients are involved, a successful procurement approach may include the appointment of a client project sponsor or project director. The client project sponsor needs to be someone who has a detailed knowledge of the client's business, and also has some experience in the management of projects. They will preferably be drawn from within the client organisation, although where no suitable internal appointment can be found, a consultant appointment may be the only way forward. Their role will be to ensure that the client gets the project required. The role of the project sponsor is therefore to manage the client within the context of the project, to resolve disputes within the client organisation, and to present a single point of contact to the construction team. He or she must therefore be invested with sufficient authority to manage the client function on behalf of the client organisation.

The project sponsor will need to consult with all stakeholders at an early stage to establish the specific functional needs that the project must fulfil (there is an important distinction to be made here between real needs, that is the things the project must do, and wants or things that would be nice to have), to develop realistic time and cost budgets against which the client organisation will have to make ongoing project decisions, and to plan the resourcing and funding of the project (see Chapter 6). Often, and particularly with complex projects, this function is delegated in part or in whole to an experienced project manager, who will see the project through all its phases from initiation to commissioning.

When the project has been defined, all the factors influencing the project have been identified and the project requirements analysed, the final strategy for the project can be developed.

It is likely that there will be more than one route that can match the proposed strategy and can be adopted to achieve the requirements of the project. It is important to consider carefully each option, as each will address the various influencing factors to a different extent. In developing strategies, a potential danger is that only the most obvious course of action may be considered – this is not necessarily the best in the longer term.

Procurement routes will differ from each other in relation to:

- The financial risk to which the client is exposed.
- The degree of control that the client has over the design and construction processes.
- The extent of design information that will be available at the time of tender.
- The information required at the time construction work can commence.
- The extent of involvement of the contractor in the design stage when the contractor may be able to contribute to the design and planning of the project.
- The organisational arrangements which distribute risk, responsibility and accountability.
- The sequential character of the process.

Factors to be considered in selecting a procurement route

Once the primary strategy has been established the factors listed below should be considered when evaluating the most appropriate procurement route:

- Factors outside the control of the project team.
- Client resources.
- Project characteristics.
- Need for and the ability to make changes at various stages as the project proceeds.
- Risk management.
- Cost issues.
- Timing.
- Quality and performance.

Inevitably, some of these requirements will be in conflict and priorities need to be decided. The choice of route should ensure that control is maintained over those factors that are of most importance to the client.

Factors outside the control of the project team

Consideration must be given to the potential impact of economic, commercial, technological, social, political and legal factors which influence the client and the project team or are likely to do so during the lifetime of the project. These may include:

- Changes to interest rates where borrowing levels for the project are relatively high.
- Increases in the level of inflation, affecting the products or trades used in the works.
- Changes in the local or national demand for construction, affecting tender price levels.
- Changes to legislation, affecting the design of the works or the methods of achieving that design.

By adopting simple risk analysis, a judgment can be made whether contingency sums should be budgeted in the scheme in order to cope with occurrences of this nature that are likely and where their impact may threaten the project.

Client resources

The client's knowledge, the experience of the client company's organisation and the environment in which it operates are vital in assessing the appropriate procurement strategy. Project objectives are influenced by the nature and culture of the client organisation, external influences and the expectations of individuals involved in or affected by the project. The extent to which the client is prepared to take a full and active role is a major consideration.

Project characteristics

The size, complexity and location of the project should be carefully considered and particular attention given to projects with novel elements. For example, if the building is especially large or complex there may be a bigger risk of cost or time overrun. Novel projects present special risks. The novelty factor potentially means that estimates of time, cost and performance are all subject to the possibility of greater error with an increased risk of failing to achieve one or more of the project's objectives.

Ability to make changes

It is preferable to identify the total needs of the project during the early stages but this is not always possible. Rapidly changing technology often means late changes. Changes in the scope of the project very often result in increased costs, especially if they arise during construction. Changes introduced after the design is well advanced or construction has commenced often have a disproportionate effect on the project, in terms of cost, delay and disruption, compared with the change itself. The design process goes through a progressive series of 'freezes' as it develops, but the client or project team should set a final design freeze date after which no significant changes to requirements or design are allowed.

Some procurement strategies are better than others at handling the introduction of changes later in the project and reducing the possibility of having to pay some form of specific premium.

Risk management

The choice of procurement route will affect the extent to which a client is exposed to risk. In some cases clients will be risk averse; other clients will be able to absorb elements of risk in order to achieve the outcome they seek. Many clients will need to know at the commencement of the procurement process a fairly accurate cost or an expected completion date. Some may need to assess the outcome of the project on their financial structure. Others will wish to ensure that the project will meet

their functional need. The risks inherent in the various procurement routes are outlined in this chapter and the management of risk in a broader sense is discussed in Chapter 11.

Cost issues

Estimates of the cost of future buildings made at an early stage are notoriously inaccurate but are necessary for decision-making purposes. This is an inevitable consequence of the unique nature of construction projects and the typical lack of early design development. Where there is the need for price certainty this influences both project timing and the procurement route to be used. Generally, design should be complete if price certainty is required before construction commences. Since design takes time this will cause a delay unless design and build strategies are adopted.

Inflation will inevitably affect total cost where there is a level of variance, and contracts typically include increased price clauses to compensate the contractor, to varying degrees, for such a variance.

Changes to design during the course of construction should be avoided if cost certainty is to be maintained. Changes, whether initiated by the client or design team, often have cost and time implications on the project well in excess of the change itself. It is therefore important for the client to fix a date after which no significant changes should be introduced or to select a route that enables such changes and accepts the consequences.

Project timing

Most projects are needed within a defined time frame or by a specific date. Timing will influence whether subsequent activity can occur as planned and, in many cases, may severely affect those factors identified as critical or high priority in the business case.

Self-evidently, setting unachievable programmes will result in overruns and the UK construction industry has a reputation for delivering projects 'late'. Over-optimism or lack of reliable data may be the cause. Realism may frustrate an impatient client but unexpected lateness may have more severe consequences.

The project programme is influenced by many of the factors identified above and a particularly large or complex project is likely to require more time for design, specification and construction than would a simple small building.

It is vitally important to ensure adequate design time for the total project, particularly if design is required to be complete before construction commences (where perhaps cost certainty is required). Design can be a complex and lengthy process, often taking as long prior to the commencement of the works as the works do themselves.

In the process of the appointment of the design team, assurances should be obtained about resource levels and the ability to meet key dates or programmes. It is not usual to impose contractual dates upon designers, although their progress is probably key to the overall completion date.

Decisions to progress with a project may be influenced planning control and approval policies, by the successful operation of compulsory purchase orders, by land purchase or by some other non-specific but critical factor (such as obtaining funding approval). Depending on whether these factors occur earlier or later, they may be an influence upon the planned or desired time available for design.

Some procurement routes enable an overlap between the design and construction stages, such that construction can start earlier than would be the case with more sequential strategies, and therefore offer the potential for earlier completion. It may be necessary to review the planned route in the light of design progress at the point where restraints to construction are removed, bearing in mind the stage of design and the consequence in terms of risk.

Time, for the construction client, has both a cost and a value. If the worth of a project is identifiable then the cost of relatively late completion and the value of relatively early completion can be assessed and may form an important factor in the decision-making process. This is often referred to as a 'time/cost trade-off'. In the case of commercial projects, achieving early completion may bring significant value benefits including improved cash flows and reduced interest and insurance charges. On the other hand, later completion will render the client's cash flow position less attractive, will attract higher interest and insurance charges (amongst others) and may lead to potential loss of opportunity. Developing calculations that identify these sums can be a useful management tool.

Construction times

Total construction time is a consequence of design. More complex structures will almost certainly take longer given the same cost or size, and may require more resources. Although it is possible to accelerate work on site, for example by working longer hours or by increasing resources, it is not always possible to achieve directly proportional productivity gains. The law of diminishing returns will have an influence because of the limited space and the nature of traditional construction methods (such as concreting and bricklaying).

Performance

The required performance of the project, measured in terms both of its response to the needs of the client as expressed in the business case and of the quality of individual elements, should be clearly identified. If performance is over-specified, a premium will be paid for exceeding actual requirements, thereby affecting the cost objective. Over-specification may also lead to time overruns. Conversely, failure to recognise the true performance objectives leads to an unsatisfactory product.

If quality and performance are particularly important the client will probably want to keep direct control over the development of the design. This can be achieved by employing the design team directly, or by developing carefully written and precise performance specifications, supported by performance measures, for both the completed building and its principal functional components.

Selection of a procurement route

Clients who can be described as experienced will be able to select a procurement approach that has worked for them before or which they know to be suitable, taking into account their prioritised objectives and their attitude to risk. Inexperienced clients (the majority of clients in the UK fall into this category) will need to seek advice from experienced professionals to help them through the process.

It is most important that the adopted route is reviewed at key stages during the progress of the project, for example the planning approval stage, before the contract strategy has been finally decided, and before the construction contracts are let. Reasons for this include that the development of design is not maintaining the pace anticipated or that the programme is otherwise affected by unexpected occurrences and that, consequently, an alternative route may become more appropriate.

The selection of an appropriate procurement route has two components:

(1) Analysis: assessing and setting the priorities of the project objectives and client attitude to risk.
(2) Choice: considering possible options, evaluating them and selecting the most appropriate.

It may be necessary to seek specialist advice from other consultants, for example, in relation to expected costs for the project. Specialist advice should always be sought when developing the strategy for novel or especially difficult projects.

In 1996, RICS published *The Procurement Guide*, which was then updated as part of the *Surveyors' Construction Handbook* (RICS 1996, 2000). RICS publish further updated guidance on procurement, which includes an extensive range of advice and information for chartered surveyors engaged in construction activity. These guides are intended to provide a code of procedure to help in developing an appropriate strategy and selecting the right procurement route for a building project. The guides are intended to be used as a prompt and focus for the issues to be addressed during the development of the procurement strategy, while setting the standards to be achieved by chartered surveyors when advising their clients.

It is however important to note that whilst such guidance provides an overview of good procurement practice, it is not a substitute for experience and, at least for more complex projects, clients would be well advised to seek out advisors with extensive procurement experience and proven expertise. The selected procurement route must be developed from an objective assessment of the client's needs and project characteristics. The objective is to provide the client with advice, thus enabling an informed client to reach an appropriate decision based on sound judgment, giving due regard to the identified criteria and the acceptable distribution of risk. Figure 7.1 shows a checklist for comparing the various strengths and weaknesses of different procurement systems.

One approach to objective selection is to develop the information provided by the Priority Distribution Analysis (see Figure 5.2) using the checklist in Figure 7.1.

	Client's priority: Essential 5 4 Desirable 3 2 Do without 1	Traditional				Design & build						Management				Design & manage			
		Sequential		Accelerated		Direct		Competitive		Develop & construct		Management contracting		Construction management		Contractor		Consultant	
		Utility	Score	Utility	Score	Utility	Score	Utility	Score	Utility	Score	Utility	Score	Utility	Score	Utility	Score	Utility	Score
Time Is early completion required?		10		50		100		90		60		100		100		90		80	
Cost Is a firm price needed before any commitment to construction is formed?		90		40		100		100		90		20		10		30		20	
Flexibility Are varitions necessary after work has begun on site?		100		90		30		30		40		80		90		60		70	
Complexity Is the building highly specialised, technologically advanced or highly serviced?		40		20		20		10		40		100		100		70		80	
Quality Is high quality important?		100		60		40		40		70		90		100		50		60	
Certainty Is completion on time important?		40		50		100		90		90		40		30		100		80	
Is completion within budget important?		30		30		100		50		70		60		90		100		90	
Division of responsibility. Is single-point responsibility wanted?		30		30		100		100		70		30		10		90		90	
Is direct professional responsibility wanted?		100		100		10		10		50		70		100		30		30	
Risk Is transfer of responsibility for the consequence of slippages important?		30		30		80		100		70		30		10		100		80	
Results																			

Figure 7.1 Strengths and weaknesses of procurement systems. (Source: R.M. Skitmore and D.E. Marsden (1988) *Which Procurement System?* Towards a Universal Procurement Selection Technique.)

Table 7.1 Owner–occupier client: typical values transferred from Figure 5.2.

		Design and Build	Traditional	Management Contracting	Construction Management
Time 20%	Speed 5%	✓	×	✓	✓
	Certainty 15%	✓	✓	×	×
Cost 30%	Price 5%	✓	✓	×	×
	Certainty 15%	✓	✓	×	×
	Whole life 10%	?	✓	✓	✓
Performance 50%	Function 30%	?	✓	✓	✓
	Design 5%	?	✓	✓	✓
	Quality 15%	?	✓	✓	✓
Total		40%+	95%	65%	65%

Table 7.2 Developer client: typical values transferred from Figure 5.2.

		Design and Build	Traditional	Management Contracting	Construction Management
Time 50%	Speed 40%	✓	×	✓	✓
	Certainty 10%	✓	✓	×	×
Cost 30%	Price 20%	✓	✓	×	×
	Certainty 10%	✓	✓	×	×
	Whole life 0%	?	✓	✓	✓
Performance 20%	Function 15%	?	✓	✓	✓
	Design 5%	?	✓	✓	✓
	Quality 0%	?	✓	✓	✓
Total		80%+	60%	60%	60%

This information can be transferred to a simple toolkit matching the client's priorities and the generally accepted characteristics of the most commonly used procurement routes. Examples are shown in Tables 7.1, 7.2 and 7.3 for, respectively, an owner–occupier, a developer and an investor. In each case the percentages identified by the client in the Priority Distribution Analysis are inserted in the left hand column and extended across to enable the best fit to be identified against the characteristics of the procurement routes shown.

To assist this process and to ensure as much objectivity as possible, checklists are provided in the Appendix. These checklists are provided to ensure that the right questions are asked of the client to ensure that the professional judgement used in the completion of Tables 7.1, 7.2 and 7.3 is as accurate as possible.

Table 7.3 Investor client: typical values transferred from Figure 5.2.

		Design and Build	Traditional	Management Contracting	Construction Management
Time 40%	Speed 40%	✓	×	✓	✓
	Certainty 0%	✓	✓	×	×
Cost 20%	Price 5%	✓	✓	×	×
	Certainty 10%	✓	✓	×	×
	Whole life 5%	?	✓	✓	✓
Performance 40%	Function 20%	?	✓	✓	✓
	Design 10%	?	✓	✓	✓
	Quality 10%	?	✓	✓	✓
Total		55%+	60%	85%	85%

Procurement routes: a review

Hughes (2004) has argued that since there are so many variables to each of the commonly adopted procurement routes, notwithstanding the commonly adopted nomenclature, there is a very wide range of routes available. This may be so, but there are a range of commonly adopted basic procurement frameworks, each of which is discussed below.

Traditional (design–bid–build)

This is probably still the most commonly adopted UK route, particularly for inexperienced or occasional construction clients. The design is completed before the selection of a contractor to build the works. It is seen as the least risk approach for the client as there is an inherent level of certainty about design, cost and duration if it is properly implemented. The sequential nature does mean that it can be relatively slow prior to the commencement of construction.

Under a traditional procurement route, design should be completed before competitive tenders are invited and before the main construction contract is let. As a result, and assuming no changes are introduced, construction costs can be determined with reasonable certainty before construction starts. This may be particularly attractive to clients with a strictly limited budget or a limit to their borrowing powers.

The tender documents include drawn designs and a specification of workmanship and materials which the contractor must use in the preparation of a price. In some cases the client will arrange to appoint a quantity surveyor to measure the quantity of work to be done in order to satisfy the demands of the design. In such cases each contractor will submit a price upon the same work extent and the client will be responsible for the accuracy of these quantities prepared in the form of a bill

of quantities. Whilst such documents reduce the contractors' tendering costs, significantly fewer of them have been used in the last 25 years, shifting the risk for assessing the extent of the work back to the contractor.

The tender documents supplied to the contractors bidding for the work may include drawings and a specification without quantities. Consequently the costs of the bidding process are increased as all tenderers will have to carry out some form of quantification for which they have to take the risk of error.

The contractor assumes responsibility and risk for the construction of the building works for the agreed contract sum, to the design produced (usually) by the client's architect, and within the contract period, whilst the client takes the responsibility and risk for the design and design team performance. Therefore, if the contractor's works are delayed by the failure of the design team to meet their obligations, the contractor may seek recompense from the client for any additional costs and time to complete the project. In turn, the client could seek to recover these costs from the design team members responsible, if negligence could be proved.

Clients are able to influence the development of the design to meet their requirements because they have direct contractual relationships with the design team. When construction begins, they usually have a single contractual relationship with a main contractor, but are usually only able to influence (not control) the construction process through their architect, acting as their agent for this purpose.

The strategy may fail to some degree if any attempt is made to appoint a contractor for the work before the design is complete. Such action will probably result in many post-contract changes which could delay the progress of the works and increase the costs. Where a traditional route is chosen because of its particular advantages, the temptation to let the work before the design is complete should be strongly resisted.

It is possible to accelerate the pace of the traditional procurement route by adopting a two-stage tendering approach where the contractor is selected on the basis of prices submitted on an approximate or notional bill of quantities. The final contract sum will be negotiated as the design is completed. This has the potentially significant advantage of enabling the contractor to contribute to the development of the design, but the extent to which this might be useful will usually depend upon the type of the project and the completeness of the design at the time the contractor is appointed. Also, depending upon the nature and degree of accuracy of the initial approximate quantities, particularly perhaps in terms of specification, inequality in the relative strengths of the parties' negotiating positions may leave the client paying a higher price than would have been the case had the work been tendered on completion of the design. In general the more novel and complex the design, the more likely it is that the contractor will be able to contribute ideas which will improve constructability and may thus lead to savings in construction time and, often to a lesser extent, construction cost. Inequalities in the parties' negotiating positions may to some extent be negated through the use of a target cost contract where payment for the work is based upon reimbursement of the contractor's actual costs assessed on an open-book basis and incorporating pain and gain share provisions, rather than on a conventional lump-sum basis. Note

however that considerable commercial acumen will typically be required on the part of the client and his advisors if they are to negotiate an acceptable target cost with a contractor whose commercial interests are plainly best served by driving up the initial target cost as high as possible. Also the assessment of 'actual cost' is a highly skilled process demanding considerable knowledge of contractors' costing systems and accounting procedures. This task is, in truth, much more akin to forensic accountancy than the cost management skills normally practiced by a consultant quantity surveyor.

Some time-saving can usually be achieved by letting a separate, advance works contract, for example by allowing ground works (site clearance, piling and foundations) to proceed to construction once planning permission has been obtained and before the design for the rest of the building is completed, with the above-ground construction being tendered separately at a later date. This generally reduces the total time to complete the project, but at the risk of losing certainty of cost before construction starts. More importantly, a substantial risk is created in that the contractor who builds the superstructure has no responsibility for the foundation works carried out by another contractor, and this may pose major difficulties in the event that warranties are required by funders, tenants or subsequent third party purchasers of the completed building. In each of these cases the certainty of end cost is reduced in the search for a faster start but the other risks may still be contained.

The organisational structure of a traditional route is shown in Figure 7.2. A wide range of standard forms of contract are available, enabling a common understanding of rights and responsibilities, and these forms are usually updated to take account of, for example, changes in the law.

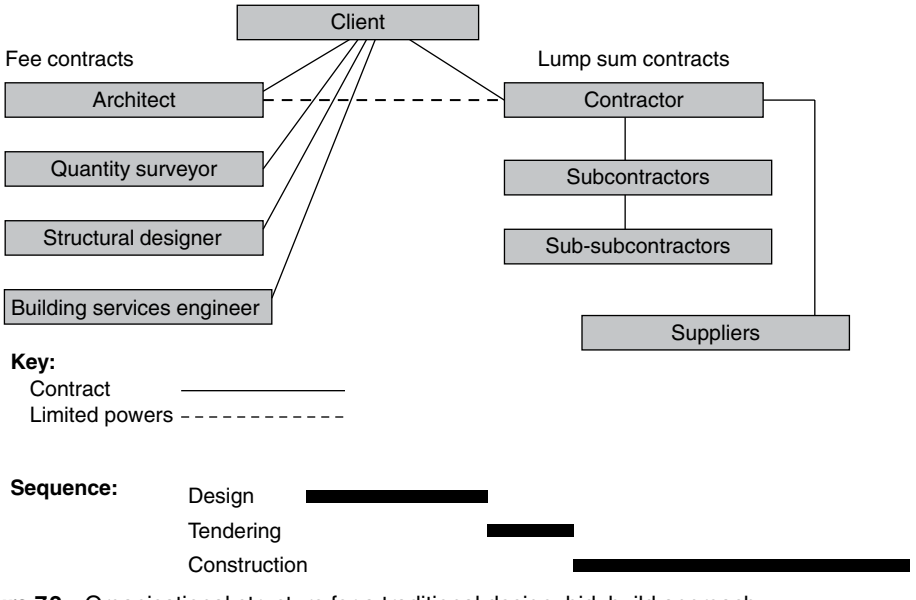


Figure 7.2 Organisational structure for a traditional design–bid–build approach.

The main advantages of a traditional contract route are as follows:

- Competitive fairness, since all tendering contractors are bidding on the same basis.
- Design-led, with the client able to have direct influence, thus facilitating a high level of functionality and bespoke quality in the design.
- Reasonable price certainty at contract award based upon market forces (subject always to design changes or client-led changes which will have cost implications).
- Where public expenditure or audit demands are rigid the route is satisfactory in terms of public accountability since it is transparent and based upon competition.
- The procedures are well known, enabling confidence to be assured in those involved throughout the supply chain.
- Changes are reasonably easy to arrange and to value where the design needs vary due to changes in client need or technology (though this ease of change can prove a disadvantage).

The main disadvantages are that:

- It is possible to attempt to speed up the process by producing tender documents from an incomplete design, but this will usually result in less cost and time certainty and can be the cause of expensive disputes.
- The overall project duration may be longer than for other routes as the strategy is sequential and construction cannot be commenced prior to the completion of design with no parallel working.
- There is no input into the design or planning of the project by the contractor, who will not be appointed at the design stage.
- The route is based upon price competition and this can result in adversarial relationships.

Design and build

The use of this approach has become increasingly popular over the last 25 years (RICS 2010). Under a design and build route, a single contractor assumes the risk and responsibility for designing and building the project, usually in return for a fixed-price lump sum. Design and build is usually regarded as a fast-track route, in that construction can start before all the detailed design is completed, with the contractor completing the design as the work progresses. There is a broad range of variants on the design and build arrangement and researchers have disagreed on how they should be categorised. For example, Andrews (1999) identified five variants and Akintoye (1994) identified six. Gidado and Arshi (2004) propose the following typology:

(A) **Traditional design and build**: The contractor accepts the total responsibility for design and construction to meet the requirement of the client.
(B) **Package deal** (including turnkey contracts): The contractor provides standard buildings or system buildings that are adapted to suit the client's space and functional requirements.

(C) **Design and manage**: The contractor gets a fee for managing all aspects of planning and design and supervising the subcontractors. The contractor has design responsibility.

(D) **Design, manage and construct**: This is similar to 'design and manage' except that the contractor is involved in construction of some work sections in addition to coordinating the activities of the subcontractors on site.

(E) **Novation design and build**: The client passes his architect to the contractor to produce detailed drawings as part of the contractor's team. During the design stage through to the appointment of the design and build contractor, the architect works directly for and is paid by the client. Once a contractor has been appointed, the architect's appointment is assigned to the contractor for whom the architect produces any outstanding information necessary to construct the work. In some cases, once practical completion of the work has been reached, the architect reverts back to being employed by the client. Beyond this stage, the architect prepares the list of defective and outstanding items, monitors their completion and certifies the completion of the project at the end of the defects liability period.

(F) **Develop and construct**: This is a hybrid process in which the contractor inherits a design that might have been produced by the client's consultants up to Stage D on the RIBA Architect's Appointment Scale. This is developed further by the contractor, taking into account the construction technique to be adopted for the project. This is different from novation in the sense that the architect who provides the concept design is not passed to the contractor by the client.

There is a reduction in risk for the client in contracting with a single organisation for both design and construction in that, unlike the traditional approach where design is carried out by one organisation and construction by another, there is no possibility of divided responsibility for defects in the completed works. There is however an increased risk that control over the design and specification may be substantially lost. It is very important for the client to reduce this risk, firstly by taking great care in selecting the contractor to carry out the work and secondly by clearly specifying the requirements and constraints of the project, generally in the form of detailed performance specifications against which the actual performance of the completed building and its constituent elements and systems can be objectively measured. The document setting out these requirements is often termed the Statement of Employer's Requirements, and it is for the tendering contractors to put forward Contractor's Proposals which address the expressed requirements. Note however that any client requirement that is not directly specified in the Statement of Employer's Requirements provided to those contractors tendering for the work will constitute a variation to the contract. Assessment of the price to be paid for variations under a design and build contract is frequently difficult, and the cost of such changes to the client will generally be greater than would be the case under a traditionally procured project with a Bill of Quantities.

Note however that, under most standard forms of contract, the bargain is formed by the client's acceptance of the Contractor's Proposals and it is therefore the client's

responsibility to ensure that such proposals adequately address the Employer's Requirements. It should also be noted that, at common law, design and build contractors have a 'fitness for purpose' liability (see for example *Viking Grain Storage* v *T.H. White Installations (*1985)[1] and *Independent Broadcasting Authority* v *EMI Electronics and BICC Construction Ltd* (1978)[2]) rather than the less onerous 'due skill and care' obligation of a consultant designer (*Bolam* v *Friern Hospital Management Committee* (1957)[3]). Design and build contractors may however exclude their common law obligation and replace it with the obligation to use 'due skill and care'. This approach is supported by a number of widely used standard forms of contract although some, notably the NEC3 form (NEC 2005), require 'fitness for purpose' as standard with the option to reduce to 'due skill and care' provided as an alternative which clients must actively choose. In recent years it has become more common for employers to seek to impose a 'fitness for purpose' obligation on design and build contractors, but such obligations may be difficult to enforce in their entirety unless the meaning of 'fitness for purpose' is clearly defined in the contract. Some have attempted to do this by requiring their Statement of Employer's Requirements to be a contract document taking precedence over the Contractor's Proposals. Note however that the issue of fitness for purpose is a very thorny one. Githunguri (2012) provides a useful summary of the legal position.

The imposition on contractors of fitness for purpose in design is a matter of judgement for clients and their professional advisers, even though tenderers in recessionary markets are unlikely to refuse to undertake such risks. The requirement for insurance to cover a higher than normal risk should be weighed against the financial ability of contractors to meet design default claims. It may represent better value for money to impose a lesser, yet insurable, liability, which will be the subject of an insurance payout in the event of a design fault, rather than a fitness for purpose requirement on a contractor with limited financial assets.

Variants E and F of the typology given earlier (Gidado and Arshi 2004) are themselves variations of a strategy generically termed 'develop and construct', under which the client appoints designers to prepare the concept design, perhaps but not always as far as RIBA Stage D, before the contractor assumes responsibility for completing the detailed design and constructing the works. By transferring design risk to the contractor, the client is able to ensure that the initial design and specification meets his needs but, as with any design and build variant, loses some control over the latter stages of project design.

Under this approach, the client will usually employ a design team to carry out some preliminary design, to prepare the project brief and other tender documents, and to assist him with the preparation of the Statement of Employer's Requirements. Sometimes, the successful contractor will voluntarily assume responsibility for this design team and use it to produce the detailed design. Where this is the case, contracts usually require the contractor to 'complete the design for the works'; until

[1] 33 BLR.

[2] 14 BLR 1.

[3] 1 WLR 582; [1957] 2 All ER 118; [1955–95] PNLR 7, QBD.

2002, it was generally considered that the contractor took no liability for the adequacy of any design work carried out by the consultant. It was however found, in *Cooperative Insurance Society Ltd* v *Henry Boot Scotland* (2002)[4] that the contractor's obligations in completing the design included a responsibility to assess and verify the assumptions upon which the original design was based.

A second option (variant E of the typology given earlier) provides for the contractor to agree to novate the contract the client has with the designers to the contractor. Under a novation arrangement the contractor effectively 'steps into the client's shoes' and takes over the client's responsibilities in respect of the consultant's existing contract. Designers do, however, sometimes resist being novated to contractors. If a design and build route is identified as a possibility at an early stage, then the basis of the appointment of the design team should reflect the possibility of novation. If it does not, the client may have to pay a termination fee to the design team. The client may wish to retain the independent services of a cost consultant throughout the contract for early cost advice involvement in the bidding process and cost reporting during construction.

Consideration may need to be given to the inclusion of a special clause in design, or design and build, contracts to ensure that the responsibility for design performance is properly allocated or shared. Such a clause should identify specific obligations that are absolute, that do not require the designer to be an expert in the client's business and, as a consequence, are reasonably insurable.

Increasingly, in the wake of cases such as *Darlington Borough Council* v *Wiltshire Northern Ltd* (1995)[5] and the lengthy saga of *Alfred McAlpine Construction* v *Panatown Ltd* (2001),[6] collateral warranties are being demanded by funders, tenants and third party purchasers to place additional responsibility on designers or subcontractors. Such problems may however now be dealt with in the UK under the contract using the provisions of the Contracts (Rights of Third Parties) Act 1999.

Clients may also choose to take out latent defects insurance to cover post-construction liability, usually covering defects due to faulty design, workmanship or materials. The policy is usually for 10–12 years for a single premium and is assignable, but this will be at a relatively high cost. This is a matter for specialist advice from insurance experts.

In short, design and build provides a range of options from a package deal or turnkey solution, in which the client has little involvement in the design development or building procurement process (effectively, a complete hands-off approach), to a develop and construct solution, in which the client appoints designers to develop his or her brief to a level of sophistication which will leave the design and build contractor to develop detailed or specialist design elements.

The generic project organisation structure for design and build is shown in Figure 7.3. Contractors may use their own firm's resources for undertaking the design (in-house design and build) or, more likely, may outsource them to one or

[4] EWHC 1270 (TCC).
[5] 1 WLR 68; [1995] 3 All ER 895; [1994] CLC 691, CA (Civ Div).
[6] Unreported, 27 July 2000, HL.

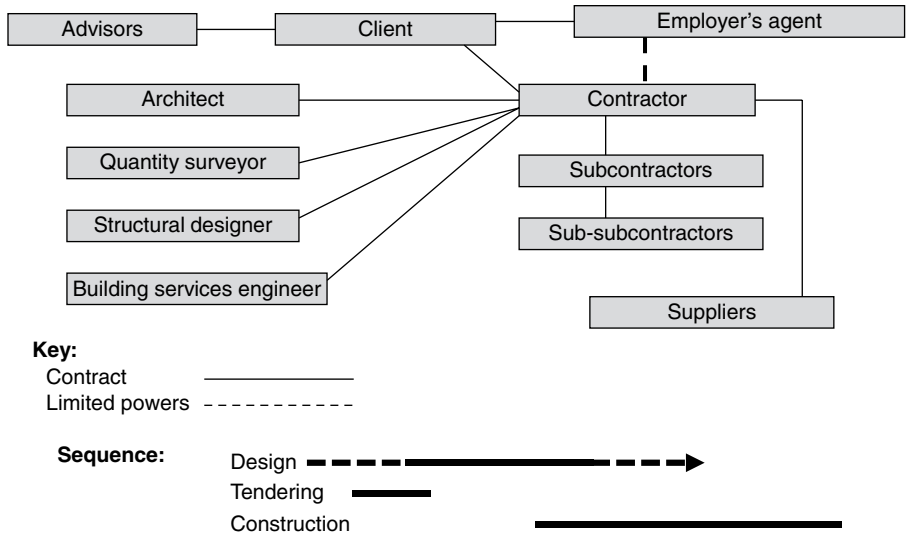


Figure 7.3 Organisational structure for a construction management for a design and build approach.

more consultancy firms, whilst retaining control. Standard forms of design and build contract are available.

The main advantages of a design and build route are as follows:

- The client has to deal with only one firm, significantly reducing the need to commit resources and time to contracting with designers and contractors separately.
- The approach enables the integration of the constructor and specialist subcontractors to contribute to the design and project planning.
- Price certainty is obtained before construction starts provided the client's requirements are adequately specified and changes are not introduced.
- It is possible to reduce the total project time due to early completion because of overlapping activities.

The disadvantages are that:

- Difficulties can be experienced by clients in preparing an adequate and sufficiently comprehensive brief and in defining what they require from the contractor's proposals in order to assess them at bid stage.
- The client is required to commit to a concept design at an early stage and often before the detailed designs are completed.
- Bids are difficult to compare since each design will be different, the project programme will vary between bidders and prices for the project will be different for each different design.
- There is no design overview unless separate consultants are appointed by the client for this purpose. Quality may be compromised as the client has relinquished control to the design and build contractor.
- Client changes to project scope can be expensive.
- Design liability is often limited by the standard contracts available.

Measurement (remeasurement or measure and value)

This procurement route is only occasionally adopted for building works but is commonly used for civil engineering projects where there is a level of uncertainty in terms of the ground conditions. The organisational structure of the route is identical to the traditional route (see Figure 7.2) but the contract sum is only established with certainty on completion of construction, when remeasurement of the quantities of work actually carried out takes place. The basis for the final sum to be paid is the tender prices provided by the contractor on the basis of a bill of approximate quantities or even a schedule of rates.

Measurement contracts are sometimes referred to as 'remeasurement' or 'measure and value' contracts and are based upon the principle that the work carried out is measured and valued at the prices for each type of work tendered by the contractor.

The most effective use of a measurement contract is where the work has been substantially designed but the final detail has not been completed. Here, as with civil engineering projects, a tender based on drawings and a bill of approximate quantities will be satisfactory.

Measurement contracts allow a client to shorten the overall programme for design, tendering and construction but usually with some lack of early price certainty because the approximate quantities reflect the lack of information on exactly what is to be built at tender stage. The scope of the work, the approximate price and a programme should be clear at the contract stage. Measurement contracts provide more risk for the client than the sort of lump sum contracts achieved through design–bid–build contracts but probably with programme advantages.

The organisational structure of a measurement contract route is identical to the traditional approach except that it is not a lump sum contract. Standard forms of contract are available.

The main advantages of a measurement contract include the following:

- Potential for pre-construction time-saving, as the later aspects of the design are still ongoing as the works are progressing on site.
- Competitive prices, as the work is tendered on standard approximate quantities which will be used to value the completed work on site.
- Some public accountability where this is required due to the competitive selection process.
- Well-known procedures, particularly in civil engineering projects.
- Changes can be made easily as the later stages of the design are still progressing.
- Parallel working possible, as the contractor is selected before the design and project planning processes are completed.

The main disadvantages are that:

- The route offers poor certainty of price since the cost to the client will not be accurately known to the client until the works are complete. This will depend upon the level of certainty in the approximate quantities used in the tendering process.

- Programme length will be affected if the pace of design is not maintained.
- There is no contractor involvement in the early planning or design stage when most of the expensive or time-impacting decisions are made.
- There is potential for adversarial relationships to develop, as with all strategies that are price dependent. This may be more likely in this case unless a willingness to negotiate is evident in both the contractor and the design team/client.

Construction management

Under a construction management route, the client does not allocate risk and responsibility to a single main contractor. Instead, the client employs the design team and a construction manager is engaged as a fee-earning professional to manage, programme and co-ordinate the design and construction activities and to facilitate collaboration in order to improve the buildability of the design.

Construction work is carried out by trade contractors through direct contracts with the client for distinct trade or work packages. These trade contractors are appointed as soon as the design for that element of work is completed. This may be at an early stage or a late stage in the construction process. Since design of the whole project does not need to be detailed when work commences this will result in an opportunity for a faster completion. The construction manager supervises the construction process and co-ordinates the design team.

This route is usually adopted where the project is programme-driven. Cost certainty is not achieved until the final trade contract is let and equally there is no contractual completion date. The client will have to decide to progress with this route on the basis of an estimated budget or an approximate programme.

The construction manager, who has no contractual links with the design team or the trade contractors, provides professional construction expertise without assuming financial risk and is liable only for negligence by failing to perform the role with reasonable skill and care, unless some greater liability is incorporated in the contract.

On appointment, the construction manager will take over any preliminary scheduling and costing information already prepared and will draw up a detailed programme of pre-construction activities. Key dates, at which client decisions will be required, are normally inserted. In adopting the construction management system, the client will be closely involved in each stage of design and construction. The client must have administrative or project management staff with the time and ability to assess the recommendations of the construction manager and take the necessary action. The client needs to maintain a strong presence through a project management team that is technically and commercially astute. This approach is not, therefore, suitable for the inexpert or inexperienced client.

Better cost certainty can inevitably be achieved when as many packages as possible are let as early as possible. This will depend upon the pace of the design process. Also, design development of later packages can affect construction work already completed. The construction manager should, therefore, have a good track record in cost forecasting and cost management. A package is made up of

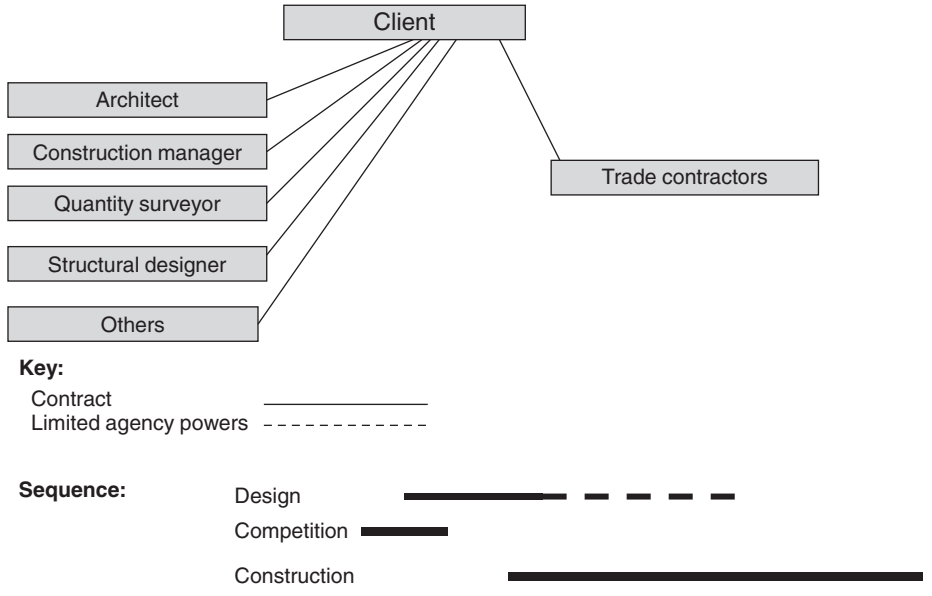


Figure 7.4 Organisational structure for a management contracting for a construction management approach.

work for which one of the trade contractors is responsible, e.g. foundations, concrete, electrical installation or decorating. These packages are tendered individually, for a lump sum price, usually on the basis of drawings and specification.

Construction management has been predominantly used in the UK for large or complex projects, but there is no intrinsic reason for this. Indeed, it is particularly recommended for projects where there is a high degree of design innovation, where the client wants 'hands on' involvement.

The organisational structure of construction management is shown in Figure 7.4. Standard forms of contract are available.

The main advantages of a construction management route are as follows:

- Relative time-saving potential for overall project time due to the overlapping of design and construction procedures.
- The route enables constructor contribution to the design and project planning.
- Roles, risks and relationships for all participants are clear.
- Changes in design can be accommodated later than in some other routes, without paying a premium, provided the relevant trade packages have not been let and already awarded packages are not adversely affected.
- The client has direct contracts with trade contractors and pays them directly. (There is some evidence that this results in lower prices because of improved cash flow certainty.)

The disadvantages are that:

- Price certainty is not achieved until the last trade packages have been let. Budgeting depends heavily upon design team estimates.

- An informed, pro-active client is required in order to operate such a strategy.
- The client must provide a good quality brief to the design team as the design will not be complete until the client has committed significant resources to the project.
- The route relies upon the client selecting a good quality and committed team.
- Close time and information control is required. The design team must be controlled and kept on programme for the delivery of design information when required to ensure that neither the work package procurement nor the works on site is delayed.

Management contracting

With this approach, a management contractor is engaged by the client to manage the whole of the building process and is paid a fee for doing so. Unlike construction management, the management contractor has direct contractual links with all the works contractors and is responsible for all the construction works. The management contractor, therefore, bears the responsibility for the construction works without actually carrying out any of that work. The management contractor may provide some of the common services on site, such as office accommodation, tower cranes, hoists and security, which are shared by the works contractors, but in pure management contracting such works are let as a self-contained work package. The client employs the design team and, therefore, bears the risk of the design team delaying construction for reasons other than negligence, for example late issue of design information which may cause delay to the programme.

Management contracting is a 'fast track' route. All design work will not be complete before the first works contractors start work, although the design necessary for those packages must be complete unless, of course, the work contained in the package is of a specialist nature (for example curtain walling) when packages may be let on a design and construct basis. Consequently there is little cost certainty for the client until construction works are well under way and it is a route usually adopted, as with construction management, where the primary objective for the client is relative speed to completion.

As design is completed, subsequent packages of work are tendered and let. Cost certainty is, thus, not achieved until all works contractors have been appointed. A high level of cost management is, therefore, required. With the agreement of the client, the management contractor selects works contractors by competitive tender to undertake sections of the construction work. The client reimburses the cost of these work packages to the management contractor who, in turn, pays the works contractors. The management contractor co-ordinates the release of information from the design team to the works contractors.

Where the management construction team is not of the highest quality, or where the management fee is inadequate, the management contractor can be less than pro-active and the system can become a reactive 'postbox' approach. It is, therefore, vital to select the management contractor carefully and to ensure that his or her fee

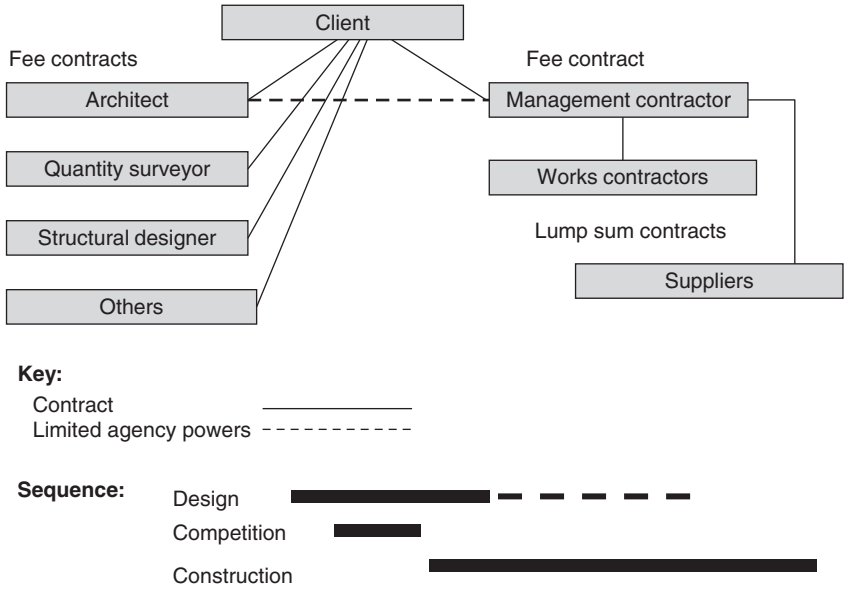


Figure 7.5 Organisational structure for a design and build for a management contracting approach.

is appropriate, bearing in mind market conditions. Similarly, resistance to works contractors' claims can be affected by the same circumstances.

The organisational structure of a management contract is shown in Figure 7.5. A standard form of contract is available.

The main advantages of management contracting are as follows:

- There are programme benefits for the overall project due to the overlapping of the design and construction processes.
- The constructor can contribute to the design and project planning.
- Changes can be accommodated provided packages affected have not been let and there is little or no impact on those already let.
- Works packages are let competitively at prices that are current at the time the work is let.

The disadvantages are that:

- The client must provide a good quality brief to the design team as the design will not be complete until the client has committed significant resources to the project.
- Poor certainty of price is offered at an early stage and the potential cost commitment depends upon design team estimates.
- The approach relies on a good quality committed team or it may become no more than a 'post box' system in certain circumstances.
- It reduces resistance to works contractors' claims where such demands are passed on to the client by the management contractor.

Design and manage

Although the design and manage approach is categorised by some researchers as a form of design and build, the design and manage route has strong similarities to management contracting. Under a design and manage contract, the contractor is paid a fee to manage and assume responsibility, not only for the works contractors, but also for the design team.

The main advantages of design and manage are as follows:

- The client deals with one firm only, enabling improved co-ordination and collaboration between designers and constructors.
- There is a relatively good time-saving potential for the overall project due to the overlapping of the design and construction processes.
- The contractor assumes the risk and responsibility for the integration of the design with construction.

The disadvantages are that:

- Price certainty is not achieved until the last work package has been let.
- The client loses direct control over the design quality which is influenced significantly by the constructors.
- The client has no direct contractual relationship with the works contractors or the design team and it is, therefore, difficult for the client to recover costs if they fail to meet their obligations.

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8 Project team selection

Introduction

Project procurement is a team-based activity. The literature relating to the appropriate selection and operation of teams to ensure suitable leadership and cohesiveness is extensive, but the temporary nature of construction project teams means that much of what has been written cannot be directly applied to construction. In addition the selection of construction teams actually involves two separate processes:

- Selection of the organisations which will come together to deliver the project.
- Selection of the individual representatives from those organisations who will be charged with physical project delivery.

The first of these two operations is conventionally carried out by the client for whom the project will be built, often working on the basis of advice provided by consultant advisors who still often themselves become part of the final project delivery team. The second process is undertaken by the delivery organisations themselves, who will appoint members of their own staff to represent them at the level of actual project delivery. These individuals therefore have an essentially divided allegiance as far as project delivery is concerned, firstly to their employer and secondly to successful completion of the project as a whole.

What this means is that, in most cases and with very few exceptions, the client will have no input at all to the team of individuals charged with delivering his project. It also means that project teams are essentially ephemeral in nature; with the exception of senior project management, the team responsible for delivery at the end of the project will, in most cases, not be the team responsible for project completion.

The transient temporary nature of the project team and the organisational structure within which the team carries out its duties means that long-term relationships are rarely possible within the project itself. Even in the context of long-term strategic relationships to deliver programmes of work based upon

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collaborative principles, the organisations may be the same but the actual composition of the project delivery team may vary from one project to the next.

In the context of this chapter, team selection relates to the client's function in choosing the organisations which will comprise the super-organisation responsible for project delivery, and it is that organisation which here is termed the 'project team'.

Selection of the project team at this level can only be based upon evidence provided by the potential team members, on hearsay from others with whom they have done business or co-operated and which the client will do all he can to verify by independent means, and price. Kashiwagi (2004) emphasises that by selecting team members who can prove previous success, the client is likely to improve the odds of a successful project. In the UK however greater emphasis, particularly perhaps in the public sector, has been given to devising processes able to support accountability.

Selecting the right project team is likely to be the single activity that can reduce most client risk. An effective team can collaborate in the client's interest to ensure the delivery of the right project at the right price at the right time. An ineffective team can fail on all these criteria and involve clients in expensive disputes.

It is therefore remarkable that much of the project work let to consultants and constructors is based primarily upon selecting team members on the basis of price rather than the quality or suitability of their bid. This is one area where government and representative bodies have consistently advised that the quality and suitability aspects of a bid should dominate choice. Inexperienced clients are well advised to emphasise provable previous performance as a key selection criterion which takes precedence over price. After all, the project will add value to the client and this added value is the key to project success. It is probably good business sense to take longer in selecting the best team on the basis of evidence provided rather than assuming capability or suitability on the basis of size or promotional literature.

Since all projects will go through phases involving design, costing, planning, construction and commissioning, they will involve appointing consultants and constructors. The selection of the most appropriate project team is a key process in terms of likely project success. Processes that aid the selection of both consultants and contractors and which incorporate aspects of quality and capability have been developed, typically those produced in the late 1990s by the (then) Construction Industry Board. Processes such as these have been widely used, particularly by public sector clients, as they also enable accountability through a clearly established algorithm.

Whilst process cannot supplant the development over time of effective teams, in cases such as the construction industry there is some anecdotal evidence to suggest that significant improvement can be achieved.

The traditional business practice of selecting on the basis of lowest price is not likely to prove the most successful strategy when the risk of a badly designed project of poor quality delivered late can result. Advice from, for example, the

client's independent advisor is available to assist in this process, to ensure sensible competition between experienced professionals. The consultants assisting the client through the project are key to achieving short-term objectives and long-term strategy. Good design adds value in both use and worth. Early appointments are likely to include designers and cost managers. The client sponsor will need to manage the process of communicating the parameters established and the functional and design needs for the project. This will enable a concept design to be produced and costed and then developed through an iterative process reflecting the development of the project brief.

The selection process

Perhaps the most sophisticated approach to the selection of consultants and contractors is that adopted for public works and illustrated here. It can be adopted for all work.

The procurement of works and services in the public sector in Europe is constrained by law under the various European Union Procurement Directives (see Chapter 4). These regulations, which are incorporated into UK law through the Public Works Contracts Regulations, prescribe a methodology that must be followed when inviting tender for public sector works or services, which is designed to ensure maximum fairness and transparency in the tendering and contractor selection processes.

Essentially the same process is used for the selection of both consultants and contractors, and the process is usually divided into three stages:

(1) Prequalification and compilation of the tender list.
(2) Tender invitation and submission.
(3) Tender evaluation (including interviews) and acceptance.

Prequalification

This 'coarse sieve' process is intended to ensure that, before being included on a tender list, applicants are assessed to ensure that they are capable of providing the necessary financial resources, technical and management expertise to complete the project successfully.

The prequalification process may be carried out for each project, when a client or organisation wishes to maintain a standing list of approved contractors, or to enter into a framework arrangement.

The purpose of prequalification then is to ensure that the organisations chosen to tender:

- Have the necessary technical and managerial skills to complete the work.
- Have the necessary resources, both technical and financial, to complete the project.
- Wish to submit a genuinely competitive bid.

The process therefore consists of:

- Identifying those firms interested in tendering for the work.
- Selecting the most appropriate of the interested applicants for the final tender list.

A general list of factors can be considered when selecting contractors, a weighting being placed on each to reflect relative importance in terms of the project. Weightings may vary from project to project and client to client. Responses are typically scored against a predefined scale, although some may be scored on a simple pass/fail basis. The following is a list of the general factors, in no particular order of importance, that may be used when prequalifying a bidder:

- Technical capability and areas of expertise.
- Financial stability and capability.
- Current project commitments.
- Geographical area of operation.
- Areas of particular specialisation.
- Management expertise.
- Quality of supervisory staff.
- Evidence of standards of quality and workmanship.
- Safety record and procedures.
- Project performance record.

It is usual for responses to be independently assessed on the basis of a predefined set of criteria by two or more assessors, with specialist advice being sought where required, for example in the case of financial issues, health and safety or environmental issues. A number of rating systems are used, but the most common involve an assessment on a scale of 1–5, 1–10 or 1–100. Table 8.1 shows a typical 1–10 grading. An example matrix analysis is shown in Figure 8.1.

The contractors obtaining the highest scores would be included in the tender list. Once all of the responses have been scored, the various assessors then come together and negotiate a mutually agreed score for each question.

In 2010, the British Standards Institution published a Publicly Available Specification, PAS 91, setting out best practice in the construction of prequalification questionnaires (BSI 2010). The specification provides advice and guidance on the preparation of prequalification questionnaires and includes standardised questions as follows:

- Annex A: Core questions dealing with the following basic issues:
  - bidder identity, roles and contact information;
  - financial information;
  - business and professional standing.
- Annex B: Supplementary questions dealing with:
  - CDM co-ordination expertise;
  - equal opportunities and diversity issues;
  - environmental management issues;
  - quality management issues.

Table 8.1 Example of an assessment scale.

Assessment	Rating
Unsatisfactory: falls short of acceptable level	1, 2
Below average: falls below level occasionally	3, 4
Average: acceptable level	5, 6
Above average: meets requirements generally	7, 8
Outstanding: often exceeds requirements	9, 10

Factors or attributes	Weight	Contractor A Rating	award	Contractor B Rating	award	Contractor C Rating	award
Financial stability	20	95	19.0	100	20.0	80	16.0
Management ability	20	100	20.0	95	19.0	95	19.0
On-site supervision	6	90	5.4	100	6.0	90	5.4
Technical expertise	20	80	16.0	100	20.0	90	18.0
Quality of material	6	95	5.7	95	5.7	100	6.0
Quality of workmanship	10	95	9.5	90	9.0	100	10.0
Quality of industrial relations	4	100	4.0	100	4.0	80	3.2
Safety procedures	4	100	4.0	90	3.6	80	3.2
Keeping to programme	10	100	10.0	100	10.0	95	9.5
Totals	100		93.6		97.3		90.3

Contractors are rated out of 100 for each of the factors or attributes, the best of the three being given 100 and the marks of the other two related to this.

$$\frac{\text{Rating}}{100} \times \text{Weight} = \text{Award} \qquad \text{e.g. } \frac{95}{100} \times 30 = 28.5$$

Figure 8.1 Matrix analysis for selection of contractors.

The specification also includes (in Annex E) a summary of the responsibilities of those procuring services in the public sector. Note that organisations using the specification are required to use Annexes A and B as-is – that is, with no alteration to or deletion from the standard questions.

Note also that construction clients require bidders to provide evidence that they are, if required, able to provide a performance bond, a parent company or a bank guarantee as a safety net for the client in the event of non-completion of the work.

Tender invitation and submission

Following completion of the scoring process, those applicants with the highest scores are included on the final tender list. Lists may be compiled either by including all firms scoring more than a pre-defined threshold score or in terms of a predefined number of bidders. In this case, the number of consultant firms invited to bid might typically be between four and eight; for contractors for a traditionally let project using either a bill of quantities or specifications and drawings, the optimum number of contractors invited to tender is recommended generally to be between five and eight. Any fewer increases the risk that the tender process will not be genuinely competitive, whilst longer lists than this are likely to result in the best firms declining the opportunity to bid on the grounds that their chances of success will be too small. For contractors tendering to bid on a design and build basis, between four and six bidders might be appropriate. The Joint Contracts Tribunal is typical of many bodies which produce standard tendering processes the latest Tendering Practice Note (JCT 2012) provides advice on pre-qualification and selective tendering procedures including single stage, two stage and competitive dialogue processes.

Tender evaluation

Modern practice is that tenders are evaluated against a range of criteria, including financial issues and technical and commercial considerations. Elements are assessed using a similar methodology to that used for the prequalification questionnaire, however in the case of tenders the evaluation will typically comprise: (1) a desk-top evaluation of the bid submission and (2) an interview process Sometimes parts of the evaluation are carried out blind, i.e. not identifying the firm whose bid is being evaluated.

Price

Evaluation of contract price forms part of the desk-top process. Several techniques could be used, but the most popular involves comparing the various tender prices and scoring them with a preset formula. One popular and simple formula allocates 100 marks to the lowest tender and ranks each other tender according to the percentage difference between it and the lowest. If we assume that contractor A submits the lowest price then the score for any other contractor (x) is calculated as:

$$\text{Score}\,(x) = 100 - \left(\frac{\text{Price}\,(x) - \text{Price}\,(A)}{\text{Price}\,(A)} \right) \times 100$$

Technical evaluation

In evaluating tender bids for a large project, various headings may be used to assess the ability to carry through this particular project. It is important to note that

technical evaluation of the tender should not duplicate the technical evaluation already carried out as part of the prequalification stage. In essence, the prequalification stage is backward-looking and reviews historical performance, whereas the tender evaluation is forward-looking and examines what the bidder proposes for the specific project. Issues reviewed at the tender stage might therefore include:

- The bidder's proposed contract management team.
- Personnel issues.
- The proposed approach to the work.
- Work control:
  - environmental practices and proposed solutions relating to the project;
  - productivity;
  - safety issues relating to the project.
- Quality assurance relating to the project.
- The number of subcontractors, perhaps identifying specific firms if important.
- Project materials.

Commercial evaluation

This approach involves checking the contractual and commercial terms of the tenders. It can be adopted in the selection of a team for public or private works. Both technical and commercial evaluations will typically form part of the desk-top process, but may also include 'reality checks', involving a site visit process.

Interview

The contractor interview is an important element of the evaluation of the potential bidder. It should be used not only as a means of learning more about the contractor, but also as an opportunity for the client's team to meet the bidder's team and to assess how well the teams will be able to work together. It is also an opportunity for the bidder to assess the client's team, which is especially important where a collaborative arrangement is envisaged.

Both client and bidder should field the key people who will be responsible for carrying out the project on a daily basis and who will therefore be responsible for project success. The interview panel must be carefully briefed and must agree beforehand on issues to be addressed.

The contractor should be asked to organise visits to suitable projects, both completed and in the course of construction, and to facilitate meetings with previous clients and end users. Such meetings will usually be private and the contractor will not generally be allowed to participate.

Where a project is relatively large or the work is more complex, a much more structured approach to the interview may be appropriate. When the Corporation of London was involved in selecting design and construction teams for city academies the interview consisted of a day of site visits, meetings with key players and an extensive, thorough and comprehensive interview in front of an expert panel.

Award of the contract

The technical, commercial and financial evaluations will be drawn together and a final decision made. Selection of tenderers and evaluation of submitted tenders may seem to be a long, laborious process, but the choice of service provider will generally be a critical decision in the successful completion of a contract.

Selecting a consultant

The process of selecting and appointing the project consultancy team is carried out by the client, but he or she may seek the advice of an independent adviser. The terms and conditions of these appointments are governed by the procurement strategy adopted for the project.

The following alternatives exist in selecting the design team:

- Single appointment of a multidiscipline firm which can provide the full range of services required or a lead consultant, often a project manager, who may directly appoint other consultants as subcontractors or who will both manage the project and act as contract administrator.
- Separate appointments for each of the different disciplines required, with one firm being appointed design team leader with responsibility for co-ordinating the work carried out by the others.

The former has the benefit of administrative simplicity and of single-source responsibility, whereas the latter offers the chance of selecting the best firm in each discipline but makes communication more difficult. The final selection will depend on the particular features of the project.

The selection of the various consultants will require the client to make a balanced judgment on the following factors, listed in order of priority:

- Capability: the experience of the firm in projects of similar size and function and the availability within the firm of sufficient, uncommitted resources for it to meet the demands of the project; the demands of the project programme may be particularly important.
- Competence: the performance of the firm on past projects, to be ascertained by detailed, confidential references from past clients; efficient performance by design consultants cannot be taken for granted.
- Staff: the personal capability and experience of the key staff whom the firm proposes to employ on the project.
- The cost quoted by the firm: unless large differences exist between offers from competing firms, this factor should not be critical.

Value for money, not lowest price, should be the aim in the selection of the consultancy team members. The Construction Industry Board (1996) provided guidance on establishing a quality/price mechanism. The guidance gives percentage weightings to quality and price – the more complex the project the more the ratio should emphasise quality (see Table 8.2).

Table 8.2 Indicative ratios of quality and price.

Type of project	Quality/price
Feasibility study	85/15
Innovative project	80/20
Complex project	70/30
Straightforward project	50/50
Repeat project	20/80

Table 8.3 Recommended quality weightings.

Characteristic	Weighting
Practice or company	20–30%
Project organisation	15–25%
Key project personnel	30–40%
Project execution	20–30%

Quality is assessed under four main headings and weighted. Recommendations for the weightings are in Table 8.3. To enable a bid to be considered it must achieve a minimum quality threshold, e.g. 65 out of 100.

The resultant assessment is achieved by marking each of the quality criteria out of 100 and multiplying by the weighting percentage.

Consultants passing the quality threshold can then be interviewed and the lowest compliant bid scored at 100, multiplied by the quality/price ratio and added together to give a total score. The highest scorer wins (see Figure 8.2). Guidelines for the value assessment of competitive tenders in the procurement of professional services have also been published by the Construction Industry Council (1998).

Fees payable to professional consultants may be expressed in one or more of the following ways:

- As a percentage of the construction cost of the project.
- As a lump sum.
- On a time charge basis.

Percentage fees based on the out-turn construction costs are not generally recommended as they increase when cost overruns occur.

Lump sum fees may be the most satisfactory form of remuneration, provided only that the scope, value and timescale of the project can be established with reasonable accuracy before the appointments are made and that the services to be provided by the consultants can be accurately defined. Where lump sum fees are to be paid, the client will need to establish systems for monitoring the consultants'

Example of a completed tender assessment sheet

Tender assessment sheet

Project quality weighting: **65%** **Project:**
Project price weighting: **35%** **Tenderer:**
Quality threshold: **65** (to be compared with total quality mark) **Assessor:**

Quality criteria	Project weighting (A)	Marks awarded (B out of 100)	Weighted marks (A × B)
Practice or company	25%	64	16
Project organisation	15%	80	12
Key project personnel	40%	65	26
Project execution	20%	75	15
	100%	**Total quality score**	69
Price criterion			
Tender price	260		
Price score	100	100	100
Overall assessment			
Quality weighting × quality score	= 65% × 69	= 44.9	
Price weighting × price score	= 35% × 100	= 35.0	
	Overall score	= 79.9	

Signed: Date:

Example of a tender assessment comparison sheet

Tender assessment comparison sheet

Project quality weighting: **65%** **Project:**
Project price weighting: **35%**
Quality threshold: **65** **Assessor:**

Quality criteria	Project weighting	Firm A Marks awarded	Firm A Weighted marks	Firm B Marks awarded	Firm B Weighted marks	Firm C Marks awarded	Firm C Weighted marks	Firm D Marks awarded	Firm D Weighted marks
Practice or company	25%	64	16	80	20	90	22.5	100	25
Project organisation	15%	80	12	70	10.5	80	12	80	12
Key project personnel	40%	65	26	80	32	80	32	90	36
Project execution	20%	75	15	70	14	70	21	80	16
Total quality score	100		**69**		**76.5**		**80.5**		**89**
Price criterion									
Tender price			260		320		280		425
Price score			100		76.9		92.3		36.5
Overall assessment									
Quality weighting × quality mark		= 65% × 69	= 44.9		× 76.5 = 49.7		× 80.5 = 52.3		× 89 = 57.9
Price weighting × price score		= 35% × 100	= 35		× 76.9 = 26.9		× 92.3 = 32.3		× 36.5 = 12.7
		Overall score = 79.9			76.6		84.6		70.6

Signed: Date:

Figure 8.2 Example of consultant selection sheets. (Source: Construction Industry Board 1996.)

performance to ensure that they provide the full, specified service and do not skimp their services to save money.

Where time charge fees are to be paid, the final amount of fees payable is not fixed and there is a substantial risk that this amount may exceed initial estimates.

Selecting a contractor

Selection of the most appropriate contractor is a fundamentally important part of the procurement process. Ensuring that the chosen contractor has the correct combination of technical skills, managerial expertise and financial resources has long been recognised as critical to project success, and has conventionally formed part of the process of tender list selection.

Contractors tender for projects in competition, seeking to obtain the project at the maximum level of profit with regard to the competition. They often tender for work at fixed prices, although generally their resource costs are not fixed. They make assumptions as to likely plant and labour outputs, which may or may not be achieved, and all of the work is generally subject to the vagaries of the weather.

It is generally recognised that in the modern construction marketplace there are many different types of client and contractor, and that the commercial relationship between them can take many forms ranging from, at one extreme, a traditional, often confrontational, supplier/customer arrangement in which the employer decides precisely what is required and the contractor simply provides what the client asks for to, at the other extreme, close collaboration arrangements such as partnering, where the employer and contractor generally work together to jointly develop the project and resolve any problems that may arise. It is against this background that the client is going to make a choice as to which contractor should carry out the project.

There exists a long-held belief that for traditionally procured projects, if all of the contractors invited to tender meet the requisite criteria and all tender on the same set of basic information, then the firm submitting the lowest price must represent best value for money. This perception has now been discredited in many parts of the world as it became increasingly apparent that where this was the case the tendering contractors were sometimes prepared to take substantial commercial risks to obtain the work.

Increasing project complexity (in terms of both the project itself and the context in which it is constructed) has led directly to more complex contractor selection methodologies based on a combination of price and other factors. It is usual to weight price and other (the so-called qualitative) factors in the assessment of the final tender evaluation in a similar way to that which can be adopted in the selection of consultants. Typical price/quality weightings will vary from 15/85 to 85/15 depending upon the complexity of the project and the environment, both physical and commercial, in which it is to be constructed.

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9 Managing the procurement process

Introduction

The evolution of a proposed project from initial idea to final building usually involves activities which are unique to the building procurement process and vital to success but are infrequently employed in the normal course of the client's business.

This chapter highlights elements of the management of the building procurement process which contribute to project success. For example, careful team selection, risk management and value management are acknowledged as beneficial processes in procurement but are often considered as separate activities addressed at different times. The interdependence of these activities may not be addressed without proactive management.

At the root of a new project is the business case which has considered how the project fits within an overall strategy. The strategy may have a limited life, perhaps related to foreseeable markets. Alternatively the strategy may be that the proposed project will have a long life with no near obsolescence.

It may be that there are suitable alternatives to a new project where long-term ownership is unnecessary, such as rental or leasing. Those clients who decide to build new often do so because of the increased functional value to them of the new facility which also enhances the fixed assets they own. Unless there is enhanced value there is unlikely to be justification for the costs associated with the process. A new project is likely to have an impact on the financial structuring of any client, particularly where money loaned or diverted to the project impacts on liquidity or borrowing capacity. Many clients will expect their investment to pay for itself in a relatively short period of time.[1]

Aspects of affordability are often at the root of early stage decisions – is the client able to generate enough funding to be able to afford a building that will meet their needs? Will the costs of owning and using the building be able to be absorbed into a new and beneficial business plan? Achieving completion of the project so that its benefits can be aligned with the time line of business case may also be vital to success.

[1] The development of a business case is discussed in Chapter 5 and other chapters discuss the value of design, briefing and the design process.

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The project manager

Integrating the variants of functional need, design, value and risk with the processes necessary in the procurement process is challenging, particularly so for the inexperienced client. Once the decision to construct a new building has been made by the client the process of initiation and management must be commenced. The definition of the project (the expectations and the boundaries) is a process that must be completed immediately. This process will include identifying the project function and an outline of the time, cost and performance constraints established in the business plan. This sets the parameters within which the project must be managed, and influences the resources that must be obtained, monitored and controlled and the quality that must be assured if the client's needs are to be satisfactorily met. Particular attention should also be given to the people who are and will be involved in the project; they will need to be motivated and managed.

The subsequent management of events is a complex and demanding process involving a wide range of professionals and specialists. There is no permanent management team and there is rarely, if ever, an opportunity to experiment with design or construction methods prior to the actual process of construction. Experience and prior proven competence are key qualities to enable a successful outcome. Walker (2002) refers to the matrix structure which construction professionals, constructors and even clients have become used to and made to work.

Relatively few clients are sufficiently experienced to manage the process and it is probably best achieved by the client appointing a project manager, who may be an employee of the client or external to the client organisation. Unless the client is confident in his or her own capability, or those of his or her employees, the project may become an unnecessary distraction to core business and it is often best to appoint an external individual or organisation to carry out the project management process and identify an employee to liaise between them and the internal stakeholders.

The project manager must be fully informed about the project, the stakeholders, the constraints and the resources and must be given appropriate and sufficient authority and accountability to mobilise these resources and make decisions regarding the project. The project manager will carry out or direct the necessary functions, systems and controls in order to achieve project completion.

The client's role now becomes one of formal approval of and support for the project manager's actions and thus the client must ensure that the necessary resources, organisational structure and contractual arrangements are in place for a successful project outcome. Some major client organisations have taken this principle further by adopting a bicameral (or 'bow tie') approach (see Figure 9.1).

This approach reflects the fact that where complex buildings and multiheaded clients are concerned it is rare to find a single individual who knows enough about both the client's business and the construction process to satisfactorily manage the demand and supply sides of the whole project single-handed. The approach would typically be adopted in conjunction with a collaborative method of procurement, and responsibility for overall project delivery is shared between the client representative (various

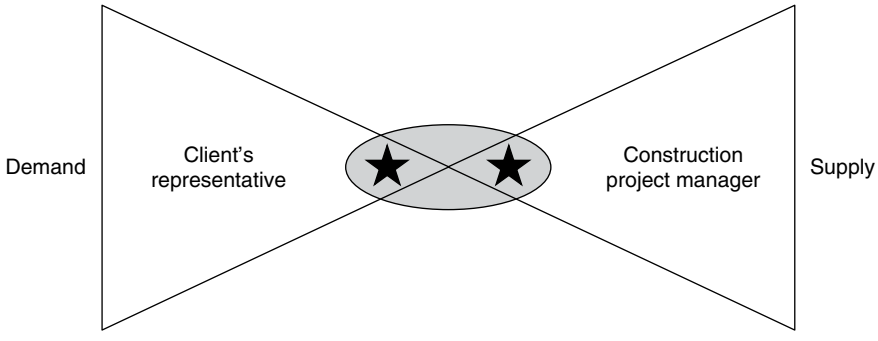


Figure 9.1 The bicameral approach to project management.

job titles are used for this role, for example project sponsor or project director) and the construction project manager. The client's representative is responsible for ensuring that all client (demand-side) functions are carried out in a satisfactory manner, for developing the brief, for resolving any disputes between client side stakeholders and end users, and for presenting a single point of contact with the construction team. The construction project manager is responsible for ensuring that the project is delivered in accordance with the client's expressed needs.

Under this approach the project manager and the client representative plainly need to work extremely closely together and to 'sing from the same hymn sheet', and therefore considerable resources need to be invested in developing and nurturing the relationship between them. This is usually done as part of the partnering process by the partnering facilitator.

Failure to ensure that this issue is properly dealt with can be clearly seen in the case of the new building constructed for the Scottish Parliament building at Holyrood in Edinburgh, where the project was finally completed almost ten times over the original budget and three years late, giving rise to a major Government enquiry (Fraser 2004). During the course of this project no fewer than three project managers resigned in fairly quick succession, mostly because of friction between them and the client project sponsor; whilst this issue was by no means the only cause of project failure, it was clearly very significant. The project sponsor's attitude is clearly evident in her reported comment (Fraser 2004) that whilst the project manager was replaceable, the architect (the alleged root cause of many of the project's problems) was not.

First tasks of the project manager

Regardless of the form of project management adopted, three major tasks require early attention:

- The development of a project execution plan acknowledging project objectives and constraints and recognising their prioritisation.

- The identification and appointment of a project team to carry out the plan to successful fruition.
- The development and implementation of an appropriate procurement strategy.

Developing the project execution plan

Earlier chapters have referred to the importance of the briefing process, project definition and procurement strategy. Developing the project execution plan from this information is the key primary role in the management of the project; it should establish the high level 'route map' to a successful project outcome.

As a first stage it is advisable to identify all stakeholders (those parties with interest in the project's outcomes), noting their particular interests in and extent of influence on the project outcomes. Once they and their potential impacts (both positive and negative) on the project have been established a view needs to be taken of the extent to which they can positively contribute to the project design or logistical planning, or the extent to which they will be counter-productive.

It is now crucial to identify and disclose all constraints, including:

- The total funds at the client's disposal for the project and their availability or readiness as the project progresses and contractual obligations become due for payment.
- The required completion date, any important interim milestones when certain stages must be achieved and any flexibility between desired completion and absolute last delivery date.

The project execution plan will also be influenced by the project brief, including:

- The required functional performance of the final product and any indications of standards of quality.
- Whether a balance is to be struck between capital and running costs or whether initial capital cost is the primary factor.
- The likely impact to the client organisation of risks inherent in the project processes associated with time, cost and function.

A statement of the project execution plan will acknowledge the constraints and requirements of the project. Bearing in mind these factors and the extent of risk that the client is able to absorb enables initial consideration to be made as to which procurement strategy to adopt.

Identifying the project team

Normally in a larger project the project manager will need to be supported through the project by a team – a group of people with particular skills, capabilities, experience and knowledge who are specifically appointed to carry out the project plan to successful completion. This team will assist in monitoring, controlling and generally managing the project. Levels of authority and accountability for team members

must be defined. Identification of the individuals who will make up the whole team is not necessary at this stage but a 'feel' for the skill requirement and the size of the team is necessary. It may also be advisable for the project manager to appoint certain 'experts' with skills over and above his or her own (e.g. procurement specialist, specification writer, and planner or programmer) at this early stage.

Implementing the procurement strategy

This is a key and early activity that warrants dedicated thought and review; it is referred to in Chapter 7. A strategy must be developed and implemented to ensure appropriate procurement in light of the project execution plan. It must be clearly communicated to all the key players.

Special attention should be given to maintaining compliance with this strategy throughout all stages of the project. This will ensure the client has a greater chance of obtaining the right project at the right time at the right cost with the minimum of conflict.

Project resources

Once the initial tasks have been completed the next key stage is to procure the necessary resources and establish the methodology for their mobilisation.

Financial resources

Normally the funding function is regarded as a matter for the client. A specific individual, company or manager may be appointed by the client to take over this role, in which case boundaries to accountability and responsibility must be acknowledged.

Funding is a vital prerequisite to the project. By the time the procurement strategy is set, sufficient funding must be planned to be available at appropriate times in the pre-construction and construction process. The means of funds availability must also be planned.

The timing of funding requirements is a consequence of contractual agreements, whether they be agreements to purchase land, to design, to construct or to project manage. Once the project plan is in place, it is possible to take account of each contractual agreement and to plan the timing of necessary expenditure in the form of a cash flow forecast. In this context the project manager, perhaps with support from the project cost consultant, should take control to ensure that funding arrangements are appropriate.

Human resources

The human resource element required for the completion of the project may be viewed as three distinct groups: the client team, the project team and the construction team.

The client must be prepared to allocate appropriate in-house personnel to the project, or to appoint consultants for this purpose, in order to uphold the integrity of the brief within the constraints. The client may, as in most current construction projects, appoint consultants to design and cost a project, but the client should have his or her own staff member to provide liaison and a focus for decisions. If this is not possible it is desirable to explicitly hand these duties over to the appointed project manager.

The project team may be part of, or external to, the client or the project manager's organisation. The team should be appointed by and be accountable to the project manager, on behalf of the client. Each team member will have a specific task or role and the level of authority and accountability must be defined. Membership of the project team may vary throughout the project as the requirements for each stage differ. Key to the successful procurement of the project is the project manager's ability to coordinate and integrate the roles of each member of the team and to ensure that communication lines are maintained effectively.

The construction team (both the main and specialist contractors) will normally be led by a main contractor, construction manager or an equivalent. It is important that all decisions and directions are communicated to the construction team only through the project manager or other person designated for this purpose by the client. If this is not carried out and controlled there is likely to be misinformation, confusion and conflict which can potentially lead to project failure.

It is important to realise that many projects fail because of a lack of sufficient attention to people, both individuals and groups. Understanding and communicating agendas and requirements help to build a level of trust and openness necessary to ensure the client receives a successful and complete project.

Physical resources

Other resources such as land, buildings, plant, machinery and materials are needed for project completion. At an early stage it is necessary to identify who is responsible for making resources available and when and where. Some often-encountered problems are highlighted below:

- Where physical resources such as land, plant and machinery have to be provided by the client, the client must ensure their availability in a suitable form at the right time; failure to do so could be costly and will impact on success.
- Should the client require alternative accommodation, or where specific arrangements for decanting an office and staff are necessary, this is normally a matter for the client or the client's organisation. Alternatively these requirements may be part of the project but should be costed and contracted for accordingly.
- Design resources must also be appropriately selected and in place at the right time. Normally this is the responsibility of the client but it may be part of the project manager's brief. The criteria for the selection of the design team should include factors of capability, competence, staff and cost. Value for money, rather than cost, should be the major influence in the selection process.

- Construction resources will be contracted by the client or on behalf of the client by the project manager, and must be appropriately selected and in place at the right time. The criteria for the selection of constructors are discussed in Chapter 8.

Once the resources for the project are in place a temporary organisational structure must be established to implement the project execution plan. Additionally systems and controls need to be developed to ensure that the implementation process is controlled within the established objectives and constraints.

Temporary organisational structure

A 'temporary organisation' is created for the life of the project which enables effective communication and decision-making, management of client input, coordination of functional and administrative needs, and the resolution of conflicts. This organisation may be headed by a key member of the client organisation or (more usually) by the project manager. This designated person must have sole authority to communicate decisions to the project design and construction team. If more than one individual is empowered to instruct, or to require changes, extreme confusion tends to occur.

Building users, specialists, facilities managers, maintenance staff, finance and account personnel, legal advisers and security personnel can all have input to the project from time to time throughout the existence of this temporary organisation, by invitation or by right. As appropriate, it can meet with designers or constructors to ensure effective communication. All decisions, however, should be exclusively reserved for the client's executive or the project manager.

Contractual arrangements

Having selected an appropriate procurement strategy it must be implemented. A range of contractual agreements are available, many of which are based upon 'standard forms of agreement' already in common use in the construction industry. The selection of the appropriate contractual forms is a consequence of the procurement strategy and the client's attitude to risk. The project manager will normally give advice upon the implication and selection of the appropriate form of contract.

Systems and controls

Once decisions have been made about the project execution plan, resources, the organisational structure and contractual arrangements, the project manager is responsible for implementing the procurement process and managing the project to its successful completion. Systems to enable the project manager to do this include:

- Financial systems that will ensure payments are made in accordance with contract agreements.
- Decision systems that will ensure decisions are communicated at the appropriate time and with the appropriate authority.
- Design change systems that will implement and monitor change as it becomes necessary.
- Cost and time monitoring systems that will chart real progress against the plan.

These systems will also enable the project manager to inform the client and other stakeholders of the current position at any point in time.

Controlling these systems to ensure that they are appropriately applied and not abused is a matter for the project manager. The diversity of these systems may mean delegating elements of the process to members of the project team (if appointed) or perhaps ensuring that existing client systems are specifically adapted.

Methods of control are most important to ensure that the costs remain within the budget, the pace is maintained within the programme, the quality or performance is within the standards set and all the systems are properly employed. This is of prime importance for project success.

The project manager will achieve cost control by ensuring appropriate preconstruction cost planning and an adequate system of regular cost reporting. Slippage will be immediately visible and hence easily manageable. A cost consultant can provide these services.

Pace control can be achieved by monitoring progress against the project programme or time plan. Progress should be assessed against imposed milestones, checkpoints or contract completion dates. Thus slippage can be immediately seen, communicated and action directed.

Quality and performance can be controlled through the provision of a sound contract which includes a detailed specification and by appointing constructors and consultants who have quality assurance systems in place. It may also be appropriate to appoint a dedicated quality control person, such as a clerk of works. His or her role would be to inspect the construction work during the progress of the project, observing and measuring quality and thereby ensuring that ongoing work is satisfactory and matches the specification. These aspects of managing the project are addressed in more detail below.

Time management

The overall programme, or time plan, of activities that constitute the project must be developed at an early stage in the procurement cycle. It is common for IT-based programming systems to be adopted to carry out this process and there are a number of effective and reliable systems of this type available. The programme forms the framework within which the designers and the constructors must start and complete their activities. It also serves as the framework within which other key stages, such as land purchase, funding and planning permission, should be completed.

The programme of activities should be feasible and realistic. Insufficient design time may have an effect upon function, quality and cost, as may insufficient time allowed for construction. The programme must identify those tasks that are critical to completion on time and those tasks where some flexibility may be available. Time for approval processes – both statutory approval and client approval – should also be included as specific activities; this is vital, as the need to obtain approval is likely to be a prerequisite to proceeding to the next stage of the project and further work.

The process of time control is in many ways analogous to that of cost control – there is only so much available. Thus, a time control system should embrace:

- A time plan – the division of total time into interlinked time allowances for readily identifiable activities with definable start and finish points.
- The overall project programme linking the time budget and the time plan.
- A time checking system – the actual time spent on each activity must be monitored closely against its allowance and divergence must be reported as soon as it is identified.

If an activity exceeds its time allowance there are essentially only two forms of corrective action available:

- Re-sequencing of later activities: This may involve abandoning low priority restraints or it may require phased transitions from earlier activities to later activities which logically follow them.
- Shortening the time allowance for future activities: This can usually be achieved by increasing specific relevant resources.

If neither of these actions is taken, the overall time budget is likely to be exceeded and the project will finish late.

It should be noted that there is a risk that certain unavoidable events (for example flooding) may delay the overall completion of a project. Such possible events should be identified and contingency provision should be made for their effects to be taken into account as soon as possible, taking cognisance of contractual conditions. Other measures may also be considered, should the client so wish, in mitigation of serious delays and associated costs.

It is important to take into account at all times the fundamental relationship between time, quality and cost. It must be understood that:

- Any extension of the overall timescale for a project always generates additional costs to the constructor or the client. Every project contains time-related costs, whether these are openly stated or not. The decision as to who carries such additional costs depends on the detailed contractual arrangements between the parties; it is likely that some of them will be borne by the client.
- Making up for lost time by resequencing later activities may be achievable but often only at the risk of compromising quality or cost control.

Time control is as important during the design stages of the project as during the construction stage. Designers must work to a series of deadlines (milestones) at

which different aspects of the design should be frozen in order that costs and the overall programme be kept under control.

At a very early stage in the project it is advisable for the client and/or the project manager to consider developing a time contingency (or reserve), with strict procedures for its allocation in specific events. This concept is essential on projects that are subject to external time constraints, for example where a building has to be available for occupation before the lease on another building expires.

Design management

Whilst the responsibility for achieving a successful design solution to the client's requirements lies chiefly with the architect, responsibility also rests with the client for ensuring both that his or her own needs are met and that the impact of the development on the local environment is acceptable.

The formulation of an accurate design brief and the development of design in strict accordance with that brief are key processes for the client or project manager to oversee and are addressed in Chapter 6.

In practical terms this means:

- Close collaboration between the client, the users and the design team during the development of the design.
- A procedure for formally checking that the developed design meets but does not exceed the requirements of the design brief.
- A formal presentation of the developed designs to the client and users.
- A formal 'sign-off' by the client that the design is correct and acceptable.

The client must indicate clearly the programme for project delivery and the design team should respond to this in terms of their strategy for meeting critical points in this programme.

Undoubtedly, through the project there will be incremental changes to the design, because, for example, of a change in the needs of the client or perhaps changes in technology or legislation. Formal processes for absorbing, reacting to and communicating these changes should be laid down and agreed by all parties.

It is unlikely that one person will have all the design skills for any other than the very simplest of projects. The collaboration of several designers will therefore be necessary, for example in specialist buildings or buildings that have sophisticated mechanical and/or electrical installations. Special attention needs to be paid to the integration of elements of specialist design and to effective communication and information flow.

Stakeholders, other than those involved in the project procurement process, are key to ensuring that the proposed project will be functional or will meet its spatial or other client value propositions. Many stakeholders are unlikely to be conversant with reading and interpretation of design drawings. It is therefore important to ensure that the design team present their proposals in a form that can be readily understood. Pictorial views are useful here and modern technology, in particular computer aided design (CAD), easily enables three-dimensional presentations.

Design risk

It is important for clients to know that when they appoint consultants or constructors to design projects the risk is safely transferred. Whilst at first sight this may be easily achieved, in practice it is somewhat complicated.

In most cases responsibility for the action follows the action, whether under contract or tort. In other words, designers can be held responsible for the consequences of design failure, though not in all cases. Additionally the allocation of liability through contract does not always ensure the capability of the defaulting party to meet the financial consequences following the event.

In common law, and by statute, the provider of a product is liable for its suitability or fitness for purpose. Most clients will see their project as a product and expect such liability, particularly when they procure the project on a design and build basis. Under common law, this is the case. It is not the case when a client purchases a service, such as the purchase of an architect's design service. Here the liability is not for suitability or fitness for purpose, but for care and skill in the pursuance of the architect's duty.

Standard forms of agreement for the appointment of consultants will reaffirm this limit of liability and, in some cases, attempt to restrict the extent of liability in express terms. The standard contracts of appointment of both the Royal Institute of British Architects and the Royal Institution of Chartered Surveyors indicate some evidence of this.

In the development of standard forms of contract, the industry and its professionals have benefited enormously from increased common understanding of the meaning of clauses. Case law and legal commentators have enabled a detailed understanding of the extent of liability and allowed clients to adopt standard contracts instead of having to write them.

Unfortunately there is a suggestion that in the contracts developed through the Joint Contracts Tribunal the influence of the client has not been as strong as it might be. Some commentators, including Murdoch and Hughes (2000), refer particularly to the JCT 'with Contractor's Design' form of contract, prepared specifically for design and build contracts. In this case the fundamental common law principle that the design and build contractor is responsible for suitability or fitness for purpose of the project is reduced to the responsibility of an architect (care and skill). In taking this approach, the client, in the event of design failure, is placed in a position of having the burden of proof to show that there has been negligence in design, a much more onerous position.

Paradoxically the only standard design and build contract prior to the publication of the JCT form was that prepared by the (then) National Federation of Building Trades Employers (NFBTE was an organisation for contractors). In this form, fitness for purpose was part of the contractor's liability. In the more recently developed New Engineering Contract forms of contract this liability is again possible (see Chapter 7).

The appointment of specialists to both the design and construction parts of the project has produced a complicated legal position. A particularly complex situation arises when, in a traditionally let project, a specialist who has carried out a level of

design for the specialist work becomes a subcontractor to the main contractor. This is the case under the most commonly adopted standard forms (the JCT forms) where the contractor does not owe any duty to the client for design. Whilst there may be duty from the specialist to the contractor, no such duty is owed to the client. In cases like this, forms of collateral warranty or parallel contracts have been adopted in an effort to protect the client.

This book does not attempt to explore the complexities of contract law, or clauses in standard forms of contract, but seeks to highlight areas of concern, in which clients need to seek additional advice where the design risk is high. One aspect of design risk that needs attention by the client, or the client's advisors, is design liability insurance. Such is the financial structure of the construction industry consequent upon the size of firms and the low level of assets needed, that insurance protection can be vital.

There is little consolation for a client knowing that there is clear contractual liability by a defaulting designer, if the designer has insufficient assets to meet the consequential costs. Protection through design liability insurance is available providing the sum insured is adequate and providing the policy is active (the premium has been paid) when the claim is made. There are difficulties in ensuring insurance continuity where either design and build contractors or specialist subcontractors are employed as it is difficult after completion for any client to demand proof.

Again, this is a matter of the extent of risk associated with the particular work. Sometimes the client will be best advised to seek insurance for his or her risk outside the contractual project framework. Examples of this include assignable latent defects insurance giving protection for up to 10 years but costing up to 1.5% of the construction cost.

In summary, design liability is as complicated as the contractual interrelationships associated with construction projects. However, treated as a key aspect of risk assessment, most project risks can be protected by the prudent client.

Cost management

It is essential that the client understands the difference between:

- An estimate of cost – the provision of an informed opinion at a particular time in the development of the design of what the final cost of the project is likely to be.
- Cost control – the management of the consequences of the design and the influences of external or site-related factors so as to achieve value for money and ensure that the final cost does not exceed the budget.

Estimates are unlikely to be accurate unless cost control is exercised. They provide a measure against which to control costs. They can also be used to assess project viability, obtain funding, manage cash flow, allocate resources, estimate duration and prepare tender prices.

The techniques used to produce estimates vary according to the type and level of data available at the time of preparation. The accuracy of the estimate will improve

as the design of the project develops and more details become available. The range of accuracy is likely to be in the region of +/−30% at project proposal stage to +/−5% at final tender stage. Providing cost control is being exercised, the accuracy of early estimates can normally be of sufficient precision for them to be valid parameters for decision-making and for the management of the project.

For estimates to be effective, they should be supported by:

- A list of assumptions on which the estimate is based.
- A risk analysis – an identification of the potential risks together with an assessment of their probability, their likely impact (cost consequence) and the time at which they may occur.
- A sensitivity analysis – a statement of the comparative effects on the total estimate due to changes in principal data or external factors such as interest rates, inflation, etc.

An estimate should include an amount to cover the uncertain cost of risks. This is known as the *contingency*. It is important that contingencies are sufficient to cover risks and are not eroded to facilitate any lack of cost control.

Cost control procedures will be more effective the earlier they are instituted. By way of simplistic illustration:

- Cost varies with (but not in direct proportion to) size: once the size of a building is fixed, so is the general level of cost.
- Cost varies with the complexity of design: innovative design tends to be expensive.
- The selection of the most economical design for basic elements such as foundations, structural frame, external cladding and roofing is of far greater cost significance than the types of finishing.
- The overall cost of mechanical and electrical systems is largely governed by early decisions as to the type of system selected.

Methods used for cost control differ radically between the pre-construction and construction stages of a project. Cost control during pre-construction depends partly on the procurement strategy but more on control of the design process within that strategy. Pre-construction cost control, in simple terms, comprises:

- Preparing a cost plan – a balanced allocation of the project budget (perhaps by using Volume 1 of the *New Rules for Measurement* (RICS 2012)) into readily identifiable elements of the building, with allowances for, say, contingencies, reserves for changes in market prices, etc.
- Checking the cost of each element as it is designed against its allowance in the cost plan. It is important to note that if this cost, as designed, exceeds its allowance in the cost plan, the excess can be corrected in one of the following ways:
  - — redesigning the element to reduce its cost;
  - — transferring money into that element from contingencies or from another element yet to be designed.

If neither of these options is exercised, there is a serious risk that the control budget will be exceeded. A contribution to added value could be made at this stage through the sensible use of value management techniques as discussed in Chapter10.

Successful cost control during the construction stage depends on avoidance of major changes after making the commitment to build. Effective management here depends on:

- Design work being completed and fully co-ordinated before a commitment to construct is made (this applies in a progressive way when design and construction overlap).
- The contract being administered efficiently and promptly in accordance with its terms and conditions.
- Changes to the design being minimised after construction has started.

Regular cost reports should be produced throughout the construction stage of the project. From these, potential overspending can be identified before it occurs and corrective action can be taken. The client should, however, recognise that such corrective action is not always beneficial since:

- It is likely that cost savings can be made only by reductions in standards or by omissions of part of the work remaining to be finalised (for example the visible finishing and fittings). This is likely to result in the requirements of the brief not being fully met.
- Late cost savings are inefficient as any amount saved will be reduced or may be negated by the costs of disruption inherent in making the changes needed to generate these savings.
- Where inflation is having an impact on the economy, estimates and cost control procedures should take this into account (i.e. the increase in construction cost between the date of the estimate and the date when the work is carried out).

The client should distinguish between inflation and the effect on construction prices of market conditions at the time of tender. Contractors tend to adjust their tender prices by reducing or increasing their target profit margins in accordance with commercial factors. It is unwise therefore to base early estimates on any assumptions as to market conditions at the time of tender as the construction industry is subject to wide and comparatively swift changes in workload in accordance with economic conditions.

It can be expected that the project will not proceed as originally perceived or planned – the unexpected will happen. Such unforeseen happenings should be covered in the cost control system by contingency sums or specific risk allowances, and the client should have a policy for the management of such contingency funds to ensure that, at all times in the project, the remaining contingencies match the remaining risks. The client may also establish and control a client reserve, not disclosed to the consultants or the contractors, to cover, for example, late changes in user requirements or unforeseeable third party events.

A particular concern of the client's may be the running costs of the finished project for the life of the client's planned tenure or even whole-life costs – the costs of use over the whole life of the building – a stance that is becoming increasingly popular. Often higher initial building costs result in lower running or maintenance costs during the project's life.

Estimating future running or maintenance costs is difficult to achieve in practice. Pasquire and Swaffield (2002) identified a range of barriers to the adoption of life cycle and whole-life costing techniques, including a lack of suitable or usable data in a reliable form concerning component life and replacement costs. Potentially some data are available, but many organisations maintain separate sections which carry out day-to-day repair and replacement; they rarely collect the costs and information in a recoverable way for individual buildings. Pasquire and Swaffield (2002) also identified the emphasis by clients on lowest initial costs as a significant barrier, particularly when current fiscal policy allows commercial clients to obtain full tax relief on property running costs. Initial costs include design, construction and installation, purchase or leasing, fees and charges.

Future costs include all operating costs, such as rent, rates, cleaning, inspection, maintenance, repair, replacements/renewals, energy and utilities use, dismantling, disposal, security and management over the life of the built asset. Loss of revenue may also need to be taken into account, for example to reflect the non-availability of the revenue-generating building during maintenance work. The timing of future costs must be taken into account in the comparison of options. Future cost flows are discounted by a rate that relates present and future money values – which may include an allowance for inflationary changes.

Opportunity costs represent the cost of not having the money available for alternative investments (which would earn money) or the interest payable on loans to finance work.

There is growing awareness that unplanned and unexpected maintenance and refurbishment costs may amount to half of all money spent on existing buildings. Estimates of the value of the unplanned portion in UK construction output range from £8 billion to £20 billion per annum.

Of course life cycle costs or whole-life costs become more important where the client organisation carries the associated risks through the project. Private Finance Initiative (PFI) and public private partnership (PPP) projects present this scenario and are referred to in Chapter 13.

Quality control

The quality (or performance) of the project, the completed building, is governed, progressively, by:

- The project brief – a clear statement of the standards of quality required. This statement of standards must be clear and unambiguous; vague phrases such as 'the highest quality attainable within the budget' should not be used.
- The original design, which must indicate:
  - the components selected for the building and their integration in the whole design;
  - how components and systems interface;
  - how mechanical and electrical systems are integrated into the overall design.

- The completeness of design before construction starts.
- The specification in terms of:
  - — the conversion of the quality standard demanded by the project brief and design drawings into precise written statements of what standards must be met and what extent of work must be done for the contract to be completed satisfactorily;
  - — the setting out of criteria against which the standard of the finished work will be judged by reference to standards, codes of practice or similar where available.
- The quality control system – control mechanisms that can be applied to the execution of the work on site, for example the detailed ongoing supervision by the contractor, the programmes for testing and the procedures for rectifying any defective work.
- The inspection systems – the independent inspection and verification of the contractor's work by the design team. This includes procedures for witnessing tests, for commissioning plant and systems, for precompletion inspection, for defects lists and defect rectification, and for final hand-over.

The client may choose to appoint a quality inspector (or a clerk of works) whose sole function is to inspect completed work and verify it against the imposed quality standards. However, such an inspection and verification regime should be recognised as a last line of defence. The key to quality control on site is to specify clearly and to monitor closely the quality control activities carried out by the contractor while work is being done.

Many construction companies and firms of consultants within the building industry have adopted, or are in the process of adopting, formal quality assurance systems for their own work or services in accordance with BS 5750, ISO 9000 series or equivalent standard. These organisations are better placed to understand and to deliver required quality products and performance.

Change control

With designed projects – particularly those based upon lump sum or fixed price contracts – avoidance of change during the work is the best strategy. Clients should avoid making changes to 'signed-off' and agreed designs as these can be the cause of significant extra costs and delay.

However, circumstances (such as the economic environment or the client's needs) do change and so a change to a project may be unavoidable. Consistency of approach to the implementation of such changes is vital; it helps to ensure transparency and effective communications and contains cost and time within understood parameters.

Client changes (as distinct from design development) are changes to a design feature in order to improve the initial design or to remove inconsistencies after the design brief has been agreed. Such changes may be made by the design team,

with the approval of the client, or by the client. The most significant of these changes are to elements of the project that are critical to timely and economic completion. Client changes can be relatively minor, such as adding a few extra power points, or they can be major, with major cost implications, such as the addition of an extra storey. The cost of client changes depends largely on when they are made, for example:

- Before the construction contract has been let, the cost can be contained to that of the changed feature itself.
- After the work has commenced, the cost will probably be disproportionate to the value of the change. It can disrupt the contractor's work and invariably gives rise to a higher cost than if the change had been included in the contract as let.

Cumulative minor changes can have a serious effect: disruption claims caused by a large number of small changes are common.

Some client changes are unavoidable. The following list gives examples of reasons for such changes:

- Compliance with changes in legislation.
- Compliance with requirements of the health and safety or fire prevention authorities.
- Unforeseen ground conditions.
- Unforeseen user requirements.

The contingency in the project budget should be sufficient to take account of the likelihood of such changes, based on risk assessments.

Changes proposed prior to construction may be unavoidable or optional. If they are unavoidable, the client should authorise a transfer from the contingency in the budget to cover them. If they are optional, the client is advised to approve them if it can be demonstrated that they offer good value for money (or a saving) and that there are sufficient funds available to pay for them.

Changes proposed after the construction contract has been let can have major time and cost implications and should be avoided if at all possible. If they are not essential, it is recommended that they should be deferred until the project is complete and then reviewed to see if they are necessary and economically justified.

Commissioning

Once the building work is complete, the systems that will support user comfort (e.g. heating, ventilation and lifts) must be commissioned to ensure they are working effectively and reliably. In relatively simple buildings, the client can insist that this is a function the contractor must perform. Where buildings have sophisticated systems controlling the internal environment or facilitating staff movement or safety, commissioning can be established as an independent activity carried out by specialists. However commissioning is facilitated, it must be complete before any building can function effectively and be handed over.

Occupation and take-over

The client is responsible for addressing the issues of occupation, staffing and subsequent operation and maintenance of the building. This activity is separate from the design and construction process, although it will affect it, and will have its own time, resource and cost implications which should be incorporated into the overall project plan.

For large projects, the client may wish nominate a member of his or her organisation to act as occupation manager to manage this activity or may appoint an external facilities manager.

Occupation plans should be established during the design stages of the project and should cover:

- The operation of the building on a regular ongoing basis.
- The hand-over and acceptance of the building from the contractors.
- The progressive final fitting-out (if any).
- The physical occupation of the building with minimum disruption to the client's operations.

Conclusion

This chapter has discussed the management of the project and has frequently referred to the project manager. Whilst there is a growing appreciation of the need for a member of the project team to manage the process and the appointment of a project manager is increasingly common, it is, of course, possible for the management role to be achieved without this appointment. The fragmentation of the design and production processes, however, makes this task very difficult for a member of the design or construction team to carry out alongside their primary role. It is not to be recommended. Managing the realisation of the product is a key role in achieving the client's aims and a separate appointment is advantageous, particularly for inexperienced construction clients.

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10 The value of design

Introduction

Good design can be appreciated by the corporate client, the individual user or by the public. In the case of the public it is often a matter of taste whether the new building is admired, accepted or disliked. Winston Churchill once asserted:

> There is no doubt whatever about the influence of architecture and structure upon human character and action. We make our buildings and afterwards they make us. They regulate the course of our lives.

However, the public see only the influence of the project in its physical context. A case can be made that there is a responsibility for architecture to be socially appropriate as well as serving the needs of the individual client, even though it is the individual client who will meet the cost. Buildings can contribute positively to their location, whilst some equally can become eyesores.

Construction is the physical response to a specific client need or value proposition as expressed through design. The design responds to a business case carried out in a micro- and macro-economic context, and within a period of particular social attitude. As Saxon (2003) argued, 'construction is a means, not an end'.

The value of the designed and constructed project flows from its use over its physical, functional and economic life. A client's view of whether a design is good may, in some cases, be more to do with its usefulness, its efficiency or its real estate value than its aesthetic qualities.

- Owner–occupier clients are often concerned with the value or worth of the building in use, how functional it is, its costs and perhaps its real estate value; aesthetic qualities often bring up the rear.
- Developer clients, particularly those who develop speculatively, will be concerned with achieving an outcome that will meet the demands of the current property market and return highest profit.
- Investor clients will be concerned with achieving extended physical, functional and economic building life and real estate value – buildings attractive in the marketplace for lease or rental.

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- Image-conscious clients may wish to compromise economy or even functionality in order to achieve a building that they feel is demonstrative of their public or market presence or of the image they wish to portray.

For each of these examples the value generated by the procurement exercise outcome must be greater than the cost, but this will often be a very subjective exercise since it depends upon the client's specific value system. Sometimes marginal benefits are acceptable (as in the case of image-value buildings), but in most cases client organisations will wish to gain the maximum benefit, as measured by their scale of values at the time, in return for their investment. The predominance of inexperienced clients often means that they focus on the maximum floor area they can obtain for initial capital cost. The process that follows can result in a project that fails to focus upon the primary aim of the value proposition as it refocuses on short-term objectives.

Considering value in the business context

The construction industry has traditionally not perceived value in the context of the client's business case or expression of need; rather it has focused upon cost. Clearly this is the consequence of segregating the design and construction functions, leading to a failure of the constructor to appreciate what 'value' means to the client in the context of any specific building, and consequently a failure to drive the maximisation of client value through the supply chain.

Oscar Wilde defined a cynic as 'one who knows the cost of everything and the value of nothing'. On that basis construction is a cynical industry. It is also a victim of that cynicism. As Saxon (2003) puts it, 'construction usually sees itself as a cost to its customers, not as a value adder. This leads to lowest-cost tendering, commoditization, adversariality, and all the other ills'. Duffy, in his introduction to the *Design and Economics of Building* (Morton and Jagger 1995), took this idea further:

> It is no longer enough to consider the costs and value of construction independent of the way clients look at buildings. Ultimately clients are interested not just in the productivity of the building process but in the occupancy costs in relation to their own economic objectives. Clients are now becoming interested in a new and most important concept: measuring the productivity of building use through time.

The Royal Academy of Engineering identified the generic ratio between capital cost, lifetime cost and occupier staff costs over 20 years as 1:5:200 (RAEng 1998). To define potential benefit, Saxon (2003) argued for a five-unit ratio, 0.1:1:5:200:250+, which includes the consultancy cost (0.1) to define and design the building and a minimum figure for value added by the occupier. He argued that this could easily be 2500 and that the ratio between consultancy input and occupier value added is thus between 1:2500 and 1:25 000.

Better building design leads to more valuable buildings. Judgement as to what constitutes good design can be affected by the perspective of those who judge.

Users, traders, owners and the general public will all have a view, mostly different to each other: users will evaluate its function and comfort, traders its marketability and owners its real estate value or efficiency. The role of the architect is to serve all these criteria in a balanced way.

Boyd (1965) argued that architecture is an art which commences with a puzzle – the unique set of problems set by the client and a host of other factors including site conditions, function, budget and time constraints. Within these limits the architect must use the 'sternly practical business of providing bodily shelter as a medium for artistic expression'.

Present-day architecture may commence with the concept of one or two practitioners developing exciting and innovative ways to address the client's problems, but over time relies upon collaboration with, and coordination of the contribution of, many participants including specialist designers, specialist suppliers and specialist constructors within an agreed cost and value framework . On occasion that collaboration and coordination may result in compromises which affect the integrity of design and, consequently, the value. Architecture can therefore sometimes become a fragmented process; however, good collaboration with an integrated team can enable improved building design, thus satisfying all stakeholders.

The value of good design

A well-designed building is a good investment; it can contribute to both the economy and the efficiency of the building through its life. Design is an important factor in ensuring good working conditions for staff and convenience for members of the public who need to visit the building. Good design requires not only a focus on aesthetics but also careful attention to:

- Internal and external layout, with particular attention to efficient and economical use of space.
- Efficiency in terms of the use of energy and natural resources, and the reduction of waste, for example through careful design and specification, dimensional co-ordination, the orientation and form of the building, incorporation of disciplines such as Passivhaus principles in design, and energy saving principles and components in the building's electrical and mechanical services.
- Building maintenance costs.
- Building and space flexibility, to allow for changing requirements.

These principles are not new. The Welsh architect Alex Gordon, President of the Royal Institute of British Architects (RIBA) in 1971, put forward these concepts in a very forward-looking paper entitled *Long Life, Loose Fit, Low Energy* which he presented to the RIBA annual conference in 1972 but, as Maxwell Hutchinson (1999) put it in Gordon's obituary, 'in the climate of the time it fell largely on deaf ears'. It is good to see that Gordon's ideas have finally received the attention they deserve and that his 40-year-old prophecy has finally come to pass.

The blame for a poor building is just as likely to be ascribed to the client as to the designer. Equally, a well-designed building reflects credit on those who commissioned it as well as on the designers who conceived it. The setting of the design (i.e. its relationship with the neighbourhood) must be considered, not just the design in isolation. Furthermore, the client should expect to consider alternatives before committing to the 'signed off' design.

The important value proposition which is developed for any project and which is underpinned by a specific business case will enable the balance between the primary criteria of cost, time and function to be established and a procurement strategy to be developed in the context of the client's attitude to the risk generated by carrying out the project.

The segregation of design and construction which is inherent in many traditionally based procurement strategies must be actively addressed if true value from the whole procurement process is to be maximised. Constructors or specialists best able to contribute are often not involved until most design parameters and all the cost and time parameters have been fixed.

There is, therefore, a lack of continuity in the process, which results in a fracture between the focus by the client on the value of the output and the focus by the construction professionals on the cost and timing issues associated with project delivery. The potential for innovation and information to flow from producer to designer or from specialist to customer is vastly reduced or eliminated. Indeed there is evidence suggesting that unless innovative solutions are necessary for the building to comply with legislation there is very little incentive to drive innovation and that unless clients specifically request innovative solutions they are rarely offered (Morledge 2010). This may, in part at least, derive from the strategy sometimes adopted by architects and other designers to propose 'what they know works' in order to avoid claims for negligence in design.

From 2001–2011, the UK Commission for Architecture and the Built Environment (CABE) was the government's advisor on architecture, urban design and public space in England. Its job was to influence and inspire the people making decisions about the built environment. It championed well-designed buildings, ran public campaigns and provided expert, practical advice. It worked directly with architects, planners, designers and clients.

One of CABE's main functions was design review – expert independent assessments of building schemes at an early stage. CABE reviewed schemes of national importance, schemes that had a significant impact on the local environment and schemes that set standards for the future. CABE's design review panel consisted of around 40 expert advisors drawn from England's architectural, built environment and creative community.

In 2010 the Government announced that it would withdraw public funding from CABE, as part of a comprehensive spending review merging it into Design Council CABE. This successor organisation is a chartered charity and, whilst it continues its design review function, it is a much reduced organisation. At the time of CABE's demise the Royal Institute of British Architects published a report (RIBA 2011) arguing the importance of getting the brief right and that investment in high quality

architecture costs less in the long term. In doing so, it pursued the argument (Saxon 2003) that design fees are only a small fraction of total construction costs and that they fade into insignificance when considered against whole life building costs. RIBA President Ruth Reed is quoted in the report:

> There is a danger that in the rush to cut costs we lose more than money from our building projects. To avoid diminishing the quality of life that good design brings, it is necessary to identify the value created by thoughtful and responsive architecture.

The argument that design fees are insignificant in terms of the whole life costs of a building is a strong one and it may affect the selection of the right team for the project by questioning the practice of selection on price alone. This is argued in Chapter 8.

The significance of the balance between project value propositions and cost and time factors is considered below. Sometimes, for example, the value proposition may require the mechanical installation to drive design. Take cold stores, where much of today's food is stored before distribution to supermarkets. In design terms they are simple structures, the predominant purpose being to cover the cooling equipment. To achieve greatest value the equipment should dominate the design, though aesthetically this is likely to produce an unimpressive result.

Best design is a combination of inspiration, understanding and application. Concept design is probably better in the hands of the architect and application in the hands of the specialists and constructors. The key is understanding the client's value proposition and functional needs. Collaborative procurement systems enabling constructors and suppliers to contribute to design will enable better design.

Best design will help to deliver best value. Most clients will be advised to focus on value outcomes rather than cost parameters. Techniques such as value management can significantly contribute to this concept and will enable a fragmented team to 'buy in' to the project. Where collaborative procurement processes such as partnering are appropriate, these too can contribute to success.

Managing value

Value management is not a new concept and it is increasingly being requested by experienced construction clients as a way of achieving best value for their investment, particularly when projects need to satisfy client needs in terms of functionality. Many construction clients see value management as essential to help them to maximise value for money. Less experienced clients tend to be unaware of the benefits that can flow from its use and are less likely to require this service. They are very dependent upon their consultants for strategic advice and appear only infrequently to be recommended to adopt value management measures.

Ashworth and Hogg (2000) refer to claims of financial success of 10–15% improved value against a fee of 1% but also suggest that less than 10% of

projects adopt the techniques due to lack of appreciation by the client and lack of marketing by practitioners.

Commercial and retail clients are facing increased pressures in their attempts to retain their competitive edge and they must pay greater attention to quality of both product and service. There is no doubt about the increased need for techniques that offer better value. Satisfying the needs of clients has become crucial and is one of the UK construction industry's key performance indicators (Constructing Excellence and Glenigan 2011).

Consultants are being required to broaden their roles and responsibilities in order to achieve better integration and compatibility with corporate client objectives and expectations have generally risen within the whole project team. Justification of expenditure is increasingly important.

The UK Government has long insisted that 'best value' be demonstrably achieved on all publicly funded projects, but it has been left largely to individual organisations to define what 'best value' actually means and how it might be measured. Value management is a structured approach to the examination and development of a project that will increase the likelihood of achieving a range of user requirements at optimum value for money. It is a continuous process from inception to completion.

Value management

'Value management' is a generic term to indicate the broad process involved in managing value. It therefore comprises the analysis of what constitutes value; 'value engineering' in terms of creating designs which maximise agreed value concepts at minimum cost; and 'value audit' as a process of measuring how successful a particular completed project is at achieving its initial value requirements. It is therefore typically a structured process of dialogue and debate among a multidisciplinary team of designers and decision-makers, which takes place in a number of formal and less formal intense short-term processes at various stages throughout the procurement process. The primary objectives of value management include the development of a common understanding of the design problem and design objectives in the context of the client's requirements and the achievement of a consensus about the comparative merits of alternative courses of action.

It is usually early in the design phase when the bigger decisions are made and when the greatest potential for making better design decisions exists (see Figure 10.1). It is inappropriate to carry out a functional analysis with the aim of eliminating unnecessary cost in the very earliest stages of design. To be able to discuss elements and components of buildings assumes that it has already been decided that a building provides the solution to a problem. It also assumes that a design solution exists. It cannot be taken for granted that the nature of the problem is fully or indeed widely or consistently understood by all participants or even within the client organisation.

This lack of clarity and/or agreement in the very early stages of the conception of a project is common and can lead to buildings that fail to satisfy a client's

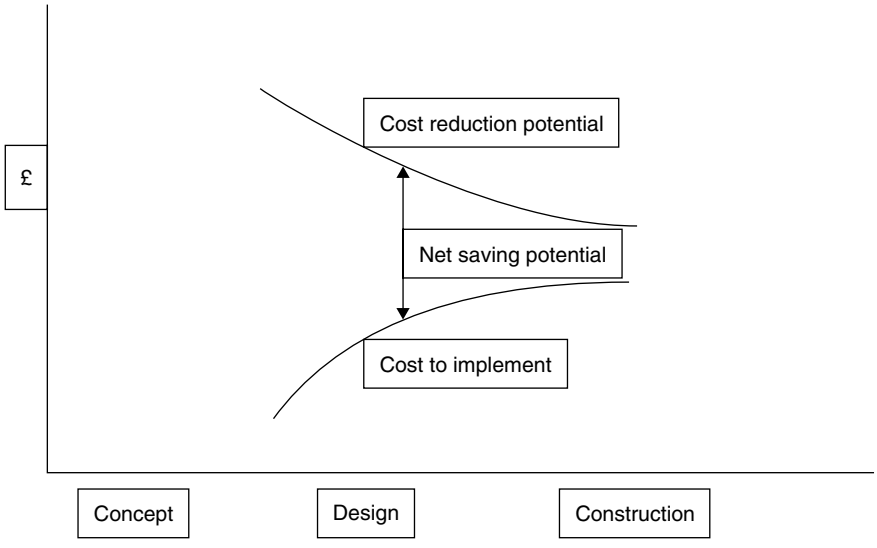


Figure 10.1 Cost benefit as design progresses.

needs. Value may mean different things to different members of the client organisation. Some way of making explicit what value means to the client is therefore needed. As this has to be done before any designs are produced, discussing functions at this early stage is not possible. Thus, the methodology for value engineering (see the next section) may also be viewed as inappropriate at this stage.

In practice it is often the case that a value engineering study is initiated when things start to go wrong or in response to a projected cost overspend, rather than being built into the design programme in advance. The potential for making better or more cost-effective design solutions is then even more limited. It is better to ensure that the right decisions are made the first time than to correct them once they have gone wrong.

Value management is the term adopted to describe the process in this earlier phase, with value engineering coming later. Sometimes value management is used as a generic term to incorporate both sets of procedures and value engineering is seen as a sub-process of value management.

Value management workshops

There are varied views about how value management should be applied to construction. The seminal work by Kelly and Male (1993) comprehensively discussed how this can be achieved through a process of workshops (see Figure 10.2). For example the first workshop may take place at the end of the concept stage (RIBA Stage A) when the building of a new project is first suggested as a possible solution to a perceived problem. This workshop is closely linked to the decision whether to proceed with the project. The primary purpose of the workshop is to confirm the

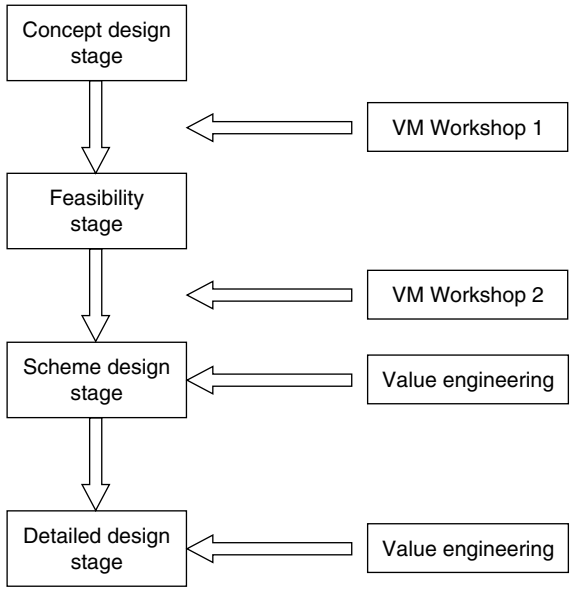


Figure 10.2 Value management (VM) and value engineering (VE) in the design process.

need to build before the client becomes committed to expenditure. The secondary objective is to ensure that there are clear project objectives which are understood by all the parties.

The next workshop could occur at the end of the feasibility stage (RIBA Stage C) when the outline brief has been completed and the design team has formulated a selection of schemes for which they have produced estimates of cost. During this second workshop, issues such as ensuring that the outline design scheme is selected in accordance with the appropriate performance criteria are addressed and any changes needed to be made to the design in the light of changes to the objectives originally formulated are considered. These may be due to changed factors, when new information has come to light or where circumstances have changed so that it would be sensible to amend the objectives in line with them.

The benefits of value management

The adoption of value management may achieve a range of benefits, including:

- Confirmation of the need for a new project.
- The open discussion of objectives.
- The development of a structured, rigorous and rational framework for evaluation and re-evaluation.
- Decisions supported by data and made on the basis of defined performance criteria.
- Improved accountability with an established audit trail.

- Consideration of alternative solutions.
- Decisions made with greater confidence.
- A greater potential for increasing value for money in the project.
- Better understanding within the team and better communication throughout the organisation.
- Increased satisfaction with the end product due to participation by users.
- Optimisation of the overall efficiency of the project.

Integration and application of both the rational problem-solving skills and the 'softer' interpersonal skills associated with effective people management are key to successful value management. Use of the various structures and procedures proposed for the workshops will facilitate the rational processes and provide a climate for creative thinking, 'ownership' and commitment.

The potential benefits of the adoption of value management are significant. The process is, to some extent, dependent upon the skill of the value management facilitator.

Value engineering

Value engineering is a systematic procedure aimed at achieving the required functions at least cost. Value engineering is based on the assumptions that all parties understand the functions required and all design alternatives provide the same level of functional performance. Each can then be assessed on the basis of cost alone.

Within this frame of reference, an increase in value can be directly related to a reduction in cost. The original concept of value engineering can be traced back at least to the development of techniques and procedures developed by George Jackson Churchward, Chief Locomotive Superintendent of the Great Western Railway in the early years of the twentieth century, to guide the design of a new range of railway locomotives. In an attempt to achieve maximum value for money and efficient operation the designers introduced disciplines to ensure that every component delivered maximum functionality at minimum cost.

The concept was applied in the USA when the General Electric Company (GEC) was faced with a significant increased demand for a number of key components. Components were in short supply, so a task force was set up to address the problem. Their task was identified by Lawrence Miles, a purchase engineer with GEC: 'if we can't get the part, then we must get the function'. This approach resulted in a method that identified the function of a scarce component and then sought its replacement with an alternative component that would serve the same purpose. It was noticed, as a side effect of this process, that many substitutions resulted in a reduced cost. The basic philosophy of value engineering was therefore established as being to eliminate the cost that does not contribute to the performance of the required function. The value engineering concept was further developed by GEC over the following ten years. It gradually became more refined and started to spread throughout the US manufacturing industry.

Application of value engineering in the construction industry

Owing to the complexity and fragmentation of the construction process it is inevitable that there is unnecessary cost in the design of most buildings. Value engineering works by bringing together into a team a range of professionals, including architects, engineers and quantity surveyors, and introducing a systematic approach during the design process to identify and overcome potential problems at an earlier stage in the project and produce better value for money. By pooling their expertise under the guidance of a value engineering team leader, the project gains through their collected experience.

The set of procedures for the conduct of a value engineering study comprises five distinct stages or phases:

(1) *Information phase*: an information-gathering process which focuses attention upon the component being studied. Particular importance is given to the use of functional analysis.
(2) *Speculation phase*: creative thinking techniques are used to generate alternative ways to provide the functions identified in the previous stage.
(3) *Evaluation phase*: the solutions generated are evaluated in terms of their feasibility and cost. Ideas are combined and consolidated to produce a list of five or six ideas that are worthy of further consideration.
(4) *Development phase*: the surviving ideas are developed in detail, ensuring that all of the interfaces with adjacent components are fully accounted for.
(5) *Presentation phase*: the best solution is identified and recommendation is made. This is often done by means of a formal presentation followed by a written report.

Value engineering workshops

Value engineering is achieved through a framework of workshops, including a series of mini-workshops conducted at key stages of the project, or a two-day workshop.

Mini-workshops

A value engineer joins the design team at the briefing stage and acts as facilitator throughout. Two mini-workshops, following the job plan format, are then held to review the proposals at about 15% and 35% design completion.

Two-day workshop

The two-day workshop appears to be the most popular approach. It enables all members of the project team to focus on the issues in an intense and focused way.

As with value management, there are significant benefits to the client where the project adopts an approach to value engineering at an appropriate stage in the project. This may be particularly so with complex projects or where the project team is fragmented.

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11 Risk management

Introduction

When a project is initiated there is risk for the client. The business case for the project will, for example, include the risk that the prediction of future markets or demand which underpin or justify the project prove to be inaccurate. The economic conditions on which those predictions were made may unexpectedly change affecting inflation or interest rates and impacting on project viability. The project itself will create the potential for risk in terms of its relative success against the objectives to be met but also physical risks caused by the construction process.

Identifying the risks associated with initiating a building project and seeking to reduce their likelihood, manage their occurrence or mitigate their impact is a fundamental element of good procurement practice. The client will be taking risks to gain the benefit from the project and will expect that these risks are recognised and contained in the procurement strategy adopted.

Construction projects are typically complex. They have time, cost and quality targets which the client requires to be met, and compromise is usually needed to attain that unique combination of targets which will generally represent the client's definition of value for money for the project. Quality, for example, may be sacrificed in order to achieve a time target or to comply with a cost limit, or time may be compromised in order to achieve high quality. Since the major purpose of the project procurement strategy is to ensure that the client is given the best possible chance of fulfilling his or her objectives as defined by 'value for money', it is clear that the development of the most appropriate strategy must at the very least be informed by the likelihood that the targets might not be achieved. Some analysis of the commercial, technical, social and political risks that might tend to knock the project off course must therefore be considered in developing the procurement strategy. It is important to note that risk management cannot eliminate risk, but risk management techniques can be used to reduce the impact of events that may cause failure to reach the desired targets. It is also important to remember that there is considerable research evidence to suggest that significant cost savings can be achieved by paying attention to contract strategy based on systematic

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consideration of risk. The proposals for funding a project should therefore include recommendations on contract strategy.

Risk management may, depending on the structure and organisation of the project team, be undertaken by the project manager or by an independent risk manager, but the success of the chosen risk management strategy will largely depend on the stage of the project at which it is introduced. It is widely recognised that deficiencies in the project brief lead to uncertainty and greater risk during the contract. For many projects in the past, risk management has been a subconscious and somewhat haphazard process, but if it is to be effective it is better for it to be formalised and embedded into the procurement process – indeed the view currently taken by many influential clients, for example the UK Government as expressed in its construction strategy (Cabinet Office 2011) is that a fundamental goal of the project procurement process is both to identify and to control project risk.

This chapter considers some issues to do with risk analysis and management. It is not suggested that a detailed risk assessment would be required for every project. Plainly the extent of the risk assessment needs to be appropriate to the type and size of the project, the prevailing economic and political circumstances, the degree of complexity inherent in the project and the commercial environment in which it is to be procured. Nonetheless some consideration of the likely risks must always form part of the project procurement strategy.

Risk and uncertainty

It is important to distinguish between events that are 'risky' and events that are 'uncertain'.

Risk events are events the occurrence of which can be predicted to at least some degree, generally based upon historical data or experience; a decision can be made according to the probability of a particular event occurring. In other words, a forecast is made on the basis of past data and therefore within some degree of certainty.

Uncertain events are random events which defy prediction. Risk events can be managed; uncertain events cannot. It should therefore be a fundamental rule of risk management to reduce uncertainties to a minimum. This is typically done by converting them into events that can be predicted, generally by gathering more data, or by engineering out of the process the events that are likely to give rise to them.

It will generally be impossible to 'manage out' all of the uncertainties, and the usual way to manage those that remain is to include some form of float or contingency allowance in programmes and budgets.

Types of risk

Risk in construction projects may be divided into health and safety risks and business risks. Health and safety risk in the UK is dealt with by law, and comprehensive processes for managing it are dealt with through the Construction

Design and Management Regulations. Health and safety risk is therefore not considered further here.

Business risk (sometimes called enterprise risk) may conveniently be subdivided into:

- Financial risk – risk to capital.
- Strategic risk – risk of market changes.
- Programme/project risk –risk of change.
- Operational risk –risk of operational failure.

Each of the above categories of risk needs to be recognised, analysed and managed through the project procurement and project management processes. In simplistic terms:

- Financial risk is managed through appropriate budgetary and cost control processes.
- Strategic risk is managed through a proper and unbiased assessment of business need and business case processes supported by value management.
- Programme risk is managed initially through the project definition and design process, and later through the processes of time planning and change control reinforced by good project management.
- Operational risk is managed through choice of the most appropriate procurement approach and the most appropriate consultant and contractor team.

Risk management strategies

Risk management may be formal or informal. Informal approaches may be appropriate for smaller and less complex projects, but larger and more complex projects will normally justify a more formalised approach. Examples of generalised formal risk management approaches would include:

- BS 3110 *Risk Management Code of Practice* published by the British Standards Institution.
- ISO 31000 *Risk Management: Principles and Guidelines* published by the International Standards Organisation.

A number of formal risk management strategies have also been developed by various organisations specifically for construction projects. The most widely used models, at least in the UK, are probably:

- BS 6079 Part 3 *Project Management. Guide to the Management of Business Related Project Risk* published by the British Standards Institution.
- *Project Risk Analysis and Management* (PRAM) published by the Association for Project Management (APM 1997).
- *Risk Analysis and Management for Projects* (RAMP) published by the Institution of Civil Engineers (ICE 1998).

Most models, however, involve the following four stages:

(1) Risk identification.
(2) Analysis, involving quantification of the risk effects and prioritisation.
(3) Choice of an acceptable risk management strategy.
(4) Risk monitoring and control.

Each of the above stages is considered in detail in the following sections. Risk engineering is sometimes used as an umbrella term to cover all of the four stages.

Identifying risk

Once the project and its objectives have been well defined, the process of risk identification can take place. There are a number of approaches that can be used. Some or all of the following approaches may be employed:

- Assumption analysis.
- Checklists.
- Brainstorming.
- Delphi technique.

Assumption analysis

As its name suggests, this is where risks are assumed based on previous experience and knowledge. The identified risks are assessed using a description. For most business decisions there are four main categories into which risks can be placed:

- High probability – high impact.
- Low probability – low impact.
- High probability – low impact.
- Low probability – high impact.

Those with a high probability of occurrence and a high impact on the project would be those typically considered for risk management.

Checklists

Checklists and prompt lists permit rapid risk identification and avoid problems being overlooked. Simple prompt lists may use acronyms, for example variants of the well-known PEST or PESTOL, where:

- P = political risk.
- E = economic and financial risk.
- S = social risk (e.g. people issues).
- T = technological risk.
- O = organisational and managerial risk.
- L = legal risk.

A more complex checklist is shown in Figure 11.1.

(1) The following check list gives both generic and specific risk issues likely to be encountered by most types of project. It is based on a number of more specific check lists from a variety of sources, and includes lessons learned from particular projects.

(2) Each question should be considered in turn by the project team and/or risk consultant, and should be answered by one of **NOT APPLICABLE**, **YES**, **NO** or **UNKNOWN**. Every question where the answer is NO or UNKNOWN requires a risk issue to be raised and risk mitigation or contingency actions to be identified.

(3) Respondents should consider both those aspects of the project for which they are responsible, and the complete project in the broader sense.

PROJECT:	**RESPONDENT:**	**RISK CONSULTANT:**	**DATE:**	
RISK TYPE	**RISK AREA**	**UNCERTAINTY**	**NA/YES/NO/ UNKNOWN**	**ACTION**
1. Requirement	1.1 Clarity	Is the requirement well understood?		
	1.2 Volatility	Is the requirement stable?		
	1.3 Specification	Are all required specifications available and adequate?		
	1.4 Interfaces	Are all interfaces well defined and acceptable to us?		
	1.5 User	Is the required user interface clearly defined?		
2. COMPLEXITY	2.1 Project	Is the complexity of the project acceptable, i.e. not expected to cause problems?		
	2.2 Size	Is the size of the project manageable, i.e. not expected to cause problems?		
	2.3 Integration	Has sufficient time/effort been allocated to system integration?		
	2.4 Subsystems	Are all subsystem interactions defined and acceptable?		
	2.5 CM	Is configuration management adequately controlled?		
. . . etc.				

Figure 11.1 Example check list. (Source: Association for Project Management in their *Project Risk Analysis and Management* (PRAM) (APM 1997).)

Brainstorming

Brainstorming (Osborn 1953) is perhaps best known as a group problem-solving technique, but it works equally well for risk identification. To ensure that the best outcome is achieved, a facilitator should set the ground rules and explain the procedures for all members of the team. The proceedings start with a framework for the session, often taken from prompt lists and checklists, looking first at whole project issues and then focusing on specific phases. No criticism is allowed. The process is usually used for risk identification and operates in two stages:

- The creative stage, in which participants are encouraged to identify all possible risks which might arise, no matter how unlikely.
- The analysis stage, in which participants consider the risks identified and attempt to classify them, generally in terms of both their likelihood of occurrence and their possible impact.

Risks are classified using a combination of the probability of occurrence and potential impact. Those with the highest composite score are considered in terms of possible management strategies.

Delphi technique

The Delphi technique is a structured way of obtaining a group consensus on risks and their impact. It is better suited to assessing risks but can be effective for risk identification.

The technique requires a chairman or co-ordinator to act as the central hub. The chairman distributes questionnaires or asks participants to generate individual lists of potential risks. These are then given to all members, each of whom individually considers the probability of the risks occurring and their consequent impact. These independent opinions are collated and redistributed to gain consensus. No participant discusses his or her opinions with anyone else. Once the process has gone through sufficient iterations and the chairman feels that no further benefit will be gained from continuing, the results are reported.

One of the benefits of the Delphi technique lies in its flexibility. Because it is an individual activity carried out in isolation, there is no need for all of the participants to be together either geographically or in time. It therefore presents a totally different approach from brainstorming.

Cause and effect of risk

Risks do not generally occur in isolation – they have one or more causes and one or more effects – and it is important that the causes and effects should be considered as part of the risk identification process. A single risk may have only minor consequences, but a combination of seemingly 'minor' risks could have serious consequences for the project. Hence the importance of a comprehensive analysis.

A further factor that needs to be considered is risk dependency – that is, the extent to which the probability of risk events occurring is modified by the occurrence of other events either individually or in combination, for example:

- If event A occurs then event B will not occur.
- If event A and event B occur then event C is inevitable.

It should also be borne in mind that any specific risk event may occur only at certain stages in the process, for example during the design stage or perhaps during various stages of the construction process. Risk management therefore needs to be a dynamic process.

Examples of risks

These examples do not include uncertainties such as economic recessions or the impact of major world events such as wars and disasters. The following list gives examples of some of the major risks that may require attention during the design of the procurement strategy:

- External risks such as those that arise from economic, legal or political environments.
- Financial risks:
  - inflation;
  - significant interest rate rises;
  - currency conversion risk;
  - availability of funding.
- Site risks:
  - restricted or occupied site;
  - planning difficulties;
  - access;
  - environmental risks.
- Client risk:
  - mistaken assessments of future markets or demand for the project;
  - lack of client knowledge and/or experience;
  - complex and multiheaded clients, leading to lack of clarity, misunderstanding or disagreement concerning project objectives;
  - likelihood of post-contract changes.
- Design risks:
  - selection of an inappropriate consultant team;
  - poor brief;
  - incomplete pre-contract design;
  - complex building works, novel design or lack of buildability;
  - inadequate co-ordination of design or production documentation;
  - inadequate design and co-ordination of construction and services.

- Selection of an inappropriate contractor:
  - inadequate selection process;
  - lack of clarity in terms of the trading relationships between employer and contractor and between contractor and supply chain.
- Construction and delivery risks:
  - weather;
  - constructability;
  - health and safety;
  - availability of key resources.

Analysing risk

Once the risks have been identified, then their effects must be analysed before attempts can be made to manage them. Risk analysis therefore involves deciding the following:

- Risk probability: how likely is it that the event will occur?
- Amount at stake: how much is the possible loss?

Risks are typically addressed through a combination of *qualitative* and *quantitative* assessment. Qualitative assessment is a relatively simplistic technique used to describe risks in linguistic terms. Quantitative assessment on the other hand describes risks in terms of their mathematical probability of occurrence and the numerical consequences of their occurrence.

Qualitative assessment

Qualitative assessment seeks to describe and understand each risk in order to assess the likelihood of occurrence and the likely consequences in terms of impact on project performance. Various linguistic scales are used, ranging from the simplistic "high/low probability, high/low impact" to more complex and subtle subdivisions in which the variables may be measured on more complex scales. One popular common technique uses a simple 'traffic light' approach (see Table 11.1) to score the importance and controllability of the risk.

Risks are then ranked in terms of the management effort needed to control them; those with a red–red profile are critical and must be managed, whereas at the other

Table 11.1 A 'traffic light' approach to assessing risk.

	Criticality	Controllability
Red	Showstoppers	Very difficult
Amber	Significant but manageable	Fairly confident
Green	Minor or local impact	Very confident

Table 11.2 A more detailed approach to assessing risk.

Probability	Impact
Very high	Catastrophic
High	Very serious
Moderate	Moderately serious
Low	Inconvenient
Very low	Insignificant

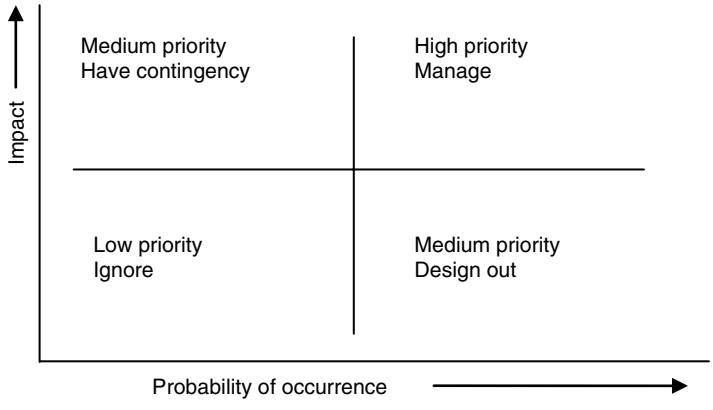


Figure 11.2 A graphical representation of risk assessment.

end of the scale those with a green–green profile are plainly insignificant and can safely be ignored. At a slightly more detailed level, scales such as that shown in Table 11.2 are typical.

Graphical representations, such as that shown in Figure 11.2, are also common. If a finer distinction than this is called for then a quantitative measure is probably the best approach.

Quantitative assessment

Here the likelihood of an event occurring is given a numerical probability. Probability is measured on a scale of 0 to 1. An event with a probability of 0 will not occur and an event with a probability of 1 will definitely occur. An event with a probability of 0.5 has an even chance of occurring or not. The possible consequences of a risk could be quantified in terms of:

- *Performance*: the extent to which the project would fail to meet the user requirements for standards and performance. Benchmarks and key performance indicators (KPIs) need to be included here.

- *Time*: the additional time required beyond the original completion date anticipated for the project.
- *Cost*: the additional cost over and above the original estimate for the project out-turn. This includes not only the contract sum but also all associated fees.

This method of analysis requires: (1) probabilistic combination of individual uncertainties; and (2) estimates of uncertainty in predicting the cost and duration of activities. Quantitative techniques are less subjective than the qualitative approach, although in many cases the raw data have had considerable subjective input.

Quantitative analysis often involves more sophisticated analysis techniques which usually require computer application. Computer-generated models and analytical techniques can be useful indicators of trends and problems for attention, but they should not be relied on as the sole guide to decisions. The accuracy of the models depends on the accuracy of the assumptions made, the skill of the model builder and the accuracy of the data used.

An alternative method for considering project risks is to analyse each risk independently of the others, with no attempt to estimate the probability of occurrence of that risk. The estimated effects of the risks can then be accumulated to provide maximum and minimum project outcome values. In other words, neither a subjective nor an analytical value is given for the probability of occurrence of the risk event. Instead, each risk event is compounded to determine the possible effect upon the project, and then, by applying a range of maximum (critical) to minimum (minor) project consequences, the full extent of the particular risk can be seen.

Sensitivity analysis

Sensitivity analysis is a technique used to consider the effect of changes with regard to those events that are deemed to be a potential risk to the project. It calculates the effects on the project using a range of values for the event changes. For example, there may be a risk that the cost of steel will increase by 2.5, 5, 10 or 15%. The project outcome is evaluated for each of these potential cost changes and the result can be plotted on a graph to show the percentage variation (risk against cost change). The results of a sensitivity analysis can be shown graphically on a 'spider diagram' (see Figure 11.3).

A sensitivity analysis is very useful, because often the effect of a small change in one variable (for example cost or duration) produces a marked difference in the project outcome. When several risks are assessed in this way, a spider diagram provides an effective way of demonstrating those risks that are most critical and sensitive. These are the ones the project manager must act upon.

A sensitivity analysis can be performed for all the risks and uncertainties that may affect a project, in order to identify those that have a large impact on the cost, time or other objectives. It may also be used to identify the variables to be considered when carrying out a probability analysis (see next section).

One problem with sensitivity analysis, however, is that each risk is considered independently, with no attempt made to quantify their probabilities of occurrence. Another

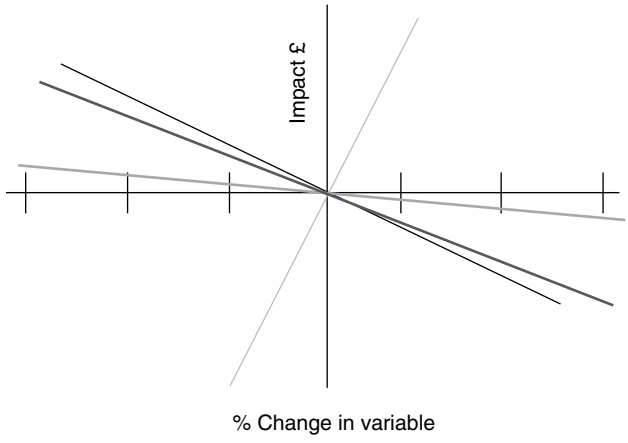


Figure 11.3 A 'spider diagram' showing the financial impact as risk changes.

limitation is that, in reality, a variable would not change without other project factors changing and this is not shown in the sensitivity analysis. Eventually, however, given sufficient practice, users can more easily identify those risks that have a large impact on the project, and so the number of risks in need of consideration can be reduced.

Probability analysis

This technique can extend beyond the limitations of a sensitivity analysis by specifying a probability distribution for each risk and then assessing the effects on the risk events in total. However, careful interpretation of the results is essential.

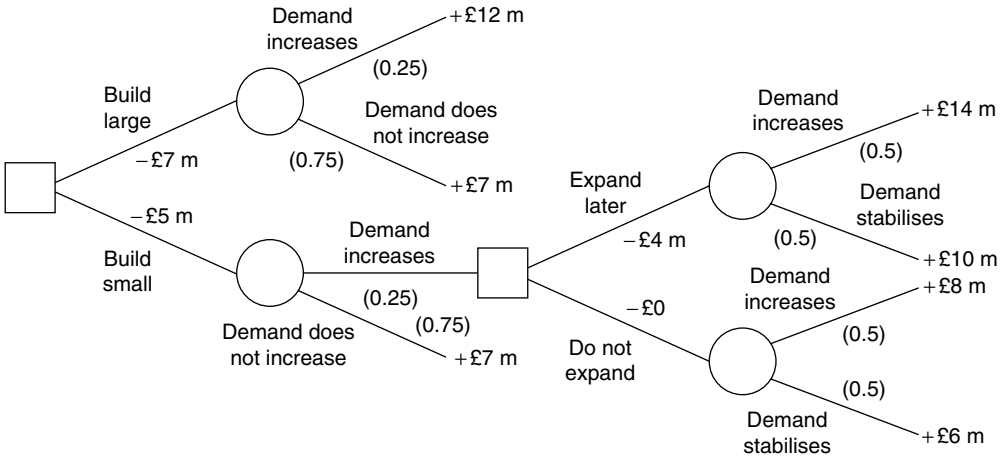
One important stage in this type of risk analysis is assessing the range of probabilities that could result. 'Monte Carlo' simulation (random sampling) can be used where calculation of data inserted into an equation would be difficult or impossible. This procedure may be used in a probability analysis as follows:

(1) The variations to the risks being considered are assessed and a suitable probability distribution of each risk is selected.
(2) For each risk a value within its specified range is selected. The value should be randomly chosen and within the estimated probability distribution.
(3) To establish the outcome for the project, a calculation is made based on the combined values for each risk.

The process in step 3 is repeated several times in order to produce the probability distribution of the project outcome.

Decision trees

For all major projects, there are almost certain to be a number of routes through which the objectives may be achieved and selection of the most appropriate procurement route may not be straightforward. Decision trees (see Figure 11.4) are



Note: By convention, a square node depicts a choice to be made, while circular nodes correspond to chance events.

Figure 11.4 A decision tree.

a useful way of assessing the likely impact of risk on managerial decision-making. They provide a graphic display of the range of possible outcomes and can be used to help make a particular choice of action or provide justification for it.

The most popular approach is to evaluate the expected outcome at each node in some numerical form, and the accumulated 'value' at that point is then given by multiplying the net value by the probability that the outcome will occur. This criterion says that the expected value, or worth, of a profit of £x that materialises with probability p is £px. Thus the expected value at each circular node is the sum of all the £px quantities. Note that summing just the probabilities out of any one chance node has to equal 1, since precisely one branch must occur. (Remember that the probability of a certain event occurring is, by definition, 1.)

To find expected values at each square node, it is necessary to subtract the costs associated with the particular branch. By working backwards exhaustively through the entire decision tree, the most appropriate decision at each node can be found simply by choosing the branch that maximises expected profit at every step. This enables the best overall strategy to be implemented – or at least gives a more solid basis on which to make decisions than purely by intuition alone.

Figure 11.5 shows the expected values inserted into the decision tree. The uppermost circular node has an expected value of £8 250 000, derived from £12 million × 0.25 + £7 million × 0.75. The second decision node (should warehouse be expanded later or not?) has an expected value of £8 000 000, being the larger of £8 million × 0.5 + £6 million × 0.5 = £7 million (if not expanding) and £14 m × 0.5 + £10 million × 0.5 + (−£4 million) = £8 million (if choosing to expand). The first decision is between expected profits of £1 250 000 for building the large warehouse immediately, against £2 250 000 for the more cautious 'wait and see' option. In this example, therefore, application of the decision tree method strongly supports building the smaller warehouse for now.

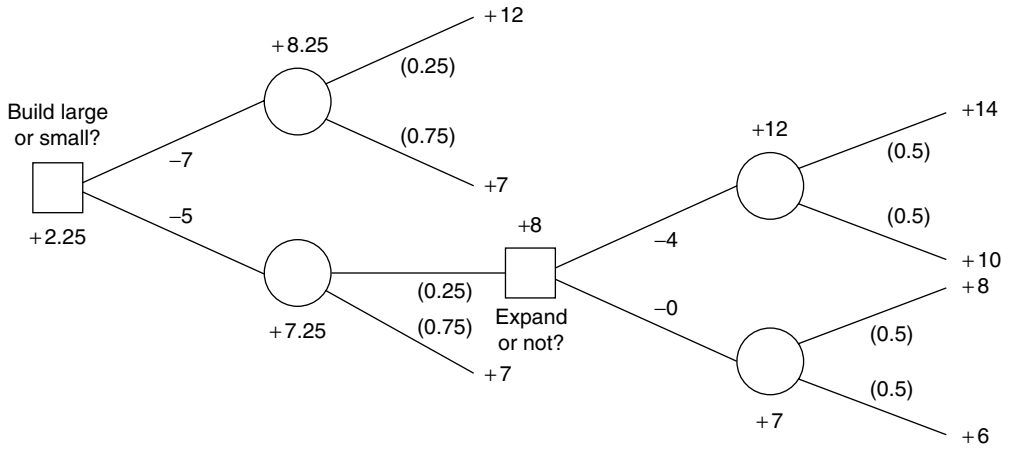


Figure 11.5 A decision tree with values inserted.

There are some obvious limitations to this technique. Used naively, the user puts faith in the accuracy of all the probability figures and cost estimates. If any of these happen to be seriously wrong, the recommended decision might also be wrong.

The usual way to overcome this problem is to conduct a sensitivity analysis, similar to that described above, especially if there are grounds for reasonable doubt as to the figures given in the decision tree – perhaps because not all values are based on well-researched, historical data. Clearly, if costs and probabilities are no more than wild guesses, simplistic use of the method has little more to offer than blind intuition. However, it comes into its own when large and complex decisions are broken into a series of smaller decisions, any of which can be subjected to minor changes in associated numeric values to assess its overall impact.

In summary, decision trees can provide a powerful technique for convincing oneself and others of the most suitable course of action. Their graphical representation sometimes makes the solution obvious. By addition of estimated costs, values of outcomes and probabilities, they provide a basis for analysing complex problems. This system can therefore help to clarify and communicate the options available to the project manager. Decision trees can be used when choosing the appropriate procurement route, the method of construction or even whether to proceed with a project claim. Their more obvious use is by clients in choosing between alternative development projects.

While this approach to risk and decision-making is not without limitations (in common with most tools in management science), a key advantage is that it encourages the client, project manager or decision-maker to assess some degree of probability of an outcome occurring and to take rational and logical action at each decision point.

Choosing a risk management strategy

Once a risk is known, a strategy must be devised to mitigate the risk. The risk must also be allocated to the person best able to control it.

Risk management strategies

Typical risk management strategies are:

- Risk avoidance.
- Risk reduction.
- Risk transfer.
- Risk sharing.
- Risk retention.

Risk avoidance

Risk avoidance requires some action to be taken to ensure that the event giving rise to the risk does not occur. Typically one would remove the cause or consider an alternative solution.

Risk reduction

Risk reduction requires some action to ensure that, if the event occurs, the impact will be reduced as much as possible. The most popular option would include consideration of alternative solutions and a more detailed examination of the risks involved.

Risk transfer

Risk transfer requires someone else to take the risk. Options here might include insurance or subletting. In the event that major risks are involved, the 'empty chair' theory of risk management says that if no-one in the team has the capability to manage the risk then an additional team member should be introduced and paid to take the risk. This technique has been used effectively in some major privatised infrastructure projects in circumstances where either local institutions have no track record in the international market place or currencies are not directly convertible in the international markets. In these cases additional organisations have been invited to join the team simply to act as guarantors against default.

A typical example of the transfer of risk in the selection of a procurement route might be a decision to use design and build rather than a traditional or management-based approach. In this case the whole of the design risk is placed with the contractor rather than with the employer.

Risk sharing

Risk sharing is generally achieved through the mechanism of the construction contract. For example in many contracts the risk of adverse weather is shared in that the contractor would be given an extension of time but no additional monies. The client would therefore not be able to deduct liquidated and ascertained damages, but neither would he or she have to pay any additional preliminary costs.

Risk retention

Risk retention means that the risk is noted and remains. In effect someone 'takes the risk'. Taking the risk is a perfectly acceptable risk management strategy provided that the decision is based upon sensible and carefully considered criteria.

Care should be taken when considering the available risk management options to ensure that the potential impact of each risk is not outweighed by the direct costs of risk management. A risk management plan will help to keep a check on the overall strategy chosen. An awareness of these problems or sources of risk is essential in order to give focus to specific aspects of the procurement process. How these factors are to be dealt with will heavily influence the choice of contract strategy.

Risk allocation

Conventional wisdom states that risk should be allocated on a solid basis of responsibility and control to those parties best able to manage it, and in a manner likely to optimise project performance. More recently however it has been proposed that simply to talk of 'managing' risk is too simplistic, and that a more rational approach, dependent upon the nature and scope of the risk, might be to allocate the risk to those best able control it effectively or absorb it financially.

The responsibility for allocating risks should rest with those:

- Who have, or can acquire, the most information about controlling it.
- Who have the most to gain by controlling it.
- Who have the most to lose by failing to control it.
- For whom the risk is inherent in their commercial role.

Ideally, the final allocation of risk should be done through the contract documents. Traditionally in construction, clients have been extremely shy of taking any responsibility, but more enlightened clients have recently come to the view that value for money in the finished project can be significantly enhanced through a proper and responsible allocation of risk.

It is also worth remembering that incentives and risk go together in that a party responsible for carrying a risk has the incentive to minimise its impact, but assuming responsibility for a risk often also has a significant cost attached to it which must be paid eventually by the client. The analogy here is the example of an insurance premium.

The traditional methods for allocating risks in the construction and real estate industry is as follows:

- From client to designer and contractors.
- From client, designer or contractor (main or sub) to insurer.
- From client, funder, developer, purchaser or tenant to professionals (architect, engineer) or contractors by collateral warranty.
- From main contractor to subcontractor (domestic and nominated).
- From contractor (main or sub) to guarantors or sureties.

Note that historically this process has been driven from the top downwards. That is, clients have unilaterally assigned their risks to designer and contractor regardless of who is best able to control them. This process, commonly known as 'risk dumping', is now widely considered to be counterproductive and a more collaborative method of risk allocation by mutual consent is recommended.

In a sensible risk management regime, risk should be equated to the expertise, role and reward of the party to whom it is ascribed. When ascribing risk, therefore, it is reasonable for a contracting party to bear risk in any of the following cases:

- If the party can cover a risk by insurance and it is reasonable for the risk to be dealt with in this way.
- If the risk is of loss due to the party's own misconduct or lack of reasonable care.
- If it is in the interests of efficiency to place the risk on the party.
- If the economic benefit of running the risk accrues to the party.

An important consideration when allocating project risks is the willingness of the respective parties to take on the risks. The allocation of project risks, contractually, has historically been in the hands of the client, but modern strategic procurement techniques now hold that the most cost-effective allocation of risk is derived from consensus, not decree.

The empty chair theory

It may be that in some cases a risk will become apparent which no-one in the project team is able to control. An example occurred during the procurement of the ShajiaoB power station in southern China under a build–operate–transfer arrangement. The project was driven by a Hong Kong developer, Hopewell Construction, and the basis of the deal was that the developer would design and build the power plant, and operate it for a period of ten years, selling the power to the local electricity authority, after which the plant would be given free of charge to the power purchaser. Payment for the power was to be made in the Chinese currency but, at the time the deal was structured, the renminbi was not freely tradeable on world financial markets, meaning that the developer would be only able to spend his earnings within China. This was plainly unacceptable and it seemed as though the project was doomed to fall at the first hurdle, but the financial engineers pointed out that there were trading companies in Hong Kong, at that time still under British rule, who routinely traded with mainland China and who would be able to act as a conduit for remittance of the monies to Hong Kong. A suitable partner was quickly identified and invited to 'fill the empty chair' in the project team in return for an acceptable fee.

Monitoring and controlling risk

The main evidence that risk management is taking place on a project is the existence of a risk-reporting procedure. This means that the risk management can be audited and measured and can provide a background of experience for future projects.

The procurement strategy must therefore include provision for a risk register, in which risk management techniques are formally recorded, and for regular monitoring and updating of the risk management strategy as the project proceeds.

There are many alternative techniques for monitoring risk; Baxter (2010) proposes a deceptively simple approach using coloured bubble diagrams presented on a simple graph. In essence the size of the bubble represents the degree to which the risk is controllable (the bigger the bubble the greater the difficulty in controlling the risk), the colour of the bubble (usually red, amber or green) represents the degree of criticality and the urgency of controlling the risk is shown by the closeness of the risk bubble to the origin of the graph. Simple graphical tools like these can prove very effective.

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12 Partnering culture and the management of relationships

Introduction

Since the mid-1980s the British construction industry has undergone massive cultural shifts, largely driven by an increasingly discontented customer base. As long ago as 1983, the British Property Federation (BPF), an organisation representing some of the largest private sector property employers in the UK, drew attention to the problems faced by employers in ensuring that projects were delivered on time, within budget and to the expected quality standards. Their response to the perceived failings of the construction industry was to develop and unilaterally introduce their own procurement methodology. The proposed methodology (known as the BPF system) was intended to reduce the cost and time taken to procure construction projects and included such advanced concepts as an employer's project manager, tenders produced on the basis of priced activity schedules which were to be used as 'milestones' to trigger payments to the contractor, and financial incentives to the contractor to improve project performance. At the time, these proposals were considered to be too radical, and the BPF system failed to achieve general acceptance. It did, however, throw the problems faced by employers into sharp focus, and began a long running debate about the future role of the employer in the construction procurement process.

The aim of this chapter is to introduce some of the major practical issues that influence the successful use of partnering and other collaborative procurement techniques. The discussion also includes an introduction to some of the skills required to successfully implement a partnering arrangement.

The Latham review and subsequent developments

In 1994 Sir Michael Latham published a government-commissioned root and branch review of the UK construction industry (Latham 1994). Amongst his major findings were that:

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- Profit margins in construction were roughly half those that were accepted as the norm in other comparable industries.
- The construction industry had an exceptionally poor record of financial investment in the future.
- Construction industry customer complaints far exceeded those in any comparable industry.

Amongst his major recommendations, all of which were subsequently accepted and endorsed by government, were:

- The introduction of improved dispute resolution mechanisms in construction.
- That construction contracts should not be placed on the basis of lowest price alone.
- That a collaborative style of construction procurement, where employers and contractors work together rather than in the confrontational way that had become accepted as the norm, should be adopted as general practice.

The Latham review was followed by a further review of construction (Egan 1998) and by a review of UK public sector procurement practices (Gershon 1999). Following the Latham review, the Government began to introduce the idea of collaborative construction procurement in the public sector through a series of Procurement Guidance Notes published by the Treasury between 1995 and 1999. Additional government advice has also been provided in a range of publications, amongst which the most notable were probably the UK National Audit Office publications *Modernising Procurement* (NAO 1999) and *Modernising Construction* (NAO 2001), culminating in the publication of the Government's Construction Strategy in 2011 (Cabinet Office 2011).

The rise of collaborative approaches to procurement

Although a collaborative approach to public sector construction procurement perhaps first came to prominence in the UK as a result of the Latham review, in fact the concept is much older. In building, a good British example of a successful early strategic alliance was the Bovis System which operated for a number of years in the 1960s and 1970s between Marks and Spencer and Bovis Construction for the construction and refurbishment of department stores(Cooper 2000). There are also illustrations of collaborative approaches in allied industries, for example the concept of 'alliancing' has been used in oil exploration since the 1980s (Knott 1996; Sakal 2005).

Overseas, 'partnering' (arguably the most popular term used to describe the collaborative approach) has been used extensively in the USA, where two of the best known examples are a substantial number of large road schemes beginning in the early 1990s (Eriksen 2009) and projects let by the US Army Corps of Engineers (US ACE 1991). In Australia, following a rather shaky start, the use of partnering now seems to be well established in road construction and maintenance

(Manley 2002) and the Australian National Museum Project in Canberra was claimed, at the time of its construction in 2005, to be the world's largest and most complex collaborative scheme. Collaborative procurement approaches are being increasingly widely used around the world for large, complex and risky projects.

All of the above approaches differ slightly in the mechanisms used and in the legal significance of the 'partner' status, but all are essentially methods of harnessing the combined skills, expertise and efforts of all involved in the project to ensure successful project completion. The technique therefore requires a significant shift in the relationship between employer and contractor away from the conventional 'customer/supplier' approach, in which each of the parties fights for his or her own goals, and towards a 'shared risk/shared reward' approach, in which all parties involved commit themselves to work for the good of the project.

The successful implementation of this method of procurement also requires the use of specialised supporting tools, such as formal risk and value management strategies, and the implementation of formal quality management procedures. Note, however, that simply putting these tools in place will not, of itself, guarantee success. The tools must be used in a sensitive way as part of a cohesive and carefully designed strategic procurement methodology where the emphasis is firmly rooted in shared goals and a mutual commitment to project success. Experience with the management of quality has, for example, shown that the simple adoption of formal quality assurance systems such as the ISO 9000 series did little to improve the quality of the finished work. What is required is a cultural shift such that a 'right first time every time' attitude is accepted as commonplace. Whilst, therefore, implementation of the techniques is important, this must be accompanied by an attitudinal change by all concerned in the project if the shift away from confrontational methods and towards collaborative methods of construction procurement is to be effective.

One major advantage of the collaborative approach is that it aims to improve value for money by placing the employer and, in many cases more importantly, the end user once more at the centre of the project development and construction process. Indeed the success of the methodology requires the employer and the end users to be full and active members of the project team.

Collaborative procurement techniques played a significant part in the majority of the projects highlighted by the UK Movement for Innovation (M4I) and the Construction Best Practice Programme (CBPP) in the early 2000s. Industrial experience over the past several years in the UK and elsewhere also clearly shows that, provided the parties to the project are carefully chosen and fully committed to the relevant principles and philosophy and that the contractual basis supports them, the approach works well in the overwhelming majority of cases.

Collaborative approaches to construction work

Collaborative approaches recognise that project success is more likely to occur if all of the parties involved work together for the good of the project rather than independently and for the good of themselves. The process of bringing the parties

together is commonly facilitated by a third party in an intensive one- or two-day workshop, although in modern practice this methodology is not the only way forward – see the case study in Chapter 15. During the workshop, considerable emphasis is placed upon breaking down organisational barriers and traditional management systems and on deriving an agreed set of common goals to which all concerned are willing to subscribe. These approaches are well founded in organisational and management theory.

Collaborative approaches such as these demand that complete trust exists between the parties and that all involved have both the willingness to maximise value for money for the project as a whole and the opportunity to earn an enhanced reward should they manage to do so. Of these, trust is probably the most important as a prerequisite for successful collaborative working.

Contractual approaches to collaboration

Collaborative techniques must be underpinned by contractual forms which encourage the parties to collaborate rather than compete. A short review of each of the major forms of contract commonly used in the UK is given below.

The JCT forms of contract including the Standard Form of Building Contract

The JCT range of contracts is very popular in the UK, not least because of their broadly risk-neutral drafting. However, although the JCT produced a Practice Note (JCT 2001) explaining the use of its contracts in a partnering environment, there is a commonly held view that this range of contracts does not in reality support the basic principles of the partnering philosophy very well. In short, the JCT range of contracts is commonly perceived to be rather confrontational in that they specifically require that parties to the contract serve formal notices in order to protect and preserve their contractual rights, and thus encourage the parties to take up entrenched positions.The exception is the JCT Constructing Excellence Contract.

The New Engineering Contract Engineering and Construction Contract (NEC ECC) Edition 3

The NEC ECC form is a popular choice for contracts let on a collaborative basis. Its flexible structure, together with clear drafting in simple English, is seen as a significant advantage and the contract includes a requirement for the parties to work together in a spirit of mutual trust and co-operation. A partnering agreement (option X12) is available for incorporation in the contract. The partnering agreement does not create a legal partnership but nevertheless establishes a framework for the partnering arrangement, which includes the formation of a core group, key performance indicators and incentive payments.

It is interesting to note that NEC ECC Edition 3 (NEC 2005) has been endorsed by the Office of Government Commerce as the preferred contract for public sector work.

The ACA Project Partnering Contract (PPC 2000)

The PPC 2000 contract (Trowers and Hamlins 2000) was the first generally available standard form of construction contract specifically built around project partnering. Partnering is therefore at the very core of the contract and the partnering agreement is legally binding. The contract incorporates all of the features recommended by Latham (1994) and Egan (1998) and a number of other key features including:

- A multiparty approach: all project partners become signatories to the contract.
- An integrated approach to design and construction: the contract provides for the early selection of a partnering team before design commences, thus encouraging the contribution of all parties during the design process.
- Supply chain management on an open-book basis.
- A partnering timetable to govern the activities of all parties in the partnering process.
- A core group responsible for management of the partnering arrangement.
- Incentives, continuous improvement and performance measurement.
- Formal risk management procedures.
- Non-adversarial problem resolution processes.
- A partnering advisor to assist the project team to effectively manage the partnering arrangement.

Notwithstanding the fact that this is the first contract specifically designed for partnering, some project teams do not want their partnering arrangements to become legally enforceable. Some purists have argued that making them enforceable is a direct denial of the benefits of partnering itself.

Perform21 Public Sector Partnering Contract (PSPC)

This new form of contract, published in 2005 on behalf of the Federation of Property Societies (Knowles and Wills 2005), aims to provide a simple form of contract, consistent with the principles of partnering and best value, for use in the public sector. The form therefore sets out the essential risk distribution between the parties in very simple terms, whilst leaving procedural matters to be agreed between the parties. The suite includes a separate partnering agreement and professional services agreement, and provides options for:

- Term maintenance on a measure and value basis (PSPC 1) or a target cost with cost reimbursable basis (PSPC 2).
- Authority design on a lump sum basis (PSPC 3) or a target cost with cost reimbursable basis (PSPC 5).

- Contractor design on a lump sum basis (PSPC 4) or a target cost with cost reimbursable basis (PSPC 6).
- Subcontracting on a lump sum basis (PSPC 7) or a target cost with cost reimbursable basis (PSPC 8).

Target cost contracts

Whilst it is perfectly possible to arrange a working partnering agreement within a conventional lump sum contract, the desirability of incorporating incentives renders this arrangement less than totally satisfactory. Many partnering contracts are therefore arranged on the basis of a 'cost plus' contract incorporating a target cost and a guaranteed maximum price. The target cost is thus predefined as a 'fair price' for the work, rather than the lowest price obtainable in a tender competition, and is commonly derived from the employer's pre-contract budget and cost plan, which normally acts as the 'control price' for the work. The price-competitive element is usually derived from competition between contractors on the basis of the percentage addition to be applied to the net cost in respect of profit and overheads.

The aim of the project team is then to secure maximum value for money by completing the contract as far below the target cost as possible but without loss of function. Contractors or subcontractors bringing forward alternative approaches or other innovations that aid this process are awarded a pre-agreed percentage of any cost savings as a reward for their innovation (known as the 'gain share'). The approach also commonly recognises the fact that events may occur that are the fault of neither party, but which nonetheless might increase the project cost. In this case the additional costs are often shared between the contractor and the employer (known as the 'pain share'). The employer's liability in this respect is commonly limited by the introduction of a 'guaranteed maximum price', which represents the absolute limit of the employer's liability unless, of course, the employer causes the project to overspend by, for example, ordering variations to the work.

This type of contract is illustrated in Figure 12.1, in which it is assumed that the initial target cost is set at £1 million, the contractor's agreed level of overheads and profit (OH&P) is set at 10% and the pain and gain share percentages are 50%. If the target is achieved, the contractor's return will amount to £100 000. If, however, the contractor is able to bring forward innovations that reduce the actual cost to £900 000, then his or her return rises by 50% of the value of the savings, to £150 000. Conversely, if unforeseen events drive the project cost up to £1 100 000, then the additional cost is shared between the contractor and the employer, and the contractor's recovery is reduced to £50 000. Where gain–share provisions are used, it is also common to cap the employer's contribution through the agreement of a guaranteed maximum price (GMP).

Note that the commonly recognised deficiencies of cost plus contracts are largely negated by allowing the contractor to improve his or her return as a reward for improving value for money. This approach is usually reinforced by an 'open-book' approach to project accounting, where the contractor's records are made fully

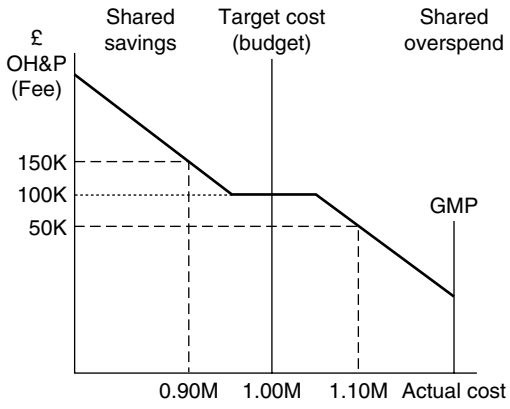


Figure 12.1 Target cost/guaranteed maximum price contract. (Reproduced with the permission of Stradia Ltd.)

available to the employer's quantity surveyor, and the contractor is then paid the agreed value of resources supplied. The approach has a number of advantages and greatly reduces the potential for disagreement over the value of the work carried out and consequent disputes.

There is, however, a major concern over the setting of the initial target cost: it is plainly in the contractor's interest to set the target as high as possible. There is therefore an important role here for the employer's cost consultant in ensuring that the initial target cost and guaranteed maximum price are realistic.

What advantages does partnering bring?

Experience across a wide range of public and private organisations shows that partnering and similar techniques can, if properly applied, significantly enhance the chances of successful project completion in accordance with the employer's time, cost and quality targets. At its best, partnering will result in significant savings in time and cost and in improved quality, thus leading to better value for money. In addition, by adopting a joint approach to the solution of problems as they arise, partnering can significantly reduce the number and severity of contractual disputes, and should therefore ensure that settlement of the final account is much less problematic than would otherwise be the case.

Managing a successful partnering arrangement

It is strongly recommended that all partnering arrangements should be facilitated by a suitably experienced external facilitator. The facilitator's role will include working with the parties to establish the initial partnering relationship and helping them to reinforce the relationship as the project proceeds. The process will include

the identification of a set of overall project objectives applicable to all parties, which all of the parties then undertake to work actively to accomplish. The agreed mutual objectives then become the 'code of practice' for the project and form the basis for the project key performance indicators against which eventual project success will be measured. Successful partnering depends upon many factors, but perhaps the most important is that all the parties involved in the project are committed both to the agreed project objectives and to the partnering philosophy. Working in this way is often very different from the more confrontational approach adopted in conventional 'low bid' tendering situations.

The role of the workshop facilitator

In general terms, the aim in partnering workshops is to achieve a shared understanding or definition of a problem and thence to generate better quality solutions through the processes of synergy and consensus decision-making. This is not an easy task and much depends on the skills of the facilitator.

The individual who has responsibility for this role not only needs to have a thorough understanding of the techniques discussed above, but also must have an extremely high level of interpersonal skills. The facilitation role is often misunderstood; it should be emphasised that this person's job is to enable and guide rather than to play a central part in the substantive aspects of the discussion or impose solutions. The facilitator should not be seen as the 'visiting expert'.

Not only is the task difficult because of its nature, but also it is all to do with orchestrating professionals with often widely divergent backgrounds, interests and objectives. Time limits and pressures also mean that a group of up to ten or 12 individuals (ideally, no more than this) has to begin working very quickly as an effective team. The time pressures involved in the workshop process therefore often result in less security with unfamiliar tasks and roles.

Compare the characteristics below:

- In co-operative groups:
  - people work together;
  - process issues are worked on covertly;
  - people negotiate;
  - information passes on a need-to-know basis;
  - conflict is accommodated;
  - politics are rife;
  - people co-operate to get the job done;
  - feelings are not part of the work;
  - trust and openness are measured.
- In effective teams:
  - people trust each other;
  - process issues are part of the work;
  - commitment is high;

— objectives are common to all;
— listening is maintained;
— conflict is worked through;
— decisions are by consensus;
— feelings are expressed freely;
— people are open.

The greater the ambiguity and uncertainty in a particular situation, the greater the need for the group to exhibit the characteristics of the effective team but the more difficult it is likely to be to do so. There are, however, a number of measures that have been found useful in assisting the facilitator to manage the process and increasing the chances of a successful outcome. Guidelines for facilitation are presented briefly below. They have much in common with those frequently advocated for the effective management of meetings. It should be emphasised that they are of even greater importance where the climate is felt to be characterised by uncertainty and potential conflict, as is frequently the case when new teams come together for the first time.

Facilitation guidelines

Agenda

It is essential that the agenda is drawn up and circulated in advance. Giving participants an idea of what to expect and what will be expected of them will help them to prepare themselves. It may also go some way towards dispelling doubts, criticisms and scepticism, as well as helping to structure the workshop. It will form an *aide-mémoire*, time-keeper and controller. A constant reminder of purpose, tasks and timings in the form of a large clear agenda displayed in a prominent position sounds so obvious that it is rarely done!

Structure and climate

It is imperative that the facilitator goes through the agenda at the start of the workshop, together with the objectives and the procedures to be adopted. The right climate must be created and the expectations of the group must be managed regarding the attention they need to pay to process issues: that is, how they are working together.

Regular summaries

Regular summaries of progress serve much the same purpose as the agenda. They help to clarify communication and maintain control. They can be used as a psychological booster to focus team members' attention on what has been achieved so far or as a way of moving things forward and keeping them on track should time be running out.

Control of phases

Clear separation between stages is necessary, but this does not mean that the facilitator should show no flexibility. It is important that he or she should be able to read the mood of the group. Often a short break will help to get things moving again if participants are flagging or ideas are lacking. However, obviously it would hardly be wise to interrupt a brainstorming session in full swing with ideas flowing thick and fast unless it appeared that the whole programme would be jeopardised as a result. Obviously judgement is required: too much control will destroy the flow, too little will open the floodgates.

Gatekeeping

Needless to say, it is the facilitator's job to 'keep the gate'. This is where his or her interpersonal skills are really stretched. He or she has to ensure that each individual is contributing and that vociferous individuals are not allowed to dominate the discussion.

Team composition

It is plainly important to ensure that the partnering team includes all of the major stakeholders. In the case of public authorities it has been found particularly important to involve audit and legal representatives at least in the initial sessions. It is important that the facilitator is seen as an impartial 'third party' who is not directly involved in the project. The perceived 'neutrality' of this person is useful in helping to guide discussion in an unbiased manner.

Some organisations hire external consultants to lead workshops, on the basis that such people have a greater degree of expertise in facilitation skills and a greater degree of objectivity.

Managing relationships

The successful implementation of collaborative procurement strategies such as partnering and strategic alliances has been held to be largely dependent upon the formation and development of trusting relationships. The aim of this section is therefore to introduce some of the major concepts and techniques involved in relationship management and to provide a brief overview of the problems of implementing these in a construction context.

Important issues to be considered include:

- Concepts of relationship management – why is it important in the modern construction industry?
- The importance of 'cultural fit' in the context of organisational relationships, and an understanding of why alignment of cultural values and philosophies is an important determinant of project success.

- The importance of mutually agreed project objectives and roles, including the function and relevance of documents such as the project charter.
- The need for team building as a component of modern collaborative strategies for construction work.
- The nature of trust and its importance in relationship management.
- The nature of corporate culture, how it may be measured and the problems inherent in achieving cultural correspondence in the construction supply chain.
- The need for reinforcement of the relationship throughout the currency of the contract and how this may be achieved.

Why is relationship management important?

Historically the construction industry across the world has been seen to be increasingly confrontational in nature, with relationships between the various members of the supply chain being characterised by a culture of mistrust, greed and opportunism. In recent years this prevailing culture has been challenged by a number of influential construction commentators and clients anxious to improve on the industry's perceived shortcomings in terms of quality and predictability of time and cost.

Following an intensive period of introspection in the UK, 'best practice' in the management of the construction industry supply chain has now been substantially reviewed and redefined by authorities such as Sir Michael Latham, Sir John Egan and others. The outcome of these influential reviews, supported by the UK Government in its advice to public sector construction clients, is that in most cases (the exceptions may be highly experienced employers dealing with well-defined and clearly documented projects) improved project performance is likely to be dependent upon re-engineering supply chain relationships such that mistrust, greed and opportunism are replaced wherever possible by trust and a shared sense of purpose.

This need for a substantial redefinition of the way the construction supply chain works has also been noted in a number of other countries across the world. A considerable body of experience in a construction context exists particularly in Australia and the USA. In oriental cultures, especially Japan, the existence of mutual dependency networks based upon shared obligations has long been a feature of business in general. Similar issues have also been addressed in other industries dependent upon significant outsourcing of stock and components, such as retailing, motor and aircraft manufacture, or where the risks are particularly high and the rewards, although potentially great, are unpredictable, for example oil exploration.

The successful implementation of integrated supply chains of this kind requires a fundamental rethink in terms of the way relationships between the various parties involved are developed and managed. Significant issues in this process include:

- Establishing the 'cultural fit' between the partners
- A clear understanding of each partner's needs and desires, followed by the identification of, and commitment to, a set of mutually agreed objectives

- Team development
- The nature of trust
- Maintenance of the relationship
- Assessment of the risks involved in dependent relationships

Establishing the 'cultural fit'

Experience shows that organisations are more likely to form successful partnerships if the cultural and ethical norms governing their respective business behaviours are both similar and clearly understood by all involved. The procedures governing the selection of a business partner (for example an employer selecting a contractor or a main contractor selecting subcontractors) must therefore be structured so as to pay close attention to ensuring that the organisations involved share, as closely as possible, the same ethical and cultural values and beliefs.

In the past, in construction, this issue has, in many cases, been clouded by emphasis on a simple supplier/customer relationship between the various members of the supply chain. Here suppliers are told explicitly what is required, and their sole responsibility is limited to supplying what is asked for. The relationship is analogous to the purchase of consumer goods, and the motivation of those involved in the transaction is largely to maximise their own advantage, thus leading all too often to a commercial culture based upon opportunism and greed, claims and litigation.

Best practice in the modern world, however, recognises that construction is largely a bespoke industry, where much (perhaps most) of the added value contributed by the various different members of the supply chain arises from a joint understanding of, and approach to, the problems to be solved. Here the aim is to maximise the synergy arising from the combination of talents and experience of all members of the supply chain, such that the whole becomes greater than the sum of the parts. The relationship is therefore much more that of partnership in the joint achievement of maximum value for money for all concerned, rather than simply the provision of some predetermined service or component. The importance of shared values and a joint approach to problem solving is therefore self-evident; in order to achieve the shared values and joint approach we need some understanding of the determinants of 'culture' itself.

What is culture?

Culture has been defined as a learned, shared, compelling, interrelated set of symbols whose meanings provide a set of orientations for members of a society. These orientations, taken together, provide solutions to problems that all societies must solve if they are to remain viable. The 'culture' of an organisation therefore defines the rules by which that organisation exists and develops. Culture, by its very nature, is dynamic (that is, it is constantly evolving, constantly growing) but the underlying cultural values of an organisation generally remain relatively stable, at least in the short and medium term, and are the benchmark against which the operation of the organisation itself is judged.

All companies operate within a hierarchy of cultural value systems, including the national culture, the prevailing business culture and the company's own corporate culture. Business culture is generally considered to be a subset of the overall national culture and comprises the rules by which business as a whole is conventionally conducted. The prevailing business culture therefore provides an overall definition of ethical boundaries (for example the limits of competitive behaviour) and defines acceptable local priorities, hierarchies and codes of conduct in business dealings.

Corporate culture, or the culture of the individual organisation, establishes 'the way things are done' within the organisation and therefore reflects both the underlying norms of the host society and the business environment in which the organisation normally operates. Corporate cultures therefore tend to reflect the cultural preferences of those in positions of power and formal and informal codes of conduct, formal and informal hierarchies and power structures, role modelling, and special language and jargon. An understanding of the cultural 'baggage' of the environment in which an organisation operates (or wishes to operate) is therefore a vitally important ingredient for successful relationship management.

Note, however, that, in all except the smallest organisations, corporate cultures are rarely monolithic and many subcultures may co-exist under the main corporate umbrella. Remember also that personal attitudes and patterns of behaviour are often largely formed from past experience and may, in some circumstances, be significantly affected by personal hidden agendas. The cultural attitudes and behaviours expressed by individuals may not therefore always completely match the cultural norms promoted explicitly by the corporate image.

Understanding culture

In the light of the above comments, it follows that the culture of an organisation is not always easy to understand. At one level it is shaped and influenced by the environment in which the organisation typically operates. It is therefore intimately influenced not only by societal norms in terms of the predominant language, education system, social hierarchy and religion, but also by past corporate experience and the normal business practices predominant in the organisation's usual marketplace. At another level, however, corporate culture may be seen as the sum of the component parts of the organisation – that is, the aggregate of the various subcultural group beliefs and personal attitudes and behaviours of those with influence within the organisation. The resultant blend is also likely to be heavily dependent upon the way the organisation is structured and managed.

Cultures may therefore not always be explicit, and in addition to the 'public face' promoted by corporate management may include unspoken 'hidden agendas' which, whilst they may not be expressly articulated, may be even more powerful drivers of business behaviour than the explicit factors.

Hofstede (1980) is perhaps the best known management theorist to propose a cultural measurement system. He proposed four measures of culture within the context of project management, and theorised that all cultures could be categorised according to how far each of the measures was evident:

(1) Power distance indicates the importance of hierarchical control. A greater power distance means that hierarchical structures are more important, whereas a smaller power distance equates to a more participative management style.
(2) Individualism–collectivism indicates the extent to which people are concerned with their own goals or with the goals of the group.
(3) Uncertainty avoidance indicates the extent to which the society tolerates ambiguity. Cultures with a high uncertainty avoidance score try to limit conflict and avoid confrontation. Those with a low score encourage conflict and risk taking.
(4) Masculinity–femininity indicates the organisation's orientation towards rational achievement or emotional affiliation.

For Asian cultures, Hofstede subsequently added a further dimension of 'Confucian dynamism', which emphasises the importance of persistence, status, thrift and a sense of shame. He has more recently added the concept of 'short-termism/long-termism' to indicate the cultural propensity to taking either the short-term or the long-term view.

Achieving cultural fit

The problems of achieving 'cultural fit' between two or more organisations are therefore considerable, and are in large part similar to those involved in personnel selection. Whilst many believe that it is possible for cultural convergence to be engineered, generally through a process analogous to mediation, the process will plainly be more difficult and take longer the further apart the organisations are to begin with. Where time is at a premium there is therefore a pressing argument for choosing to collaborate with organisations that already have a close cultural correspondence.

Preliminary assessment of commercial supply chain partners may therefore comprise an initial assessment of price, coupled with non-price factors such as technical and managerial competence, financial standing, etc. Following this initial trawl a number of potential partners will emerge, and the final assessment must then be substantially based upon some form of cultural assessment. This final assessment will often comprise both a review of the corporate culture and an assessment of the actual members of staff (particularly managers) that it is proposed to assign to the project. In this respect it should be noted that on some large collaboratively procured schemes (for example the Australian National Museum project in Canberra) human resources professionals have been employed as an integral part of the assessment team.

Mutual objectives

The development of a set of measurable mutual objectives, which all parties are prepared to commit themselves to achieving, is a central part of a truly collaborative procurement approach. Successful development of a satisfactory set of mutual

objectives will firstly require each of the organisations involved to critically review and articulate their own objectives in a way that can be understood by all of the other organisations involved. The process will then require the various partners to jointly review all of the proposed objectives, seeking areas in which modification or compromise of their own objectives can lead to improved mutual benefits. This process also enables all concerned to begin to identify and understand the risks to which they will be jointly and individually exposed, and to develop agreed mutually dependent strategies to manage them.

The process of developing the mutual objectives is conventionally carried out in a workshop environment, using a process of facilitated discussion and negotiation. It is plain that this process requires that each of the partners is open and honest about what they want to achieve and that there is no room for hidden agendas or the seeking of opportunistic advantage.

In the case of a construction project it is likely that the employer's declared objectives will initially centre around the achievement of acceptable performance criteria in terms of time, cost and quality, but experience shows that this may not always represent the whole picture. One case in point concerned a local authority project to redevelop and extend an adult retraining centre in a town suffering from high unemployment caused by the collapse of the local coal mining industry. The project was initiated by the local authority technical services department who, in the initial partnering workshop, expressed their project objectives in terms of the conventional time, cost and quality criteria. Contributions from the training centre management, however, showed that one of their primary objectives from the project was to maximise the employment opportunities arising from the construction work for local unemployed workers who had been retrained in construction skills. This issue was not articulated in the tender documents and therefore came as a complete surprise to all of the other stakeholders. An improved briefing and project inception process would help to remove this type of confusion.

From the contractor's point of view, the major objective will usually be to achieve a certain level of profit together with an acceptable limitation of risk. A subsidiary objective in some cases may be for the contractor to develop his or her relationship with the employer, thus leading to future work. A clear understanding by the employer of the commercial realities of the scheme from the contractor's point of view is an essential element in establishing the required mutual trust and commitment. It is therefore important that contractors are open and honest about their commercial objectives and, equally, that the employer agrees that the required profit levels are acceptable.

The agreed set of mutual objectives then forms the basis for the project key performance indicators and a set of business principles derived from these normally forms the basis for the project charter.

Team development

Most construction projects allow little time for formal team-building in advance of the start of construction work. On the contrary, the traditional procurement

route relies heavily upon project participants simply taking up predetermined standardised roles (employer, contractor, architect, quantity surveyor, etc.) as a strategy to enable the construction team to move from team formation to some minimum acceptable level of performance in the shortest possible time. Any innovative ideas that occur as the result of improved team interaction happen largely by accident as the project proceeds; this approach therefore runs totally counter to the fact that the maximum scope for innovative change occurs at the beginning of the project.

We have already seen that the successful use of modern collaborative approaches demands the early development of a team approach, freed as far as possible from the constraints imposed by rigid adherence to traditional roles. The careful choice of supply chain partners, coupled with the use of a workshop approach to partnering, risk and value management as early as possible in the process, helps the project team to move quickly through the well-known cycle of forming, storming, norming and performing. This then permits maximum advantage to be taken of any innovative ideas that arise.

Some of the main characteristics of effective teams have been identified as follows:

- Clear focus of goals.
- Creative operation.
- Strong focus on results.
- Clear definition of roles and responsibilities.
- Well organised and managed.
- Good utilisation of individual skills and talents.
- Mutual support.
- Positive 'can do' attitude.
- Resolution of disagreements without confrontation.
- Open communication.
- Objective decision-making processes.
- Regular evaluation of effectiveness and effective action on the results.

There is a considerable body of theory and practice relating to personal motivation, 0 team development, personal interaction and conflict resolution. The origins of the discipline lie in the work of pioneering management theorists such as Drucker, Argyris, Likert, Hetrzberg, McGregor and others during the 1950s and 1960s, and active research in this area continues to the present day. Central to the whole debate, however, is recognition of the fact that simply bringing highly skilled, competent and motivated people together, even when they belong to the same organisation and may have agreed to the same goals, does not necessarily make them behave as a team. Teamwork depends upon a recognition of mutual dependence arising out of an acceptance of one's personal and technical shortcomings and a recognition that the skills and knowledge possessed by other team members supplement one's own. Tacit recognition of these issues by all team members will then allow the team to move forward and will help to ensure that the performance of the team exceeds the sum of the parts.

There are many issues to be resolved here, perhaps the most important of which is the management and resolution of interpersonal conflict. There are many ways in which this can be handled, but it is certain that conflict avoidance (simply sweeping the problem under the carpet) is not the best approach. Experience seems to show that compromise can be useful in some cases, but the best approach appears to be to create a team atmosphere where members feel confident that they can raise issues in an environment where their concerns will be taken seriously, confronted and addressed in a positive way by the other team members. Meredith and Mantel (1995), for example, quoting from a study by Hill and White (1979), report how a construction project manager handled a difficult conflict:

> The project manager did not flinch in the face of negative interpersonal feelings when listening to differences between people. 'You have to learn to listen, keep your mouth shut, and let the guy get it off his chest.' In short the manager:
>
> - Encouraged openness and emotional expression.
> - Set a role model for reacting to personality clashes. It was observed that a peer would often intercede and act out a third-party conciliation role much like the manager.
> - The manager seemed to exhibit the attitude that conflict could be harnessed for productive ends.
> - Although the manager usually confronted conflicts, he also avoided face to face meetings when outside pressure was too high.

Some organisations have developed specific team-building exercises designed to encourage teams to work together to meet some shared intellectual or practical challenge. Many of these programmes are based out of doors and they often rely in whole or in part upon some shared fear or perception of danger. Typical activities would include night-time orienteering or navigation tasks, rock climbing, abseiling and potholing, in which, although the activity is carried out under the supervision of an appropriately qualified expert, there is still a sufficient personal challenge to encourage both individuals and the team as a whole to work together to accomplish the task in the face of various obstacles. There is significant evidence that activities such as these not only develop team unity but also may engender greatly enhanced levels of personal satisfaction among team members.

Considerable interest has also been expressed in the management of teams, and here we can, I believe, learn much from other disciplines that rely for their success on team rather than individual performance. Perhaps some of the best examples lie in the sports and leisure industry, particularly perhaps in the UK in sports such as professional football or Formula 1 motor sport. Whilst it is of course accepted that high performing teams need 'star' players, the difference between the best and worst teams seems to be largely due to the quality of the team's management, and we may be able to enhance construction performance by observing and learning from the acknowledged high performers in these fields.

The nature of trust

The concept of trust between the parties involved is usually considered to be a fundamental prerequisite for successful partnering, but relatively few commentators have attempted to analyse the nature of trust, or how it can be developed.

Trust between two parties may be viewed in two basic ways. Optimists tend to believe from the beginning that their partner is trustworthy and work on that basis until they are proven wrong. Pessimists on the other hand take the view that trust needs to be earned, and they will therefore behave with considerable caution until they are sure their partner can be trusted. Plainly, in an environment such as a construction project where time is usually critical, a trusting relationship both between the parties and, perhaps more importantly, at a personal level between the members of the project team needs to be forged as quickly as possible if the consequent benefits are to be maximised. In essence, what is required is confidence between the partners and the team members that they can rely on each other. Here again, establishing cultural fit between the partners and between the individual members of the team is of paramount importance and will be substantially reinforced by the team-building activity discussed above.

Although trust as a concept is quite hard to define, the following characteristics of a trusting relationship within the context of a construction project have been identified:

- Full and open communication.
- A consistent view from all personnel.
- Long-term commitment.
- Full cost transparency.
- Price not being the overriding factor.
- Honesty and openness.
- Early input into the project design.
- Mutual advantage.
- Words backed up by actions.
- Receptiveness to ideas from partners.
- Good attitude and loyalty.
- Honouring price commitments.
- Providing help to other team members with no strings attached.

Many of these characteristics are, as would be expected, similar to those displayed by effective teams.

There is also clear evidence to show that trust is enhanced through the use of appropriate contractual mechanisms. Where contracts encourage the partners to view each other in a confrontational supplier/customer way through the use of strict contractual procedures and strongly defined roles and hierarchies (sometimes termed arm's-length contractual approaches as, for example, in the JCT Standard Building Contract) there is a natural tendency for the parties to rely on

the contract to resolve their problems. On the other hand, where contracts are written in a much less formal way and where much greater importance is placed upon mutual obligations and a shared approach to problem solving (an approach sometimes termed obligational or relational contracting) there is much less pressure for the partners to resort to acting in a confrontational way.

This distinction between short-term (i.e. supplier/customer) transactional contracts and longer-term relational contracts is one that has occupied the minds of legal theorists for over a quarter of a century. Basically the discussion centres upon the extent to which project risks can be foreseen and quantified, sometimes called the degree of 'presensiation'. In the case of simple supplier/customer transactional contracts, such as the purchase of a bus ticket or a can of food, the transaction is completed within a short period of time and the risks are very transparent. Such contracts can therefore be very prescriptive and have a high chance of being able to provide a contractual remedy for virtually any event that is likely to occur. In construction, such remedies frequently involve the development of complex and prescriptive sets of rules such as, for example, those included in the UK JCT Standard Building Contract for the valuation of variations.

In the case of longer-term relational contracts, however, future events that might occur during the currency of the contract are much more difficult to foresee with any degree of clarity. There is therefore an argument for structuring contracts, and contractual terms and conditions, that facilitate the parties finding mutually acceptable, and possibly even extra-contractual, solutions to problems through discussion and negotiation. Such discussion may of course in some cases involve the services of a third party (a dispute resolution advisor, mediator, facilitator, conciliator, adjudicator, etc.) rather than the simple application of a prescribed set of rules. Some indication of the modern development of such systems is seen clearly in the development of adjudication as a mandatory form of alternative dispute resolution (ADR) in many British construction contracts and in the role of the partnering facilitator in the Standard Form of Contract for Project Partnering (Trowers and Hamlins 2000).

It is important, however, not to lose sight of the fact that the development of mutually trustworthy relationships may be heavily influenced by the relative power of the organisations involved. Significant power factors would include:

- Differential commercial strength, sometimes called 'leverage' (for example where one organisation is much larger and financially more powerful than the other or, on the other hand, where one organisation has a monopoly of supply over something that is indispensable to the other).
- The degree of mutual dependence (that is the extent to which mutual success is critical to both of the organisations involved).

It is also important to recognise that a mutually supportive relationship will only continue to thrive whilst both parties continue to gain some advantage from it.

Maintenance of the relationship

Once established, collaborative relationships need to be reinforced on a regular basis if the benefits are to continue to accrue. Maintenance of the relationship will involve consideration of a number of distinct factors, for example:

- The preservation of personal and organisational ties.
- Periodic re-evaluation of the mutual benefits to be gained from team membership.
- The need for an 'induction mechanism' to ensure that incoming new team members accept the goals, culture and behaviour patterns established by the team and are appropriately incorporated into the team structure.
- The need to ensure continuous improvement and to prevent the relationship from becoming too 'cosy'.

It is held by many commentators that the preservation of personal and organisational ties depends largely upon positive social interaction between team members (i.e. people are more likely to work more harmoniously and to perform better if they are working with people they like rather than those they do not). In this context, team maintenance begins to reach outside the work environment and will often include social events in addition to directly work-related activity. On the other hand there is the need to guard against the team becoming simply a social organisation and to ensure that team members remain focused upon the need for continuous practical improvement in team performance. Again there are many similarities here between commercial teams and other more overtly competitive organisations such as sports teams.

There is also the need for each of the partners in the collaborative relationship to periodically and objectively review both the cost of their contribution to the overall team goals, and the benefits accruing to them from team membership. This process should also include a periodic reassessment of the risks arising from continued membership. A good example here would be the risks faced by a relatively small company from becoming too dependent upon one much larger partner. Here the risks faced by the small company might be much greater than those faced by the larger one, particularly where there are alternative suppliers in the market for the products or services provided by the smaller organisation.

Long-term collaborative relationships must also recognise that their membership will change during the currency of the project and that these transitional events need to be carefully planned. There are a number of documented examples in areas such as vehicle manufacture where long-term relationships which have been forged between organisations have been driven by a few key individuals and, when one of these key individuals is removed (for example by promotion or transfer to another project), the relationship collapses. There is therefore the need to plan for these transitional events if the organisational relationship is to continue to function effectively. In essence what is required is an induction mechanism to ensure that both incoming and replacement team members are in tune with the goals and ideals of the team and their initial

interaction with other team members is carefully managed until they are fully absorbed into the team structure and totally comfortable with the team ethos. Many of the problems faced by new team members (mutual goals and objectives, shared culture and trust) are analogous to those facing the initial team members upon the original formation of their partnership. They are, however, made more difficult because the team has already settled into an operational state. New members will therefore have less of an opportunity (and will consequently find it more difficult) to influence the pre-existing team goals to match their own personal aspirations. There are obvious parallels here with the human resources processes commonly used for staff induction; the use of human resources techniques may be very useful.

The project supply chain

Historically, in construction projects let using either traditional or design and build arrangements, the project supply chain has been generally considered to comprise basically the main contractor and those organisations upon which he or she relies in order to complete the works (subcontractors of various kinds, materials suppliers, etc.). The supply chain was balanced in most cases by a 'demand chain' comprising all of those elements upstream of the main contractor and including bodies such as the end users, project funders and various other parts of the client organisation who would benefit from the proposed project. The main dividing point between the demand chain and the supply chain was therefore perceived to be the main construction contract, thus mirroring the traditional supplier/customer arrangement. Management of the supply chain thus rested virtually completely with the contractor and management of the demand chain rested with the employer.

Collaborative procurement techniques have, however, tended to change this position. Under a collaborative arrangement the relationship between employer and contractor changes from a supplier/customer arrangement to more of a partnership of equals. Under these arrangements the demand and supply chains have tended to become concatenated into a single supply chain dedicated to satisfying the needs of the eventual consumer (the end user), and the rationale for treating the construction contract as some sort of natural division between demand and supply chains therefore becomes much less clear. Under collaborative arrangements, the whole of the project team (including substantial elements of what used to be considered as the contractor's supply chain) is expected to contribute to project success through the use of innovation and continuous improvement and, in return, to participate in sharing any consequent rewards. This is a very substantive issue for the many main contractors who act primarily as management organisations subletting most if not all of the construction work.

There is also the issue that conventionally the project's temporary organisation has consisted of representatives of the relevant participant organisations and has tended to exist outside the constituent firms. It has therefore developed a large degree of autonomy. Whilst this is in many ways a good thing, it may mean that

none of the specialist organisations involved in the supply chain actually assumes ownership of the scheme and the project team is thus in some respects left to fend for itself.

This model does not fit well with modern collaborative procurement methodologies, where ownership of the scheme by all participating organisations is often seen as a prerequisite to mutual project success. This is not to say, of course, that the project management team should not enjoy a significant degree of autonomy, merely that for the project to be successful all parties must be prepared to provide wholehearted support.

The challenge then is to ensure true ownership of the project by all of the parties in the extended supply chain (thus ensuring a high degree of 'buy in' to the project goals) whilst still allowing the project management team sufficient freedom to manage the way in which they think best in order to ensure project success.

Initial partnering exercises tended to be very unfair to subcontractors and suppliers in that although they brought forward many innovations, the traditional supply chain management processes of many main contractors effectively prevented any sharing of the consequent rewards. This issue was of great concern to employers, many of whom realised that the majority of innovation was in fact being driven not by the main contractors themselves but by their supply chain. Employers therefore began to take an active interest in the way main contractors managed their supply chains in an attempt to ensure that the contractual and business arrangements and culture set out in the main contract were cascaded down the supply chain. This then poses many problems as to: (1) how the contractor's supply chain should be managed to maximise value for money and incentivise innovation; and (2) how the merged demand and supply chain should be managed in order to maximise project performance.

These problems tend to become more significant as projects and their supply chains become larger and more complex, and much more work is required to build the necessary theoretical models to support practical improvements in project success.

A crude analysis would seem to indicate four generic alternative approaches:

- The *holistic* approach: Management of the extended supply chain by a specialist independent project manager.
- The *bicameral* approach: Separate management of the demand chain by a project sponsor or project director and of the supply chain by a construction project manager, with the project sponsor or director and construction project manager working closely together with joint overall responsibility for project delivery but each having virtual autonomy over their own areas of responsibility.
- The *unilateral* approach: Management of the extended supply chain, including the employer, primarily by the main contractor.
- The *collaborative* approach: Management of the supply chain as a partnership of equals.

The holistic approach

Where project managers have been employed, overall management of the project has historically been considered to be the project manager's responsibility. This obligation was made clearly evident in the GC/Works/5 Framework Agreement for the Appointment of Consultants, where the duties of the project manager provided that the project manager was required to 'carry out the services and obligations necessary to achieve the satisfactory completion of the project at or below the approved cost limit'.

In the past, detailed management of the contractor's supply chain was left to the main contractor but increasingly the employer's desire to influence this process has led to the project manager becoming involved. This process has apparently been used with some success by experienced clients working in long-term strategic relationships with contractors and specialist subcontractors, but it is unlikely that satisfactory results will be obtained from a one-off arrangement.

The bicameral approach

It has already been pointed out that merging of the demand and supply chains to include 'upstream' stakeholders such as the client, funder and end user has led to problems, and these become especially problematic in the case of complex projects with complex multiheaded clients.

In these cases, some organisations have opted to divide the conventional project management role into two by separating the functions of demand chain and supply chain management. The demand side of the project is typically managed by a 'project sponsor' or 'project director' and the supply side is managed by a conventional construction project manager. The project director is often drawn from within the employer's organisation, and generally takes responsibility for the major strategic decisions, whilst the management of the supply side is controlled by the construction project manager.

This model has been adopted with varying degrees of success by several UK public sector organisations. The major problem of course is that overall project management is only as good as the relationship between the project sponsor and the project manager, and great care and considerable effort therefore needs to be taken to ensure that this relationship works effectively.

The unilateral approach

In this approach the contractor takes the lead. A good example is the development of some framework contracts where the role of the chosen contractor is required to integrate all the activities of a pre-assembled supply chain across a programme of projects. The process is claimed to replace short-term contractually driven adversarial relationships with long-term strategic alliances based on trust and co-operation. Central to the arrangement is the construction of the pre-assembled supply chain based upon clusters of specialists (e.g. mechanical and electrical

services, groundworks, frame and envelope or internal finishes) working together to provide specific elements under a cluster leader. The job of each cluster is then to design and deliver an integrated part or element of the building. The responsibility of the prime contractor is therefore to bring together the entire supply chain, from clusters to the end user, to design for best value.

Another area where this approach has considerable potential is in the repair and refurbishment of social housing. In this latter category the prime constituents generally comprise activities such as refurbishment of kitchens and bathrooms, rewiring, upgrading of gas and plumbing installations, wall and ceiling insulation, repair and refurbishment of precast reinforced concrete dwellings and re-roofing.

The amount of work available in this sector is significant, and a number of main contractors and specialist subcontractors are seeking to specialise in this type of work. This situation is leading to specialist main contractors being able to offer prospective employers a package consisting of specialist social housing expertise which is sensitive to and experienced in the wider issues associated with working in this sector, coupled with a ready-made tried and tested supply chain which is prepared to guarantee delivery on time and on budget. The next logical step in this process is seen by some as contractors developing a process to induct employers into their pre-assembled supply chain and thus to integrate the demand chain into their existing processes.

The collaborative approach

The collaborative approach relies upon all of the key participants acting together within a framework of a partnership of equals. Such an approach is incorporated into the PPC 2000 Standard Form of Contract for Project Partnering (Trowers and Hamlins 2000). Under this form, all of the key participants of the projects are parties to the contract and the idea of a contractual hierarchy based around subcontractors to a main contractor is therefore avoided.Under this contract all of the major participants, including the employer, owe mutual obligations to each other to 'work in mutual cooperation to fulfil their agreed roles and responsibilities and apply their agreed expertise in relation to the project'. The parties elect members to a core group, which cumulatively has the objective of delivering the project to meet the agreed objectives.

Conclusion

This chapter has reviewed the factors underlying the development of collaborative methods of construction procurement, together with a range of contextual issues. It must be remembered that the successful application of partnering (and other collaborative techniques) is much more than simply and mechanically applying the tools. Partnering requires a substantial cultural shift, such that the parties to the contract work together as partners rather than as opponents each working for their own individual goals. The development of trust and good

working relationships is, above all, the major critical success factor in achieving a successful partnering relationship.

Traditional approaches to construction work have historically been based upon a competitive tender process largely based on lowest price. The relationship between the parties has thus been grounded generally upon commercial considerations, with increasingly more complex forms of contract providing a framework for a culture of claims and blame allocation.

This approach has now been widely discredited and there is an increasing realisation that successful projects are those where all of the supply chain members work together for the good of all concerned. This philosophy is reflected in modern collaborative approaches to construction procurement; increasing attention is now being paid to the nature of the relationships that tie supply chain members together. These concerns are reflected in other industries such as retailing and motor manufacture; however, the techniques of relationship management pioneering in these industries need to be modified to fit the unique nature of the modern international construction industry.

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13 Privately financed public sector projects

Introduction

The concept of governments using private finance to procure public sector infrastructure has a long history and many alternative forms have been used, from outright privatisation (usually with varying degrees of regulation and control) through a wide range of collaborative models. The purpose of this chapter is to explore the various models used and to review how successful they have been both as investment vehicles and as methods of providing public services which governments have been unable to fund from capital resources.

Historical development

Privately financed models for infrastructure and other public sector works have their roots in Europe, in the beginnings of a demand for mass travel and long-distance commerce in the second half of the seventeenth century. Smith (1999) provides an extensive analysis of the early development of the role of government in partnerships between the public and private sectors.

In the UK, the movement began in the 1660s with the creation of the first turnpike trusts for the development of roads; it flourished in the form of canals and railways, nurtured by the explosion of British manufacturing industry which followed the industrial revolution, with private investment in transport infrastructure reaching peaks in the 1790s, the 1840s and the 1860s, each of which was followed by a dramatic financial collapse which ruined many investors both large and small. This development pattern of turnpike roads, followed by canals and waterways and later by railroads, was subsequently repeated in the USA between about the end of the eighteenth and the end of the nineteenth centuries.

In continental Europe the involvement of the private sector was facilitated through the use of concessions: entrepreneurs were effectively given a licence to provide public services for a specified period of time and to charge a fee. McCarthy and Perry (1989) report the granting of the first water supply concession, to provide

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a distribution system to parts of Paris, to the Perier (sic) brothers in 1782, although this was subsequently revoked following the French revolution. They also report that the use of concessions for water supply spread rapidly in France, Spain, Italy, Belgium and Germany from about 1850 onwards, although their use became less frequent as the primary infrastructure was completed.

Perhaps one of the best known early examples of international private sector involvement in major infrastructure work using the concession approach, and also a good early example of a public/private partnership, is the 90-mile long Suez Canal, completed in 1869 with a 99-year concession period. The concession was initially granted to a semi-retired French diplomat, Ferdinand de Lesseps, in 1854 by Said Pasha, Turkish Viceroy of Egypt. De Lesseps formed a company to carry out the development, but was apparently unable to raise all of the estimated £8 million construction cost from the private sector, largely due to strong British opposition led by the Prime Minister Lord Palmerston, who declared that the enterprise was not only impractical but also commercially unsound and would never make a profit. A substantial proportion of the finance was eventually provided by Said Pasha, who also provided much of the necessary labour under a *corvée* system. The concession was eventually terminated when the canal was nationalised by the Egyptian government in 1956.

This early project also illustrates many of the issues that have been identified as critical factors for success in more modern projects:

- It shows the need for a politically skilled champion prepared to fight for the project against strong opposition.
- It displays the extended gestation period typical of many present-day large infrastructure projects.
- The events leading up to the repudiation of the concession agreement, the serious effects of the action on international trade and political stability and the frantic attempts to find a diplomatic solution to the crisis provide a vivid illustration of the vulnerability of large-scale long-term international privately financed infrastructure projects to shifts in the political landscape.

By the time the Suez Canal was opened the use of private sector capital for infrastructural development in Britain, mainly by that time in railways, had begun to gradually decline. This decline intensified during the closing years of the nineteenth century, when a wide range of factors including over-competition, public concern about fares, charges and levels of service, increasing regulation and governmental control over what had come to be seen as an essential public services, and the growing bargaining power of an increasingly well organised labour force meant that the returns paid to shareholders by the operating companies were no longer competitive with returns from alternative forms of investment. This in turn led directly to a shortage of the necessary investment funds and thus to an inability to maintain and renew the facilities as they began to reach the end of their physical life. Significant private sector involvement in British transport infrastructure was effectively brought to an end as Europe lurched towards the First World War.

Early schemes were not, however, in the UK at least, an outstanding financial success. Fay (1947) reported that none of the early turnpike trusts ever achieved their target of paying off all of their debt within the initial 21-year term. Some early canal schemes did, however, prove extremely profitable; Deane (1984) for example reports that the Oxford canal paid annual dividends of 30% for more than 30 years and that shares in the Birmingham canal, which cost £140 each when the canal was constructed in the 1780s, were selling for £2840 each by 1825. They were therefore, in general, very popular with investors, although there were occasional difficulties with funding. Pannell (1977) for example reports that construction of the Forth–Clyde canal in Scotland in the latter half of the eighteenth century was halted owing to difficulties in raising the necessary funds and construction was only able to continue after the Government agreed to a £50 000 loan, approximately one third of the total cost of the works.

Deane credits the canals with producing 'a new class of investor, the canal shareholder, a non-participant investor who was readily transformed into a railway shareholder'. Some authors claim that the need to protect the interests of these new private investors gave rise to a further expansion of the Government's role as regulator. Burton (1972) explains:

> Canals required very large capital sums indeed.... Allowing promoters to encourage the public to invest in such projects with the promise of large profits was an obvious solution. ... Although canals were largely built by joint-stock companies, before anything could be done a scheme had to be approved by Act of Parliament. The company and its plans were subject to parliamentary scrutiny. It was not a fool-proof system, but it did offer the investors some guarantee that a disinterested third party had given the plans consideration and approved them as practical.

Despite Burton's assertions, however, such approvals often did not offer much protection. Burton himself goes on to admit that:

> In fact companies regularly underestimated the construction costs by an alarming amount, and overestimated the profits similarly. [Nonetheless] the canals were built, and the best of them provided handsome dividends.

The point is confirmed by Pannell (1977) who, whilst discussing the construction of the Forth–Clyde canal in the 1760s, reports the final cost of the works as £150 000, which, he comments, was extremely close to John Smeaton's original estimate of £147 337, 'a very unusual circumstance when most engineers' estimates were, to say the least of it on the optimistic side'.

By the beginning of the 1790s, canal construction was in full swing and shares were booming, but in 1792–93 the economic 'boom–bust' cycle generated a general financial collapse in which 'as usual, the loudest wails were raised on behalf of the poor city clerk, the widow and the orphan' (Fay 1947).

Notwithstanding the financial woes of the 1790s, by the mid-nineteenth century and following on from the tremendous success of the world's first inter-city railway between Liverpool and Manchester which opened in 1830, the railway boom was

in full flood. Spurred on by the average annual dividends of 9.5% paid by the Liverpool and Manchester company, much higher than the returns paid by alternative forms of investment available at equivalent risk, investors queued to pour their money into the new railway mania. Many companies followed the practice previously established by the canal promoters of issuing part-paid shares, whereby investors could obtain shares with a nominal value of, say, £100 often for as little as £5, with the remainder only being called for as and when required during construction. It was therefore possible, for a very small sum, for a person to be issued with shares of an apparently much higher value. These factors acted as a considerable incentive to those willing to speculate that the value of the shares would rise before future payments were called for, thus allowing them to trade the part-paid shares at a substantial profit.

Numerous companies were floated between 1830 and 1840, many of them deliberately fraudulent and most offering impossibly optimistic projected returns, and disaster was ultimately inevitable. Williams (1883) described how easy it was to part the general public from its money and the 'dirty tricks' that some promoters engaged in:

> The capital required was small. A few knaves engaged an office, bought a map, struck out a railway in what appeared to be a suitable direction, gave it a plausible title, and with a sheet of foolscap and a 'Court Guide' made a prospectus, on which they placed the names of a few noble lords, Right Honourables, ex-M.P.s, and merchants, to which an engineer, banker, and lawyer were added, and the whole was 'served up', with imaginary advantages, and with the assurance of at least a ten per cent dividend. The excitement of the times prevented much chance of the detection of the fraud, and the inexperienced who also wished to speculate were taken in.... The names of gentlemen wholly unconnected with railways, and who would have utterly repudiated association with men who advocated them were unhesitatingly employed for the purpose of lending a supposititious countenance to bubble companies. One line was declared to enjoy the patronage of four gentlemen who had been dead for several months; and ten others had no knowledge of the existence of the scheme till they saw it paraded before the public avowedly under their own sanction. In another case, the three leading projectors of a very costly railway were notoriously 'living by their wits', and could not have raised a hundred pounds among them except by fraud.

The total amount of money actually invested in these schemes was staggering. Deane (1984) reports that, at the height of the construction boom in 1847, total railway expenditure 'was then running at a level which was more than the declared value of British exports and roughly a tenth of the total national income'. The result was predictable. Financial collapses in the 1840s and 1860s ruined both rich and poor.

As with the canal schemes of the previous century, a common problem was the tendency to dramatically underestimate the costs involved. Pollins (1971), for example, reports that, in 1836, the promoters of the London and Birmingham Railway announced that in order to complete construction work they would need to double

their capital base from the planned £2.25 million to £4.5 million. There are uncanny precursors here of twentieth century schemes such as the Channel Tunnel.

Modern models for privatisation

Many different arrangements have been developed for private sector participation, from outright and complete privatisation, through various degrees of partnership and shared control, and some of the best known are considered below.

Outright privatisation

Outright privatisation, whilst originally the major model for private sector participation in infrastructure provision, is now much less common. Perhaps the most well-known modern examples are seen in the areas of water and gas supply, power generation and telecommunications, and the industries are, in theory at least, usually subject to substantial degrees of government regulation and control. Nonetheless, from a financial standpoint, outright privatisation, with its total lack of reliance on any public sector investment, is plainly the most desirable option for governments embracing a high degree of free market economics. The problem of course comes in ensuring that the service to consumers can be protected by an adequate regulatory framework and that strategic public services can be maintained in times of emergency without the risk of governments being subject to any form of pressure applied by the service providers. In recent years the effectiveness of such controls, particularly over the prices which may be charged to end users, has been perceived by consumers to be inadequate and the difficulty of enforcing controls in countries such as the UK has increased as a consequence of the internationalisation and, to some extent, the politicisation of the companies involved.

It was generally believed that outright privatisation would perhaps be most successful in industries like telecommunications, where the service could be provided at a comparatively low unit cost to a large number of consumers, and where the market could, in theory, be easily opened up to a large number of potential competitors (that is, where a natural monopoly was considered unlikely to arise). The telecommunications industry is however typically characterised by rapid technological change and very high research and development costs, and a regulated and competitive private sector is therefore often seen as the most efficient way to promote improved consumer services. The only investment required by government is the establishment of industrial regulatory and consumer protection systems, and this may easily be recovered from the private sector operators through some form of licensing system. The need for the European Union to legislate to regulate cross-border mobile phone charges could arguably be seen to be an indicator of market failure.

The commercial nature of the outright privatisation model may, however, limit government's freedom to influence both the way in which the industry itself develops and the extent to which any specific government can ensure that services are made available to those sections of society where, although there is a social need, the

economic demand for the service is insufficient to ensure that it can be supplied at an economic price. A typical example commonly concerns the provision of services such as electricity supply to outlying or remote consumers, for example rural farmers or small isolated communities, where the full cost of providing the normal level of service may be prohibitive. Whilst it is possible for government to undertake a certain amount of 'social engineering' and to provide some support for such consumers through its regulatory frameworks, such moves are likely to be actively resisted by service providers unless government provides some form of subsidy.

Similar issues are evident at the time of writing (mid 2012) in the UK in respect of the government's difficulties in attempting to attract international power generators to compete to provide the next country's next generation nuclear power plants.

Participative privately financed techniques

Models in which the private sector collaborates in some way with government include corporatisation and the use of 'mixed' companies, management contracts, leasing, pre-financing and a variety of concession-based methods using some private sector resources to provide a defined combination of design, construction, financing, operation and subsequent transfer to the host government. Whilst all of these techniques allow government to provide large and costly infrastructure without the budgetary constraints normally imposed by substantial capital expenditure, it has been argued that in overall economic terms the use of private finance in this way is more expensive over time to government, end users and taxpayersthan the use of public capital, essentially because government is in a position to borrow money at more competitive rates of interest than the private sector. This is perfectly true, but this disadvantage has usually been considered to be outweighed by the short-term budgetary advantages. Some of these techniques may, in some countries, pose particular problems regarding law and taxation, and governments may need to give special consideration to this issue on a case-by-case basis.

Corporatisation and the use of semi-private (mixed) companies

Publicly owned corporations

A number of governments have created special-purpose corporations specifically to construct and operate infrastructure facilities. A wide range of options exists, from companies that are totally publicly owned to semi-private (i.e. mixed) companies having both public and private sector shareholders.

One example of a totally publicly owned corporation is provided by the development of the French motorway network during the mid-1950s (Vornetti 1994). A number of free-standing, concession-holding companies were formed but the whole of their equity was held by local authorities and by a public credit institution, the *Caisse des Dépôts et Consignations* (CDC). Although the French government had no direct stake in the companies, it was heavily involved in both the financial and technical aspects. In so far as the technical aspects were concerned the state was responsible for the initial design of the motorway and took the roles of main

contractor for the construction work and maintenance contractor. In terms of finance, loans for the construction work, guaranteed by the state, were issued through the CDC. The total absence of any private sector involvement meant that the concession companies were simply a 'front' for the State; a device that enabled government to circumvent its own budget restrictions.

Other examples of publicly owned corporations that operate more like truly private companies exist elsewhere. In Hong Kong for example the Mass Transit Railway Corporation (MTRC)and the Kowloon–Canton Railway Corporation (KCRC) operated in this way for many years. They did, however, operate very differently from conventional government departments in that:

- They operated their core business as private companies and both were governed by the provisions of the Companies Ordinance.
- They may, within the context of their core business, plan new projects on their own based solely on financial viability.
- They were authorised to raise the necessary development funds from the capital markets.
- Their staff were not civil servants.

Neither operation received a government subsidy and both were generally considered to be very successful commercial entities. The MTRC particularly is one of very few underground railways in the world to run at a profit. MTRC was privatised by the government in 2000 and is listed on the Hang Seng Stock Exchange although the government still holds a controlling interest. It is now therefore effectively a semi-public corporation. MTRC and KCRC were merged into a single company in 2006.

Semi-public corporations

In the case of semi-public corporations the company typically operates outwardly as a commercial concern, with private sector shareholders but raising its own capital funds on the open market. The company is not subject to direct governmental control, although it is common for government to retain a controlling interest, either by retaining a minimum of 51% of the share capital or by holding a so-called 'golden share'.

Cavanagh (1995) reports that the Hungarian government considered the development of a possible joint venture semi-public corporation structure for the development of new motorways. The structure envisaged the use of private sector finance and management forming a joint venture company with government. The company would then let construction contracts on a phased basis through a construction management route and would let operations contracts by competitive tender. Government would limit tolls to provide a minimum rate of return and would reimburse the operator through either a shadow toll or a minimum traffic flow guarantee.

A further example is the Japanese 'third sector' approach introduced in the mid-1980s. The declared objective of this initiative was to bring together both public (the 'first sector') and private (the 'second sector') industry expertise in individual project-based companies (the 'third sector') with a view to:

- 'Tapping the vitality' of private sector management in order to promote large-scale projects with greater efficiency than might be expected from government acting on its own.
- Stimulating additional private sector activity in ways that would benefit regional development.
- Developing synergy between the public and private sectors in helping to solve local problems.

Projects would be financed partly through the private sector and partly through government subsidy, and the project companies would be staffed by secondment from the public and private sector partner organisations. Special legislation was enacted and a large number of such companies were established during the late 1980s and early 1990s. Examples of typical projects that were planned to be procured in this way included a large number of resort developments, the 15 km Trans-Tokyo Bay Highway between Kawasaki and Chiba prefectures, and the 58 km Joban Railway line linking Tokyo's Central Business District with the Tsukuba Science Park in the Ibaragi prefecture.

The approach does not appear to have been very successful and a number of the proposed project companies had difficulty in attracting sufficient private sector partners. In addition, when the Japanese economy collapsed in the mid-1990s, many companies were left in chaos, with projects that were no longer financially viable and bitter complaints from the private sector partners about their bureaucratic public sector colleagues.

Management contracts

Existing services and utilities are commonly privatised through the medium of management contracts, where the private sector takes over responsibility for the operation and maintenance of some existing facility which has previously been operated by the public sector. This form of arrangement may be especially useful when the public sector has a facility that is in need of some upgrading or renovation but does not have the necessary funds available to carry out the work. An alternative to a conventional management contract is a fixed term concession based upon a lease–renovate–operate–transfer (LROT) contract, as described in the section on concession-based methods.

The leasing or build–lease–transfer (BLT) model

In this model the facility (for example a motorway) is typically designed, financed and constructed by the private sector and is then leased back to government for some predetermined period of time at a pre-agreed rental. Rental costs are commonly based upon the costs of construction and finance and, according to Trosa and Schreiner (1994), will usually represent about 9% or 10% of the investment costs. During the period of the lease, legal ownership of the facility rests with the private sector partner; at the end of the leasing period government typically has the option to renew the lease, to buy out the private sector partner for a lump sum or

simply to walk away from the deal, leaving the facility in private sector hands. Operation and maintenance of the utility during the lease period will typically be the government's responsibility and, in the case of a motorway for example, government may choose to operate the utility effectively free of charge to the user (usually recouping the costs from general taxation or from some form of specific vehicle road tax) or charge a toll. It may also contract out the operation and maintenance, either as part of the original contract or to a separate contractor under an operation and maintenance contract, or retain the responsibility for operations and maintenance itself. Where operation and maintenance forms part of the original deal the project may be described as build–lease–transfer–maintain (BLTM).

This form of procurement thus effectively provides government with a way of financing large-scale infrastructure out of ongoing revenue rather than out of capital expenditure, but the primary disadvantage is that the legal ownership remains with the private sector. It is also common with this type of project for government to contribute to the initial construction, perhaps by assembling and providing the necessary land and external utilities (for example drainage disposal, access roads, etc.), or provide assistance with initial route alignment, obtaining the necessary planning approvals, etc.

With this form of arrangement the private sector partner has the advantage of knowing that the operational risks he or she carries are largely mitigated by the length of the lease and the frequency and amount of the periodic rent review. There remains, of course, the political risk that government might renege on the terms of the lease. The developer, however carries no risk relating to the extent of usage of the facility, this being assumed by government. Risk transfer is therefore seen as minimal.

Trosa and Schreiner (1994) report that this model has been considered for use in Germany in the construction of motorways; Havens (1994) reports that a number of variations of the lease and lease–purchase models have been used for the construction of prisons in the USA; and Hollihan (1994) reports that power stations in Mexico have been procured using this approach.

Prefinancing

The prefinancing model is similar in many respects to the leasing model, but the major difference between them is that with the prefinancing model the private sector will initially finance and construct the project, with government paying off the full cost, including the financing charges, by a series of pre-agreed annual lump sum payments over some agreed period of time (typically around 15 years). With this model it is again usual for government to provide the land free of charge and also to carry out work such as preparing initial route alignments and obtaining the necessary planning permissions. The final detailed design may be prepared by government, with tenders being invited for the financing and construction only, or the final design may be entrusted to the contractor on a design, finance and construct basis.

Tenders for the work will therefore essentially comprise an offer to finance and construct the works to some agreed specification in exchange for a series of lump sum

payments over an agreed time period. As in the case of the leasing model, government may either operate the facility itself or contract out operation and maintenance to the private sector.

With this approach it is common for ownership of the completed facility to pass to government and for the payments to begin immediately upon completion of the construction work; there is therefore considerable incentive for the work to be completed in the shortest possible time. As with the leasing model, this approach has advantages for the developer in that all market risks are born by government and the developer's risk is normally limited to cost and time overruns on the construction contract and fluctuations in the costs of providing the necessary capital.

It was reported (PFI 1995) that the German government had begun a programme of 12 major motorway contracts using this model, totalling some 151 km, at an estimated cost of some DM 3.89 billion.

Mixed models

A development of the leasing and prefinancing models was used for the redevelopment of the A2 motorway between Helmstedt and Berlin in Germany (Trosa and Schreiner 1994). On this project, ownership of the scheme passed to government immediately after construction and the annual payments from government depend upon the traffic flows. Payments are calculated based upon the number of different types of vehicle using the road, with different types of vehicle generating different fees. The road is not operated as a toll road and the government payments are based on traffic counts. The method can therefore be seen as a precursor of the British 'shadow tolling' approach incorporated into the design–build–finance–operate (DBFO) strategy, which is discussed in more detail below.

The risks for the developer and for government are thus significantly changed when using this approach. Since payments are based upon traffic flows, if traffic flows are lighter than predicted then the developer will suffer, but if traffic flows exceed expectations then government will have to pay more. The government payments are therefore much more difficult to anticipate and to plan for.

Concession-based methods

A wide variety of techniques have been developed based upon the concept of a fixed term concession. Where the concession makes provision for ownership of the facility to be vested in the host government, this may occur either upon completion of the construction work or at the end of the concession period, depending upon the terms of the concession agreement. Note, however, that, in some cases, even if legal ownership is transferred upon completion of the construction phase, the operator is frequently required to be *deemed* to be the owner for taxation purposes. Upon completion of the concession period the host government generally takes over responsibility for operation and maintenance of the facility. At this stage the host government may, if it wishes, let a further concession for operation and maintenance, often on a lease–renovate–operate–transfer (LROT) basis.

It is common for the concession period to include the design and construction period. As discussed earlier, concession-based approaches are among the oldest forms of public/private sector partnership. The terminology and acronyms used to describe concession-based projects are not, however, always used consistently, and different projects that apparently use the same terms may vary significantly in the actual contractual arrangements. On the other hand a number of terms are virtually synonymous. The principal variants in common use are described in the following sections.

Build–operate–transfer (BOT)

BOT is often used as a generic term for concession-based agreements where the facility is designed, financed, operated and maintained by the concession company for the period of the concession, typically between ten and 30 years. The United Nations Industrial Development Organisation produced detailed guidelines which discuss all aspects of the BOT family of approaches (UNIDO 1996).

Under the 'standard' BOT route the concessionaire's involvement with the project terminates at the end of the concession period and at this point all operating rights and maintenance responsibilities revert to the host government. Legal ownership of the utility may or may not rest with the concession company. In many projects legal ownership of the constructed facility is required to pass free of charge to the host government immediately upon completion of construction but the concessionaire retains the right to operate the utility for the full concession period effectively as a licensee.

Walker and Smith (1995) contend that the Hong Kong Cross Harbour Tunnel, first mooted in 1958 and eventually opened in 1972, is probably the world's first modern-day BOT project, but there are other possible contenders. Messent (1997) for example writes of the construction of Australia's longest bridge, the Hornibrook Highway across Moreton Bay near Brisbane, built in the 1930s by building contractor Manuel Hornibrook as a way of keeping his company going during the Great Depression. Messent reports that:

> Hornibrook personally took on the extraordinarily difficult task of privately raising the finance for the project during the black years of the Depression. The bridge was opened on the 4th of October 1935 at a toll of a shilling a car. It proved of national importance during the war years carrying military convoys, none of which paid any tolls.

He goes on to report that the toll remained at one shilling per car (A$0.10 after decimalisation) until the bridge was handed over to government debt-free in 1975.

More recently British contractor John Laing entered into a joint venture in the late 1960s with the Spanish company Ferrovial for the construction and operation of a 109 km motorway between Bilbao and San Sebastian in Spain under the provisions of the Spanish government's Toll Motorway Construction Plan. Armstrong (1994) reports that the 35-year concession was awarded in 1968 and the road opened to traffic in 1976. According to Armstrong, support provided by the Spanish government included the following:

- A guarantee of 75% of the funds borrowed in international capital markets.
- Subject to a premium of 0.2% per annum, foreign currency would be supplied for the settlement of principal and interest at the same exchange rate as that prevailing on drawdown in respect of funds borrowed in the international capital markets.
- An interest-free advance was made, equal to the difference in revenue between actual receipts and those for the target traffic density, subject to repayment only when traffic density exceeds the target by 5%. In consideration of this support, net dividends were capped at 10%.

Build–own–operate–transfer (BOOT)

This phrase describes the earliest concession model; the late Turkish Prime Minister, Targut Ozal, is popularly cited as originating the phrase 'build, own, operate and transfer' in the 1980s in connection with proposals for the construction of power plants in Turkey. In this model, ownership of the utility rests with the concessionaire until the end of the concession period, at which point both ownership and operating rights are transferred free of charge to the host government. Host governments often consider legal ownership of the concession by the concessionaire to be undesirable, particularly where the utility is of strategic importance, and the use of this variant is now much less popular.

Build–transfer–operate (BTO) and build–transfer–service–maintain (BTSM)

Technically these terms could be applied to any project where ownership of the facility passes to the host government upon completion of the construction phase. In practice the terms tend to be used for projects where the host government takes possession of, and pays for, the facility once construction is complete, with the developer being responsible for maintenance and operation of the plant for the period of the concession. This approach has been used for projects such as chemical waste treatment and waste recycling plants, where very specific expertise is usually required in the design and operation, but the revenue stream is difficult to predict with any degree of accuracy. Payment for operation of the facility is often a combination of a fixed and predetermined 'availability charge' covering the fixed costs of the facility, supplemented by a further variable charge depending upon the extent of use.

Build–own–operate (BOO)

The limit of the build–own–operate approach is, of course, outright privatisation, but BOO projects are sometimes let on a concession basis for a fixed period of time with no provision for transfer of ownership to the host government. In projects of this type the developer is responsible for design, funding, construction, operation and maintenance of the facility during the concession period, at the end of which several options might apply. Typically the project agreement might provide for one or more of the following options:

- Renegotiation of the original agreement for a further concession period.
- Negotiation of a new agreement on a renovate and operate basis.
- Purchase of the facility by the host government (who may then of course let a separate lease–renovate–operate–transfer concession).
- Termination of the facility, in which case the developer may be responsible for decommissioning, demolition and reinstatement of the site. Here the project may be defined as build–own–operate–remove (BOOR). An example of a project of this type is the A$25 million Yan Yean Water Treatment Plant constructed outside Melbourne by a Transfield–North West Water joint venture, where the plant is required to be removed and the site reinstated at the end of the 25-year concession period (Young and Sidwell 1996).

Lease–renovate–operate–transfer (LROT)

LROT is an approach that may be used where a host government already owns a facility which requires modernisation and improvement or as a 'follow-on' to an concession once it reaches the end of the concession period. In this case the private sector operator pays a rental to government and undertakes to renovate the utility to some pre-agreed standard. In exchange, the private sector operator is granted a concession to operate the facility for a fixed period of time and to charge a fee for the service. The private sector partner is responsible for financing and carrying out any required refurbishment work in addition to regular maintenance during the concession period. This approach has been widely used in some parts of the world, for example for government-owned car parks and vehicular tunnels in Hong Kong and for water and sewage treatment plants in Malaysia.

Design–build–finance–operate (DBFO)

DBFO is a term coined by the UK Highways Agency to describe their concession-based road schemes let under the UK Government's Private Finance Initiative. The basis of the 'standard' DBFO contract was defined by the Highways Agency (1995) to say that the private sector partner (the DBFO concessionaire) will be:

- Responsible for the design, construction operation, maintenance (i.e. capital, routine and winter maintenance) and operation of the project road.
- Responsible for financing the project.
- Granted a long-term right of access (probably 30 years) to the project road by the Secretary of State for those purposes.
- Paid by the department for delivery of the specified service in the form of payments over the life of the contract.

In addition to the free provision of any necessary land, the public sector contribution is likely to include some or all of the following, depending upon the detailed requirements of a particular project:

- A right of access to the project road without charge.
- DBFO payments which are expected to include traffic-related payments, usually based upon 'shadow tolls', lane closure charges and additional payments for initiatives designed to improve safety.

Significant features of DBFO contracts are as follows:

- No rights of ownership are conferred on the developer, neither does the developer at any point acquire any interest in the land. The Secretary of State remains the highway authority throughout the contract period.
- The DBFO contractor is merely given a right of access to the road and a 'licence' to operate it, normally for a period of 30 years.
- Five years before the end of the operation period, a joint inspection will be held to identify any work that the operator is required to carry out before the road is handed back to the Highways Agency.
- Payment is made on the basis of traffic flows at predetermined 'shadow tolls'. The level of the shadow tolls forms an element of the DBFO tender.
- Some protection will be offered in the form of increased payments in the event that the public sector partner changes the conditions under which the road operates (for example if other competing roads are upgraded during the contract period thus reducing traffic flows).

Design–construct–manage–finance (DCMF) and design–build–finance–operate–manage (DBFOM)

DCMF and DBFOM are terms used in connection with projects let under the Private Finance Initiative in the UK. These projects are very similar in many ways to build–own–operate concessions.

Public private partnerships (PPPs)

Public private partnerships are used in many countries around the world including Australia, Canada, Finland, France, Ireland, Japan, Malaysia, Norway, Spain, the USA, Singapore and the UK. There are various business models adopted and there has been much confusion over the terminology. In the UK this may have arisen from comments made in the early stages of the Private Finance Initiative (PFI). One of the principal tenets of the PFI was that risk would be passed to the private sector and the government expressly set out the contractual relationship between itself and its private sector providers as a strictly 'supplier/customer' arrangement and expressly not a partnership in any legal sense of the term.

Later thinking however modified this view and in 2000 the UK government clarified its position by defining how it would henceforth define the term 'Public Private Partnership (PPP)' (HM Treasury 2000). The document defined the following three types of PPP:

- The transfer of private sector ownership into state-owned businesses, using the full range of possible structures (whether by floatation or the introduction of a strategic partner), with sales of either a majority or a minority stake.
- The UK Private Finance Initiative as defined in law, and other arrangements where the public sector contracts to purchase quality services on a long-term basis so as to take advantage of private sector management skills incentivised by having private finance at risk. This includes concessions and franchises, where a private sector partner takes on the responsibility for providing a public service, including maintaining, enhancing or constructing the necessary infrastructure.
- Selling government services into wider markets and other partnership arrangements where private sector expertise and finance are used to exploit the commercial potential of government assets.

The Private Finance Initiative

Genesis

The UK Government's Private Finance Initiative (PFI) was introduced by the then Chancellor of the Exchequer, Norman Lamont, in his autumn budget statement in November 1992. The initiative marked a further step along the privatisation road which had been pioneered by Margaret Thatcher and continued by John Major, and was intended to encourage a major shift in the way government fulfilled its basic obligation to provide economically efficient infrastructure and services.

Many so-called 'public services' in the UK, including electricity, gas, water supply, telecommunications and rail services, had already been privatised with varying degrees of success, but the principles underlying the PFI envisaged much more. PFI was intended to go far beyond a simple sale of public sector assets. It was much more radical, and was based upon the premise that, rather than government committing capital investment to owning, operating or managing the means of providing the necessary services, substantially greater economic efficiency and lower costs might be attained by 'contracting out' the services to the private sector. In other words, rather than building and owning a school, a prison or a hospital, government would simply buy the service it required from the private sector, for example education for a specified number of children, custodial services for a given number of prisoners or medical facilities to a defined standard. It would then leave it to the private sector partner to develop and put in place whatever mechanisms it considered to be necessary for the required level of service to be provided.The initiative therefore offered the opportunity to encourage private sector capital investment in public services that would be additional to that already available from public funds.

It was, of course, recognised that privately funded and operated schemes might be more expensive than similar publicly funded projects, but an important principle was that PFI offered the opportunity to shift a substantial part of the risk burden inherent in the development of new projects from the public to the private sector by carefully

specifying the service that it required the private sector to provide, thus forcing the private sector to make the necessary investment in new construction and the development of new technology. In addition government would no longer be responsible for cost and time overruns, or systems that were inefficient or that failed to work at all. All of the responsibility for these issues would ultimately rest with the private sector, for which government would in theory be happy to pay a higher price.

None of this was fundamentally new, but what was different about PFI, at least in modern history, is that, for the first time, private sector procurement, management and financing of key projects had been placed at the very heart of government's procurement philosophy. All major projects were required to be assessed prior to any government investment to see whether the private sector could offer a better deal.

The fundamentals underpinning the scheme were explained by the Treasury as follows:

- The private sector must genuinely assume risk.
- There should be competition where government facilitates a project or seeks a private sector partner or purchases services as a customer.
- The initiative would apply not only to infrastructure projects but also to any other capital investment providing services to the public sector.

In essence, there were to be two principal conditions:

- Privately funded projects must be tested against publicly funded alternatives to prove that they are cost effective.
- Privately funded projects should not be additional to public expenditure provision and public expenditure should be reduced by the amount of the private sector funds obtained.

Problems

Early indications were that PFI was publicly widely welcomed, particularly by the construction industry (Hoare 1995). Despite the initial optimism, however, and the apparent success of several high-profile projects including the Queen Elizabeth the Second Bridge at Dartford, the Second Severn Crossing and the redevelopment of the Norwich and Norfolk District Hospital (McTaggart 1997), actual real performance in terms of new projects coming forward in the pipeline was poor. Part of the reason for this was plainly the fact that both the public and the private sectors were still unsure of exactly how this new method of procurement would work and initial experience, outside the few widely publicised projects mentioned above, led some to believe that the approach had many problems.

Understanding the rules

Morrison and Owen (1996) drew attention to the problems of understanding and interpreting the mass of PFI legislation. They comment that PFI is very complex within both sovereign and European Community law:

> The first difficulty the practitioner will find is determining which set of rules applies to a particular project. PFI is promoted on the basis that it is essentially the provision of a service by the private sector, albeit that, in most cases, such provision is preceded by a construction period. So does a typical PFI contract fall within the rules applying to the provision of (a) public services or (b) public works?

High bidding costs

Butler and Stewart (1996) reported that bidding costs for PFI projects averaged approximately 3% of project value as opposed to approximately 1% for traditional projects. PFI projects also took much longer to procure than comparable traditional schemes, with the average time taken to achieve financial closure estimated at 26 months for local government projects and 42 months for NHS projects. In an attempt to ease these burdens, the Audit Commission (2001) published guidance for local government managers, requiring them to:

- Demonstrate a clear purpose and a strong vision of the desired outcomes from the scheme.
- Translate that vision into a simple output specification and resist the temptation to make regular changes to that specification.
- Get early commitment to the scheme from key stakeholders.
- Set up a project management structure that allows for an appropriate level of delegation to key officers and is integrated with existing decision-making processes.
- Agree a clear project plan, establish project milestones and monitor progress against the plan on a regular basis.
- Agree the key contractual terms, including payment mechanisms and risk transfers, prior to issuing the invitation to negotiate, in order to force bidders to indicate their position early on in the negotiation process.
- Be clear about how they are going to evaluate bids.

Tendering is both time consuming and costly, varying across the world. According to RICS (2011) the tender period for an average PFI project in the UK averages 34 months. High bid costs can act as a barrier to entry. The required submission of design ideas and the depth of detail required means time and costs are applied and often wasted.

Risk

Tenderers for early PFI schemes encountered major concerns about the risks that were to be transferred, and there was considerable uncertainty over how their tenders were to be assessed. The Highways Agency, for example, in its prequalification requirements document for DBFO road schemes (Highways Agency 1995), wrote that:

> The Department recognises the many different views that Tenderers may have as to the scope of obligations and allocation of risk under a DBFO Contract. The Department does not have a settled view on the full extent of

those obligations nor on the final allocation of risk. Nor can it prejudge what potential tenderers may be prepared to offer.

The Agency did offer a model contract which gave some indication of the kind of 'standard' level of risk transfer against which all tenderers were required to bid, but tenderers were also at liberty to propose any 'non-standard' alternative arrangements. There were, however, no indications in the documentation as to how bids might be assessed or what criteria were considered the most important. Whilst one must agree that it might not be possible to give a definitive list of quantifiable assessment criteria, it is difficult to escape the conclusion that government did not know what it actually wanted and thus could not formulate any criteria against which bids would be judged. It must therefore follow that bidders could only guess at what the most important assessment criteria might be. The mental picture that emerges is of two people blundering around in a darkened room, attempting simultaneously to grasp the same slippery black ball.

Refinancing

The financing package for a major scheme may be extremely complex; private sector developers involved in large infrastructure schemes have long recognised that it is often possible to improve returns by refinancing projects during the development or operation process. Opportunities for refinancing may arise either to take advantage of international currency exchange rate fluctuations or interest rate variations, or to reflect the changing nature of risk in a project as it moves from construction (conventionally rated a high risk activity) to operation.

The amounts involved may be substantial.As an example, consider the Shajiao B power station in southern China (estimated cost approximately US$512 million) where refinancing one year into the project to take advantage of shifts in international exchange and interest rates allegedly increased the return to the investors by approximately US$40 million. In the UK it is reported (NAO 2000) that, upon completion of the construction phase four months early and having established a track record in operation, Fazakerley Prison Services Limited (FPSL) were able to refinance the Fazakerley prison project. Refinancing here resulted in expected returns to shareholders being increased from £17.5 million to approximately £28.2 million, or approximately 61%. In this case the Prison Service stated that it believed the windfall profit was due to FPSL successfully managing the risks of procurement and that they should be allowed to keep it (Allen 2001).

Morgan and Mathiason (2001), however, saw the issue rather differently, alleging that windfall gains were set to be taken from a wide range of projects including hospitals, roads, prisons and schools and describing the process as 'robbery of the public'.

The UK Government's present general stance on the refinancing issue (HM Treasury 2004a) is set out as follows:

- Refinancing constitutes a material change to the agreed project structure and the client therefore has the right to be informed of and to approve any refinancing package.

- Contractors' proposals for refinancing should be welcomed and considered positively.
- The client's long-term commitment to purchase a service at a guaranteed price for an extended period is a commercially valuable promise. Clients therefore have a natural right to share in any refinancing gains which arise as a consequence of this promise.
- Increases in returns to investors gained through increased efficiency or performance should be owned by the investors. However, the Treasury chooses not to consider improvements in loan margins and certain beneficial changes to the term and leverage of the debt finance to be due to efficiency gains and therefore insists that such benefits should be shared on a 50:50 basis between the client and the contractor. Similar conditions apply where refinancing opportunities arise as the result of a general increase in the maturity of the market as a whole.

The very nature of the PFI requires that government prepare an 'output specification' detailing the service that it requires to be provided. Where the project includes new construction the specification may also include details of the accommodation to be provided and this may be supplemented in some cases by statutory requirements, for example in the case of roads or prisons. An obvious problem here is that government is not accustomed to working in this way and the degree of prescription in the output specification is likely to have a considerable impact upon the degree of innovation that the tenderer is able to introduce. This issue apparently posed a significant problem for the Bridgend and Fazakerley prisons. Price and Ivison (1996) wrote that:

> The consortium's view was that, by being prescriptive, the Prison Service minimised the supplier's ability to be innovative in its approach to the provision of the prison facilities and the service. An alternative would have been for the Prison Service simply to specify the output required and to have left the supplier to develop proposals to meet the output.

Value for money

Notwithstanding the fact that PFI is now firmly embedded at the heart of UK Government procurement, there is still considerable discussion about whether or not PFI truly delivers improved value for money. In terms of the early projects, a study by Arthur Anderson and Enterprise LSE (2000) of a sample of 29 PFI projects showed an average saving of 17%. In 2001 the National Audit Office (NAO) reported that in a survey of authorities responsible for managing 121 PFI projects worth in total some £5.73 billion, 81% ranked value for money as satisfactory or better (NAO 2001). Allen (2001) reported that seven of the 15 projects upon which the NAO had reported in detail at that time had been assessed in value-for-money terms and appeared to show that 'if the NAO sample was representative of all PFI projects then an estimate of the savings from the £22 billion PFI projects signed up to 1st December 2001 would be in the region of £4.4 billion'. However, since two of

the projects accounted for 81% of the total savings, he concluded that a more realistic estimate might be £2.2 billion or approximately 10%.

There are, however, dissenting voices. Pollock (2000) maintains that PFI has failed to deliver value for money in health projects, citing as an example the Kidderminster Hospital where:

> using PFI means that increased costs of the new hospital will be met in part by the closure of 219 inpatient beds without alternative provision. But since the catchment area of the new hospital will increase by 10 000 to 380,000, the population served will have almost one third fewer acute beds under PFI.

She also comments that although the first NHS trust to sign a PFI contract stated during the outline business case that there would be no additional cost to the trust, by the time the contract reached the full business case an additional £2 million a year was required.

Allen (2001) comments that:

> The evidence suggests that some types of public service projects may be more suited to PFI than others. While roads and prison projects have achieved reasonable efficiency gains, projects in other sectors such as schools and hospitals have shown minimal gains.

The Treasury has long been keen to ensure that PFI projects genuinely provide real value for money, defined as 'the optimum combination of whole life cost and quality (or fitness for purpose) to meet the user's requirement', and to that end has published updated and detailed guidance for prospective PFI clients (HM Treasury 2004a, 2004b, 2004c). The guidance is seen to be required in order to reflect NAO reports on previous projects and to take into account the Treasury's revised approach to investment appraisal. Changes include a reduction in the discount rate from 6% to 3.5%, a requirement for the incorporation of an 'optimism bias' to reflect the tendency for project appraisers to be unduly optimistic about project outcomes and consideration of the taxation implications of different procurement routes.

The intention is that PFI should only be pursued as a procurement option where it provides clear value-for-money benefits. Procedures now set out a detailed methodology for assessing all stages of a proposed PFI project, including:

- A test of the potential value for money of procurement options when procurement decisions are being made, to ensure that PFI is used only in those sectors where it is appropriate and has a good value-for-money case and that departments provide sufficient budget flexibility to accommodate subsequent decisions not to use PFI.
- Reforming the public sector comparator into part of an early rigorous economic appraisal of an individual project at the stage an outline business case is produced, prior to procurement of the project, to allow projects to proceed down alternative procurement routes where they offer better value for money.

- A final test at the procurement stage of a project to evaluate the competitive interest in a project and the capacity of the market to deliver it effectively.

Issues to be considered in assessing value for money include:

- Good design.
- Not achieving value for money at the expense of workers' terms and conditions of service.
- Non-market factors which may affect the project, such as environmental impact and non-project-related strategic risks.

The Treasury has also developed standard spreadsheets for the assessment of PFI projects. The methodology and a worked example are set out by HM Treasury (2004c). Revised value for money guidance in connection with NHS hospital PFI schemes (HM Treasury 2008) and a useful summary of current guidance in respect of PFI infrastructure are also available (HM Treasury undated (a)).

Design

Early PFI schemes suffered considerable criticism in respect of design issues (see for example the work of Cole 1995) and many took the view that the PFI solution to a problem would generally represent the most 'economical' design approach. This was seen by some as a risk mitigation tactic: 'use what we know works, innovation is risky and dangerous'.

Government has, for some time, been anxious to overcome these issues and has published a significant amount of design guidance particularly in respect of health buildings, much of which is now available through the internet (see for example HM Treasury undated (b)). This seems to have been effective. The National Audit Office (NAO 2001) reported that, in general, PFI consortia:

- Invested in good design and construction at the start of the project.
- Achieved better quality buildings and a reduction in maintenance costs, while maintaining the assets to the agreed standards.
- Placed more emphasis on the aesthetics of design than had previously been the case.

The relationship between PFI client and contractor

As discussed earlier, historically the relationship between the PFI client and the contractor was seen to be rather confrontational. The early emphasis on a supplier/customer relationship, proven risk transfer, the client's need to ensure that levels of service were delivered in accordance with the contract, and funders' determination to protect their investment and to limit their own exposure to risk led inevitably to lengthy and complex contracts and a relationship driven by strict contractual compliance. Even as late as 2001, when the author was involved in the development of procurement systems for the NHS, any suggestion that NHS PFI contracts should incorporate partnering principles was scornfully rejected.

Nonetheless some have consistently argued that in the development of public/private sector partnerships both parties would surely wish to maximise the chances of project success to achieve what has been termed a 'win–win' outcome. In order that this may be achieved, however, the structure of the partnership and the working relationship between the people involved requires very careful consideration. As Mody (1996) pointed out, establishing such a partnership requires a clear understanding of the relative strengths and weaknesses of both parties in addition to an understanding of their histories. It is, however, often the case that government believes that it can only fulfil its functions by maintaining close control over all aspects of the project, but this process may be perceived by the private sector partner as an unwarranted interference with the way he or she wishes to run his or her business. Hurst (1994), for example, writes that:

> Even in most developed states such as the UK, there is a tendency for government to retain control of projects through a complex approvals procedure, especially where design and construction of projects is concerned. In private-sector electricity projects, especially in Asia, the state is often involved at every stage of the project, going far beyond the usual 'planning' rules, treating the private-sector generators as though they were part of the public sector.
>
> This extends to requiring the right to review and approve all design drawings, the specifications for each item of equipment, the right to act as an additional *de facto* project manager during the construction phase of a project, the right to receive hundreds of 'as-built' drawings for every aspect of the station, and the right to visit and inspect the station. Vast quantities of corporate information on the project company and/or the sponsors are often required.

The same point is also made in connection with the first two prisons to be commissioned under the UK Government's PFI programme. Price and Ivison (1996) commented that, although the focus of the contract was on the provision of a custody service rather than on the construction of a building, and thus the design and construction risk lay solely with the private sector partner, government insisted on the appointment of an independent engineer, who expected to have an input into design matters. The situation was apparently only resolved when the role of the independent engineer was redefined such that:

> government (had) the comfort of an independent adviser who was familiar with its concerns doing an initial design-check of the prison and monitoring construction on site, but also enabled the consortium to be innovative in its design and construction methods.

The privatised infrastructure developers' ideal market would probably be one in which they were able to provide services, on behalf of government, to a captive market, at prices to be fixed solely by themselves, whilst at the same time being subject to an absolute minimum of regulatory or governmental control. Unfortunately, however, history shows that this kind of *laissez-faire* approach does not work very well.

The major rationale usually put forward for governmental regulation and control of projects is that the government may, at some stage, become owner or operator of the utility in order to preserve some essential public service in the event of default by the concessionaire or project operator.Whilst this may, in some cases, be a genuine concern, it is obvious that any increase in government 'interference' is likely to increase project risk and thus project costs and in turn therefore the cost to the user. Government is therefore faced with a considerable dilemma. The latter concern basically envisages some failure of the concessionnaire to perform his or her obligations. This concern might well be real, but as a starting position it seems somewhat negative. It is not in anyone's interest for these schemes to fail financially or otherwise once they are operational. A financial failure, or indeed any failure of the operator to deliver the required level of service, which is serious enough for government to terminate the concession contract early is bad news for all of the parties involved. Operation of the utility by government itself is often the very eventuality that government wished to avoid and may be the reason for privatised operation in the first place.

Smith and Walker (1994) identified high-level factors in which success appears to be necessary in order that each of the major project participants in a privatised infrastructure project have the maximum chance of achieving their goals. Those factors are as follows:

- A genuine desire for a win–win solution with common agreement between the parties as to their mutual and individual objectives. These objectives must be explicit, realistic and achievable.
- A strong, persistent, persuasive and politically skilled project leader willing and able to fight for the scheme.
- Adequate and accurate data and risk assessment of both the procurement and operational phases, with responsibility for managing the risks given to the party best able to control them.
- An honest and accurate calculation of the project economics, including the length of the concession, which incorporates probability assessments of the influence on income and expenditure of the risks and uncertainties previously identified.
- Choice of the correct procurement methodology for the construction phase.

It is also important to remember that governments often come and go within relatively short time periods. The life of a particular administration may represent only a small fraction of the length of the concession itself and subsequent governments (although not so far in the UK) have been known to wish to revisit agreements made by their predecessors. Two examples reviewed by Smith (1999) are the Dabhol power project in India and the Bangkok Second Stage Expressway in Thailand. In at least one of these projects the primary reason for wishing to revisit the original negotiations centred around allegations of corruption. In order that allegations of this kind may be refuted, it is plainly essential to ensure a high degree of public accountability in all government action and decision-making. The initial negotiation process must therefore be both totally transparent and accurately documented.

In the light of the above, it is suggested that a 'team' approach involving shared perceptions and shared goals between the public and private sector representatives is likely to be more effective than the very commercial customer/service-provider relationship which appears to have been used in the UK in the past. Similar approaches have been successfully used elsewhere. Reijniers (1994), for example, analysed the working of just such a partnership in the Netherlands.

Different patterns of partnership formed with different kinds of people may be required at different stages of the process. During the initial stages, prior to the appointment of the concessionaire, particularly if a competitive tendering process is involved, governments must obviously maintain a proper distance between themselves and their tenderers, and must be seen to be impartial to all of the competitors, but once the concession is signed then it can be convincingly argued that government should perhaps take on a much more active partnership role during the construction and operational phases. It is, however, important here that government is seen to be actively contributing to the success of the project and not merely interfering in the affairs of its private sector partners.

The idea of PFI projects based upon collaborative principles has been actively supported by the NAO. In a major review of the management of PFI projects (NAO 2001), it concluded that some of the major issues to which client departments should pay particular attention were as follows:

- PFI projects need to be approached in a spirit of partnership. A successful outcome for both parties can only be achieved if they clearly understand each other's business and have a shared and common vision of how they can work together as partners.
- A successful partnership needs to be established at the outset. Failure to properly consider how the relationship will be managed before contracts are let is likely to lead to misunderstanding and a period of additional risk while the required service is being developed.
- The development of a successful relationship requires an appropriate contractual framework, which properly allocates risk, clearly defines the service parameters and incorporates a mechanism to deal with change.
- Having staff with the right skills is essential to good contract management. It is highly likely that additional training will be required to equip staff to work in this new way.

Small projects

Some contracting authorities have attempted to overcome the problems of making small projects viable by grouping together a number of related smaller schemes, none of which would be viable on its own, and so constructing a viable, bankable PFI package with clearly defined risks. This approach has been followed successfully by a number of local authorities for schools refurbishment and is also at the heart of the NHS Local Improvement Finance Trust (LIFT) initiative.

Concession agreements

The drawing up of concession agreements is plainly a very skilled task. The following sections address questions that have been identified (Vintner 1996) as some of the more important questions of principle which need to be considered by governments when carrying out this task.

What provisions should government include in the agreement in order to safeguard itself against non-performance by the concessionaire? How should disputes be resolved?

It has already been established that governments would normally be wise to consider early termination of a concession only in the direst of circumstances. To do so would usually bring upon government more problems that it would solve. Vintner (1996) suggests that it may therefore be more sensible, if the government wishes to be able to penalise the concessionaire in some way, for the concession agreement to incorporate a system of fines or penalty points linked to some graduated reduction in revenue.

The length of concession contracts often poses a major problem, in that the contract periods are often so long as to make it virtually impossible to predict, and thus to provide for, all of the possible changes in circumstances that may arise. This issue has been considered by a number of eminent legal writers who have questioned whether the classical approach to contract drafting, embodying fixed remedies for breach, is truly applicable. MacNeil (1974), in his seminal essay on the subject, draws attention to the differences in the kind and scope of various types of contractual relationship. He makes a firm distinction between what he terms 'transactional' contracts, such as buying a newspaper, which are essentially short term and the action is affected by no past events and concerned with no future ones, upon the basis of which the classical law of contract has developed and 'relational' contracts in which the parties anticipate a lengthy relationship and the contract generally attempts, to some extent, to predict the future.

Campbell and Harris (1993) go further and maintain that the foundation of classical contracting, which is based on the principle of 'presensiation' (in other words an assumption that one can predict the future with some degree of accuracy and that a contract can be drawn up that adequately apportions the consequent risks and assigns strict liabilities for breach), is totally inappropriate for complex long-term relational agreements. Their review of the available literature leads them to believe that, where long-term contracts do include strict liabilities for future breaches, the contracting parties frequently compensate for their inadequacy by ignoring them when disputes arise in favour of 'a repertoire of extra-legal strategies when the liability arises'. They therefore assert that:

> Efficient long term contractual behaviour must be understood as consciously co-operative. We see a long term contract as an analogy to a partnership. The parties are not aiming at utility-maximisation directly through performance of specified obligations; rather, they are aiming at utility-maximisation indirectly through long-term co-operative behaviour manifested in trust and not in reliance on obligations specified in advance.

One consequence of the increasing acceptance of the distinction between transactional contracts and relational contracts has been the increasing inclusion in relational contracts of various types of alternative dispute resolution (ADR) provisions. These mechanisms (for example mediation, negotiation and adjudication) go beyond the boundaries of classical contract law by recognising that the parties may not be in a position when they sign the initial agreement to foresee all of the possible consequences and to make provision for them. ADR therefore attempts to provide a mechanism for settlement of disputes in such a way that the parties are not necessarily rigidly bound by the terms of the original contract. Such settlements may involve modifying or even, in some cases, setting aside specific provisions in the original contract in the interests of settling the dispute quickly and to everyone's advantage in the light of changing circumstances. However, Campbell and Harris (1993) point out that, in order to make these provisions work, they must be supported by an attitude of trust and a willingness to co-operate, and this again reinforces all of the arguments already made above.

It would appear that in the past such options have been used reluctantly if at all. Gould (1998) reviews the various dispute resolution mechanisms commonly used in BOT contracts. The only options reported in his review are an obligation to negotiate 'in good faith' in an attempt to reach agreement on the changed circumstances, reference of the dispute to an independent third party whose decision may or may not be binding and, in exceptional circumstances, the right of one party or the other to terminate the agreement.

How detailed should the specification be?

It has already been shown that many governments are apparently uncomfortable unless the works to be constructed and the way in which they are to be operated are closely specified in the concession agreement. The argument for doing this, particularly in the case of concession contracts, is usually two-fold:

- Government will argue that at some point it will have to take over responsibility for operation of the facility and it therefore needs to know that it will meet whatever standards government has set.
- Government needs to ensure that, at the end of the concession, the facility will still be an asset and will not be time-expired or in need of extensive, and very probably expensive, maintenance.

Concessionaires complain that detailed specifications of this sort severely restrict their freedom to provide innovative solutions to problems and thus limit their competitive edge. Whilst this argument may appear to have some superficial appeal, in truth there is, usually, little really innovative engineering in PFI projects, because innovation normally involves risk and the concessionaire will usually do all he or she can to limit the project's exposure to technological risk.

Allowing the concessionaire the freedom offered by a performance specification, especially for a complex project, may not always be wise. Performance specifications for complex projects need to be written very carefully, with no loose ends, if the government is not to leave itself open to disappointment. In some types of facility, for example a power station, it is possible for the

concessionaire to compromise the efficiency and energy saving characteristics of the plant in the interests of economy. Walker and Smith (1995) provide a good example with a case study of the Shajiao B power station in China which was provided under a BOT contract. In discussing the technical aspects of the plant they write that:

> The (Shajiao B) station appears to typify control of the technological risk factors through the use of design and construction methods which are both well tried and economic, although without some of the frills which might be expected in stations constructed elsewhere. … The general impression of the plant was that it was relatively simple and old fashioned. The turbine is designed with a relatively low basic level of efficiency and requires more frequent and extensive overhaul maintenance than up-to-date turbine technology.

On the other hand it is, of course, much easier to specify the operation phase of the concession in performance terms and government should be prepared to allow the concessionaire much more freedom of action whilst still safeguarding standards of service.

The UK Government, in its PFI deals, has opted for this approach, generally specifying the *service* that it expects the private sector to provide rather than the *facility* to be constructed. In other words, government is quite happy to prepare a performance specification, leaving the detailed means of providing the required service to the concessionaire. This is perhaps most appropriate where there is to be no transfer of the completed facility to government at the end of the concession.

To what extent should the concessionaire's bankers be given the rights to take security over the concession agreement in the event of default on their loans?

Generally the host government will want to control the identity of the party providing services to it under the concession agreement and it will therefore usually be reluctant to allow bankers rights of this kind. Nevertheless in many schemes the funding will not be forthcoming unless the banks have this level of security. The usual form for arrangements of this type is a direct supplemental 'step-in' agreement between the concession granter and the banks, where the bank itself agrees to take over the concessionaire's responsibilities under the main concession agreement. Vintner (1996) points out that, in setting up such an agreement, the following points merit special attention:

- The supplemental agreement should provide specifically for the banks, rather than a nominee, to step in and must require them to take over all of the concessionaire's obligations.
- Provision must be made for the banks to be released from their obligation at some point after their debts have been repaid and government needs to consider very carefully how it will approach the task of maintaining the service provided by the facility when this point is reached.
- Under this type of agreement both the banks and the government may have rights to take over operation of the project. It is obvious that some provision

must be made in the agreement to regulate this position and to establish who has priority rights in the event of a default.
- It may be that the banks are still required to make payments to the project after their step-in rights have been exercised. Some provision must therefore be made in the agreement to establish the legal status of such payments.

Should compensation be payable to the banks in the event of termination of the agreement by the host government?

This question is very difficult, both as to principle and as to amount. As regards the principle, it can be argued that this is one of the risks the bank assumes when it undertakes no-recourse or limited recourse financing and that the government should not be placed in the position of having to pay a lump sum in compensation when the whole purpose of the exercise was to avoid substantial capital expenditure. On the other hand the banks argue that not to pay compensation would leave the government holding a substantial asset for which it had paid nothing whilst the banks would lose everything. Vintner (1996) sets out a number of legal observations upon this issue but it will probably only be resolved through a legal test case.

Is it possible to standardise PFI contracts?

As experience with the use of PFI contracts increases it should be possible to develop 'model' forms of contract, at least for specific sectors of the market. In the UK, model contracts have already been developed for highways and for hospitals and the UK Government now publishes a substantial manual of guidance on the preparation of all PFI contracts (HM Treasury 2007, undated (c)). The purpose of the guidance is stated to be:

- To promote a common understanding of the main risks that are encountered in a standard PFI project.
- To allow consistency of approach and pricing across a range of similar projects.
- To reduce the time and costs of negotiation by enabling all parties concerned to agree a range of areas that can follow a standard approach without extended regulations.

The guidance considers the following topics in detail, setting out the government's present position and in many cases providing standard clauses for the use of contract draftsmen:

- Duration of the contract.
- Service commencement and quality management systems.
- Protection against late service commencement.
- Compensation and relief events.
- Warranties.
- Service requirements and availability.
- Maintenance.
- Performance monitoring.

- Price, payment for variations, payment mechanisms and set-off.
- Changes in service and in law.
- Subcontractors.
- Assignment.
- Change of ownership.
- Termination.
- Treatment of assets at the end of the service period.
- Early termination.
- Surveys at expiry or early termination.
- Insurance, indemnities, guarantees, etc.
- Information and confidentiality.
- Intellectual property rights.
- Dispute resolution.
- Step-in rights.
- Land and other property interests.
- Due diligence, commitment letters, etc.
- Refinancing.

Current developments

PFI has now been in place for 20 years and is now firmly embedded at the heart of UK Government procurement practice. It has been responsible for the procurement of over 600 projects with a total value of approximately £56 billion. The NHS, where a considerable proportion of new hospital provision has been delivered through this route, has carried out much work in the development of standardised contracts and service level specifications. However, since 2008 the flow of PFI projects has slowed to a trickle. The UK infrastructure programme has slowed in the face of weakening of the UK economy and disruption in the world financial markets.

RICS (2011) suggested that governments need to ensure a pipeline to demonstrate a long-term commitment to PFI to allow the private sector to alter its business models. Institutional investors – pension funds and the like – have become increasingly important over the last five years. An active secondary market allows contractors an exit strategy (and funds to invest).

In the UK the constraints on government spending and the need to tackle the national debt increases the need for substantial volumes of private sector capital to meet this need for infrastructure development. As a result of the global financial crisis, many private funding sources lost interest in such projects as they concentrated on their core business, meaning that only the largest projects were still viable and the cost of borrowing increased 1% to 2.5%. In 2011, the Treasury Select Committee initiated a new enquiry seeking to compare different public procurement methods and the limits of risk transfer.

The UK Government stepped in to support projects with £2 billion and the result was greater confidence in the model in the banking sector. This was achieved by the creation of an Infrastructure Finance Unit whose role was to coordinate

public sector infrastructure budgets with the aim of attracting institutional investment and additional funding through bond issues. Many of those involved as primary investors will sell their stake soon after the completion of the asset. They sell their shares on to secondary investors who are looking for a long term income. As many as 40% of completed projects had changed ownership by 2006.

In terms of performance, NAO reports that 69% of projects were delivered on time and 65% were delivered on budget. However the Treasury Select Committee (2012) expressed concern that value for money for the taxpayer may not be achieved in all cases and that there may have been wasted investment. The government response was that it would consult on a replacement for PFI drawing on private innovation but at a lower cost because existing PFI models had a higher cost than traditionally procured projects, involved over-bureaucratic processes, were inherently inflexible and were not the only way to transfer risk.

In 2012 there is already evidence of change driven by the government, including an agreement with a group of UK pension funds to support UK infrastructure projects and an agreement with the Association of British Insurers to set up an Insurer Infrastructure Investment Fund from which they are targeting £20 billion.

Conclusion

The procurement of what are essentially public works using private sector capital is a very complex topic. In this chapter, we have simply attempted to provide an overview of some of the important conceptual issues. It must also be borne in mind that this whole area is constantly under development. In addition to the material covered here there are many detailed issues to do with the structure of commercial and legal relationships, the drafting of contracts, the various negotiation procedures, etc. Those interested in the 'nuts and bolts' of the subject are strongly advised to seek out the specialist journals dealing with this topic for an up-to-date review of the latest position.

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14 Construction procurement: Europe, the Middle East and China

Introduction

It is perhaps no surprise that the early development of construction procurement in the UK was heavily influenced by the prevailing legal system, the social and business environment and the evolving needs of the public sector; hence the gradual evolution from the trade-centred construction industry of the Middle Ages through the development of the independent architect as artistic project designer; the development of civil and structural engineering skills, many derived from military engineering practice, required to drive the industrial revolution; and the rise of the general contractor in response to the building booms of the nineteenth century. Furthermore it is equally evident that those same procurement approaches would have been exported to the developing world as a by-product of nineteenth and early twentieth century colonial development. We might therefore expect to see clones of the British approach being used in many Commonwealth countries, ranging from parts of Africa (for example South Africa, Zimbabwe and Ghana) through the Far East (India, Sri Lanka, Hong Kong, Malaysia and Singapore) to Australasia and the western areas around the Caribbean such as Trinidad, Tobago, Jamaica and Bermuda.

It is also evident that similar processes would occur in other 'old world' countries and that the procurement processes that they would evolve might differ in many important respects from those developed in Britain.

In this chapter we therefore explore some of these alternative approaches and the ways in which they vary from the British approach, through a review of developments in the most significant of our European neighbours. We also include an overview of the position in China, a communist country attempting to come to terms with a capitalist world and one of the world's largest consumers of construction resources.

One of the problems we face in attempting to compare procurement systems across the world is that whilst there have been a number of attempts to develop taxonomies of one sort or another, there is no single generally accepted method of comparison. We have therefore resisted the temptation to develop yet another and instead simply highlight the major variations in regional practice in order to provide a flavour of the procurement that has developed.

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Europe

Although it is common to talk of a European construction industry, in fact there are several distinct groupings of countries whose construction industries share common characteristics. Observers have identified four basic groupings as follows (Oliver-Taylor 1993):

- The traditional British system (basically the UK and Ireland).
- Countries using the French system.
- The northern European approach.
- The Mediterranean approach.

The British system has already been considered in some detail; the other systems are considered below.

The French system

France, Belgium and Luxembourg all use variants of the system historically developed in France. The French system has some similarities with the UK approach, but there are important differences.Statutory and legal requirements are achieved through a more complex and more highly regulated series of relationships than apply in the UK. The architect and contractor are jointly responsible for the condition of the building (excluding fair wear and tear) for ten years following completion and decennial (10-year) defects insurance is almost universal. The client's insurer therefore exercises a substantial degree of control over both design and construction. The process can be seen as analogous to the ten-year guarantee offered by registered house builders in the UK.

Although under the French legal system (based on Roman law) the term 'contracting system' is not strictly appropriate, it is used here to describe the system that regulates the relationships between the various parties involved in the construction industry. Under the French system the obligations and responsibilities inherent in the relationships between the parties are clearly stated and standard contractual procedures are in place.

In the public sector the designers' contracts often include target costs for buildings which, if under- or overestimated, trigger burdensome penalty clauses. Building contracts are usually fixed price, based on drawings and specifications. The apportionment of risk between the designer and the contractor is dictated by the scope of the designer's contract, which may be limited to scheme design or may include full working drawings. It has been claimed that this situation creates defensive attitudes and generates a large number of disputes.

The architect

The role of the architect under this system is usually limited to the preparation of general outline drawings and a specification. For public sector projects the

preparation of the working drawings will be carried out by a group of specialist designers and engineers working in a *bureau d'études*. These specialists translate the architect's concept designs into working drawings and engineers are seen as key players in this process. For the private sector a version of the develop and construct approach is common, whereby the contractor prepares the working drawings from the architect's preliminary sketches to the architect's approval. Concrete and joinery designs are commonly prepared by the contractor.

Contractors

Contractors tend to fall into two main classifications:

- *Gros oeuvre* contractors specialise in reinforced concrete shell construction.
- *Second oeuvre* contractors specialise in fitting and finishing trades.

This division is reflected in French construction education. There is no separate quantity surveyor in the French system. Measurement is conventionally carried out by a measurer/checker (*métreur/vérificateur*) employed by the contractor, whilst cost monitoring is the architect's responsibility.The use of approval systems for contractors is widespread, and particularly for public works contracts where only properly qualified and registered contractors will be permitted to tender.

The client

The role of the 'client's principal representative' is assigned to the *maître d'oeuvre* and his or her role may also incorporate aspects of what, under the UK system, would be considered to be the role of the architect, the construction project manager, the quantity surveyor or the main contractor. On simple projects he or she will usually be an architect or an engineer, but on more complex projects the client's principal representative is more likely to be a body composed of several consultants each of whom is responsible for part of the overall role. On major projects there may also be a separate consultant (known as the *pilot*), reporting to the *maître d'oeuvre*, who is responsible for overall construction planning, site organisation and motivation. The fragmentation produced by separate trade contractors each producing their own drawings often ensures that much of the *pilot*'s work is concerned with making sure that all of the pieces fit together and with resolving clashes and dimensional anomalies.

Contractual approaches

Contracts may be let to a general contractor (*entreprise générale*) – in which case it is common for the main contractor to sublet most of the work except the main structure – or as separate trade packages (*lots séparés*) – in which case co-ordination is carried out by the architect.The latter is considered the traditional French approach. A variation of this system is a grouping of contractors (*groupement des entreprises*), under which a group of separate trade contractors come together in a

joint venture for a particular project. Advantages and disadvantages of each system are described below.

Lots séparés

This is considered to be the traditional French construction method and is the most widely used. It resembles the British construction management system in its organisational structure; however, the contractual relationships between the parties differ. Generally the project is divided into separate work packages (lots), which are let to individual trade contractors and are supervised by the client's representative, the *maître d'oeuvre*, who on smaller projects is usually also the architect. Each trade contractor has a direct contract with the employer and is selected on the basis of a submitted tender from a list chosen by the client or architect, who will also accept recommendations from the rest of the design team.

The normal method of selecting a contractor is by competitive tendering, the criteria used being much the same as in the UK. Despite the European Union's intention to create a more open market across Europe, there is little evidence of foreign construction firms operating in France in their own right, although it is well recognised that the European construction industries are very closely interconnected, with virtually all of the major construction groups owning substantial shareholdings in each other.

The popularity and continued use of the *lots séparés* system is said to be due to the advantages it can offer to the employer:

- It allows the employer or his or her representatives the opportunity to limit those tendering for a particular package, thus ensuring that it goes to a known and experienced contractor. The concept of nomination is not known in France; there is no contractual mechanism obliging a contractor to work with a particular subcontractor as in the UK. This is important where specialist work is required or there is an element of contractor design.
- It allows employers potential savings, in that by dealing directly with the trade contractors they do not have to pay the additional percentage profit that a main contractor would demand were they the employer's subcontractors. Employers thus benefit directly from subcontractor pricing.
- It allows the potential for time saving, due to the ability inherent in this system to stagger the preparation and letting of the work packages.

The main disadvantage of this system to the employer is the workload. As the employer has separate contracts with each trade contractor, the employer (or his or her *maître d'oeuvre*) must produce contract documentation, drawings and specifications for each trade. This in reality can mean over 100 tender packages, which must be analysed and reported on as they are returned. Once the contractor has been selected, each must be treated separately, with guarantees, retention and payments individually administered. The system is criticised for its labour-intensive administration; consequently, the fee component of the project costs is high and employers are required to have an organisational structure capable of dealing with this task.

From the contractor's point of view, this system is advantageous because each contractor has a direct contract with the employer. If there are any problems or discrepancies the contractor goes directly to the employer for a response. The contractor is also considered to be financially more secure as his or her payment comes directly from the employer, rather than via a main contractor as in the UK. The main disadvantage for individual contractors is the contractor's responsibility. If one of the trade contractors causes a delay in a project, it is standard procedure that he or she should bear the full costs of liquidated damages for late completion. This usually offers a powerful incentive to make up time once delays have occurred.

Entreprise générale

This system is very similar to the UK traditional method of procurement. The *entreprise*, the main contractor, agrees to undertake the project for a fixed price. The main contractor is chosen on the basis of producing the most attractive tender. The employer has a variety of options available with this procurement route:

- Full drawings and specifications are prepared before the tender stage and the contractor is responsible for ensuring that the project is completed in accordance with them. The advantages of this approach are similar to those offered by the traditional system in the UK.
- The tender may be let on the basis of a brief and outline drawings, and possibly specifications, and the contract is awarded to the contractor who offers the best proposal. This method requires the contractor to come up with a full design solution, taking the role of the architect and the *bureaux d'études*. This is essentially the same as a variant of the UK develop and construct approach.

Between these two forms, there is a whole range of contractor design options.

Specific advantages offered by the *entreprise générale* approach over the *lots séparés* approach are as follows:

- The employer and his or her representatives have a single point of responsibility and point of contact.
- There is a single contract to administer, thus reducing the amount of tender documentation.
- The *entreprise générale* takes responsibility for the subcontractors and can also if required assist with the co-ordination of detailed design and construction.
- The *entreprise générale* can assist with the design of a project and offer the advantages of buildability when a develop and construct approach is taken.

Despite these advantages, the *entreprise générale* system remains an unpopular option, although its popularity has increased during recent years.

The perceived disadvantages of the system are that:

- It is considered to be an expensive way of acquiring a building. Generally, the contract costs approximately 10% more than that for a*lots séparés* project.
- The system requires greater pre-contract preparation time. Usually, the design and documentation must be completed before the tender is sent out. The contractor is therefore not usually involved in pre-contract design.

- Due to the production of detailed pre-contractual documentation, there is a comparatively long initial tender period.
- The process tends to be very sequential, with little opportunity for fast-tracking.
- The contractor is considered to have too much power in this form of procurement.

Groupement des entreprises

A *groupement* is a group of contractors who come together to undertake a project (essentially a kind of joint venture). There are two types of *groupement*:

- *Groupement des entreprises solidaires*: a joint venture in which each of the contractors takes an equal responsibility for the whole works and jointly bears the risk should any of the members default.
- *Groupement des entreprises conjointes*: each contractor is separately responsible for a section of the works but combines with others to submit a single tender for the project as a whole. The works are formally divided up, with no contractor bearing any responsibility for the default of any of the others. This is a more common approach and ranks with *lots séparés* as one of the most popular methods.

The advantages of a *groupement* for the client include:

- Reduced documentation.
- A shorter tender period.
- Savings of cost and time in post-contract administration.
- Only one tender document must be analysed.

The principal disadvantage is the length of time required to produce pre-contract documentation.

The growth in popularity of this system has led to a situation where a client may ask a group of *lots séparés* contractors to come together to form a *groupement* for a project. This is attractive to contractors because for major projects it allows the pooling of resources and because the *groupement* can take on work that no single contractor could take on individually. The pooling of resources also allows them to achieve savings in such items as site overheads, facilities and insurance premiums. In addition the spirit of greater co-operation often leads to smoother progress on site.

Tender documentation

The client (*maître d'ouvrage*) will normally have decided in advance of issuing tender invitations which contracting system he or she wishes to use. As in the UK, clients may have a list of possible contractors (selective tendering) or they may choose open competition, in which case the tender will be advertised and any contractor may bid. Tender documentation is usually prepared by the architect or the engineer. Because tenders are often let on some form of develop and construct basis, it is not always practical to accept the lowest tender price. In the public sector it is usually the tender that is 'economically the most advantageous' that is accepted.

Contracts

French public sector contracts are based on the public sector procurement code, the *Code des Marchés Publics* (CMP). For private sector contracts the *Association Française de Normalisation* (AFNOR) provides a standard form of contract under the civil code. It is important to note that under the CMP and the law relating to the public sector client (*maîtrise d'ouvrage publique*) the client has not only an economic relationship with the contractor but also a set of fundamental obligations which he or she must fulfil. For the public sector client, these include financing the investment, putting in place those responsible for design, technical control and execution of the works and the letting of contracts for architectural and engineering design.

Contracts incorporate general administrative clauses (*Cahier des Clauses Administratives Générales* (CCAG)) and general technical clauses (*Cahier des Clauses Techniques Générales* (CCTG)). To this may be added specific administrative and technical matters relating to the project (*Cahier des Clauses Administratives Particulières* (CCAP)) and (*Cahier des Clauses Techniques Particulières* (CCTP)). These documents together effectively represent all of the information included in the preliminaries and specification sections of the British bill of quantities without any quantities and are collectively known as the *Cahier des Charges*.

The contract documents, which are not necessarily part of the tender documentation, typically include:

- Articles of agreement.
- Particular conditions of the contract relating to the project.
- Specifications.
- Drawings.
- A programme of works.
- Insurance cover notes.
- The contractor's qualification certificate.

Contracts are frequently lump sum, with virtually all responsibility for construction placed upon the contractor. Variations are possible if the architect or the client changes his or her mind or specified materials or products are not available. Where variations are ordered contractors are normally required to produce an estimate before the work is put in hand and it is common for this to be used as a basis for negotiation of the actual price.

Contract sums may be subject to fluctuations according to price changes, especially for contracts over 12 months' duration. Adjustments may be made with the use of indices. Contracts include a retention clause. Retentions are by law limited to a maximum of 5% and are held for one year after handover.

Procurement approaches to large construction projects (France)

The most popular procurement approaches used for large construction projects (i.e. those exceeding about £5 million) in the public sector is as follows:

- Public works contract (*marché de travaux publics*) – the standard CMP contract with employer's design.
- Agreement for the preparation and supervision of public works (*contrat de maîtrise d'oeuvre*) – a contract for the preparation and supervision of works generally on the basis of a lump sum price.
- Contracts for the design and realisation of public buildings and works (*marché de conception réalisation*) – a design and build contract. The use of this method is strictly controlled. Basically, design and build may only be used where necessary for technical reasons, for example where the work poses particular technical difficulties and where the skills required are only possessed by the contractor.

The most popular procurement approaches used for large construction projects (i.e. those exceeding about £5 million) in the private sector is as follows:

- Constructor's agreement (*contrat de louage d'ouvrage*) –the standard AFNOR form of contract.
- Property development contract (*contrat de promotion immobilière*) – generally bespoke agreements based on a lump sum turnkey contract.
- Project manager agreement (*contrat de maîtrise*) – a bespoke agreement where the project manager takes full responsibility for final delivery of the facility and enters into construction contracts as the employer's agent.

Procurement approaches to large construction projects (Belgium)

The situation in Belgium is somewhat similar to the situation in France.

The most popular procurement approach used for large construction projects (i.e. those exceeding about £5 million) in the public sector is as follows:

- Public works contract (*marchés publics/overheidsopdrachten*) – the standard public works contract with employer's design.
- Public private partnership contracts (*association publique privée/publieke en private samenwerking*) – generally a bespoke joint venture contract used for long-term construction or facilities management.

The most popular procurement approach used for large construction projects (i.e. those exceeding about £5 million) in the private sector is as follows:

- Traditional contract (*contrat d'entreprise/aannemingsovereenkomst*) – an independent architect and engineers are responsible for construction with the contractor;ten-year defects liability.
- Design and build (*contrat de promotion/ontwikkelingsovereenkomst*) – a turnkey contract with the building site administered by an independent architect.
- Construction management arrangement (*contrat de maîtrise d'ouvrage délégué/overeenkomst tot delegatie van bepaalde taken van bouwheen*) – a version of the *lots séparés* approach where the works are co-ordinated by a construction manager employed by the client under a construction management agreement.

Contractual disputes

Generally in France there seems to be far fewer disputes over contractual matters between the contractor and the client and there seems to be a greater degree of mutual trust than exists in the UK. It is considered that this may well have its basis in the way the construction process is organised and in the insurance system. The predominance of a develop and construct approach means that the contractor cannot blame the client when things go wrong. Additionally, the contract documentation is weighted more in favour of the client and has a higher weighting than is usual with standard contracts in the UK.

Contemporary developments

In France, over the past decade, there has been substantial evidence of concentration in the sector as larger provincial companies have bought out smaller rivals specifically to target the public sector market more effectively. Initially larger firms sought to develop clearly differentiated marketing strategies largely aimed again at securing work in the public sector. Examples include the development of an 'all-in service' including engineering design, financial appraisal and improved mechanisms for project co-ordination and control. Subsequent developments involved further mergers and acquisitions between some of the larger players and a renewed concentration on the private sector, with construction firms diversifying into property development, property and facilities management and urban design.

At the same time, a variety of new procurement methods have been introduced, including the revival of an ancient form of contract, the *Marché d'Entreprises Travaux Publics* (METP). The METP is a form of build–operate–transfer contract under which local authorities can let contracts requiring the contractor both to construct a specified facility and to manage the service that the facility provides, with payments spread over a number of years, after which the facility is returned to the local authority. An example is the use of this approach in schools refurbishment with a ten-year contract period.

The northern European approach

The approach described in this section is used in northern Europe, primarily in Sweden, Denmark, Germany, Austria and the Netherlands. The northern European group is characterised by very comprehensive sets of national standards which tend to act as 'best practice' guides for the industry. Germany probably has the most highly structured approach, with Austria adopting the least structured. There is a saying that 'in France everything is permitted; in England everything is permitted unless it is expressly forbidden; in Germany everything is forbidden unless it is expressly permitted'. This section describes the German approach to illustrate the general principles. The approach in other northern European countries differ in some details.

Germany is a federal republic comprising 16 separate states (*Länder*), each of which has some degree of political and legal autonomy. Law-making and the

exercise of regulatory power is therefore split between the federal government and the local administrations.German regulations governing construction projects (*Verdingungsordnung für Bauleistungen* (VOB)) are published by the federal government.They include a method of tendering for public works, model conditions of contract, standard specification clauses and performance standards for all major building elements, together with guidelines for measurement. These form the basis for virtually all building contracts in both the public and private sectors.Control is achieved through strict adherence to statutory requirements, rigid checking by the responsible authorities and clear definitions of roles and responsibilities of the parties in the industry. Standard contractual procedures are in place (in effect there are only two major forms of contract) and the balance of risk appears to act rather more in the contractor's favour than is usual in the UK system. Contractual relations are enshrined in the German Civil Code (BGB).Under German law, penalties are enforceable for late completion.

Many projects are let on the basis of plans and specifications, and the architect traditionally carries out most of the pre-contract processes including design, preparation of an approximate cost estimate, preparation of the building performance specification (*Leistungsverzeichnis*) and control of the tendering process. The architect also prepares the contract programme and supervises the work on site on behalf of the client. For smaller projects, bills of quantities are sometimes prepared by the architect or the engineer. Quantities may be either firm or remeasured on completion. In Germany contractors are often asked to give details of labour, material, plant and overhead costs for each item. Larger contracts will almost always be let on a lump sum basis based on a performance specification. On the rare occasions when bills of quantities are used for larger projects the quantities will be provided on a 'no liability' basis and contractors use them at their own risk.

In Germany separate trade contracts (*Einzelvergabe*) are still widely used (similar in many ways to the French *lots séparés* system), with co-ordination being carried out by the architect.In recent years the general contractor (*Generalunternehmer*) has grown in importance but it has been reported that a high proportion of commercial clients stated that they would prefer to use a 'tender by lots' approach. General contracting is, however, characterised by a high level of subcontracting. Contractors who specialise in working in this way are termed *Generalübernehmer* or management contractors. Also, as in France, there is a distinction between the trades associated with construction of the structure (*Bauhauptgewerbe*) and those associated with the finishings (*Ausbaugewerbe*). There are echoes here of the French *gros oeuvre* and *second oeuvre* approach. For major German projects where the contractor is acting as main contractor, the 'responsible site manager' (*verantwortlicher Bauleiter*) has ultimate contractual, managerial, financial and legal responsibility for the work on site. It is claimed by some that this emphasis on the importance of site management has led to an extremely professional approach to construction management, which has in turn given rise to high quality work and very competent staff.

Sweden also has historically used a form of the bill of quantities for some projects. If quantities are used they are usually measured by a 'quantity reckoner' (*massberäknar*).

It is common practice for the contractor to be given the right to check the quantities for a project on a stipulated number of days, after which only authorised variations will be accepted. On large schemes the 'building controller' (*byggnadskontrollant*) has replaced the architect as project co-ordinator and is also responsible for site co-ordination and control, progress payments and variations. The building controller is often a building engineer with special training in cost accounting.

In countries using the northern European approach there appears to be a less confrontational approach to contracting, and this may perhaps be due to the fact that the high degree of regulation leaves less scope for claims and disputes to arise. As a consequence it appears that disputes are more often settled by informal negotiation based upon the working relationships developed by the parties, rather than by reference to contract documents. It would appear that there is a greater expectation of team working and that contractors wish to develop longer-term relationships with clients.

Recent years have seen significant developments in the construction industries in northern Europe. In Denmark and Sweden, construction management and design and build contracts have made significant inroads into the market.Whilst partnering and other collaborative forms of procurement are effectively non-existent in Germany, these arrangements have increasingly been used successfully in Scandinavia, in particular in Denmark, Finland and Sweden.

In Germany during the period since reunification, contractors have attempted to seize more control of the development and construction process from the clients by providing more integrated services. This process has seen the development of some design and build contractors (*Totalunternehmer*) and design and manage contractors (*Totalübernehmer*). The limit of this model is the evolution of the *Projectentwickler*(literally a project developer), who takes on the full range of tasks involved in integrating the whole development and construction process.

Public procurement legislation has also been substantially revised in order to bring it into line with EU and GATT requirements. The new government procurement code (*Vergaberechtsänderungsgesetz*) was introduced in Germany in 1999.

The Mediterranean approach

Here we group together the construction industries of Greece, Italy, Portugal and Spain. Although there are similarities between them, particularly in philosophy, there is also more diversity in this group than in any of the others. The similarities between them lie more in the ways in which they differ from the UK system rather than in their similarity to each other.

Public administration in these countries, except perhaps to a lesser degree in Spain, tends to be very bureaucratic and slow to respond. Procedures for public tenders tend to be lengthy, inefficient and expensive. The private sector is characterised by networks of personal and company relationships which influence how the work is shared out.

Contractual relationships are governed to a large extent by national civil codes. The concept of standard conditions of contract outside of the public works area is

often seen as a limit to the flexibility of the parties involved and has not been widely taken up, although standard forms of contract do exist in some areas.

Business relationships are carefully nurtured and maintained, and disputes are therefore subject to very lengthy negotiation. The leisurely pace of the administration of justice in these countries combined with significant inflation rates makes it generally uneconomic to resort to litigation for the settlement of private disputes.

In all of these countries, networks of relationships are fundamental to the way in which business is carried out. Politics and business are very close and those in the network exercise significant control.

Greece

Contractors for public works must be licensed, and the rules governing tender procedures and public works contracts are enshrined in law. Tender documents usually comprise drawings, general specifications, technical specifications and a list of work items that the contractor is required to price. Bills of quantities are not used.

For private sector contracts there is no licensing requirement. Many contracts are negotiated with a single builder and where competitive tenders are used they are usually taken as a starting point for negotiation. The lowest tender may not therefore be accepted.

All construction work must be supervised by a licensed engineer, who is also responsible for financial matters such as interim payments and settlement of the final account. Quantities of work 'as built' are measured by the contractor and used by him or her to compile a final account which is then subject to approval by the engineer. Prices for variations are generally calculated in accordance with a set of rules for the analytical cost of building works published by the Ministry of Public Buildings and Works. Many contracts incorporate a performance bonus. Retention is typically 10% held until the end of the maintenance period (normally 12 months).

Italy

The majority of the industry is trade based but with some general contractors, one or two of whom are very large worldwide companies. Each site is usually supervised by a director of works (*direttore dei lavori*) who is often an architect.

All contractors are required to be licensed with a central licensing authority and, when tendering, must show that the project is within the types that they are licensed to carry out. Before submitting tenders, contractors must usually pay a deposit to the employer, which is refunded to unsuccessful tenderers less a nominal tax. Tenders are let on plans and specifications.

Contracts may be let to a general contractor (who will almost always sublet virtually everything) or on a trade-by-trade basis similar to the French *lots séparés* approach. In this case the client's consultants are responsible for co-ordination. Any disputes are referred to a panel of three arbitrators, one appointed by the client, one by the contractor and one by the court. The arbitrators' decision is binding.

For public work, contractors may be asked to tender either on the basis of their own prices or by quoting a percentage on or off a figure quoted by the client, often derived from a bill of quantities priced in accordance with an official published price list. The successful tenderer is not always the lowest. Procurement law provides a formula for the calculation of a lower threshold; if the discount offered is lower than the threshold then the tender may be rejected on the basis of a qualitative assessment. If the discounted price is higher than the threshold then it must be accepted provided that all of the tender requirements are met.

No standard forms of building contract exist, although there are 'regional' standard forms published by engineering organisations which are often used as a basis for specific projects.

The Italian construction industry was rocked by corruption scandals involving the procurement of public sector works in the 1990s, as a result of which the industry has undergone substantial change. In addition the government has enacted new legislation designed to control public procurement and to improve the quality of completed projects. It is, however, difficult to judge the extent to which matters have really improved.

Spain and Portugal

Most contracts are let to general contractors who then subcontract extensively. Public works contracts are governed by law and tender documents must include conditions and specifications, a general description of the works, priced bills of quantity, a contract programme, drawings and the contractor's qualification details. The law also covers procedures to be followed in awarding contracts, setting out and approval and penalties for non-completion, variations, determination, handover, final account preparation and a variety of other more minor issues.

Traditional procurement is by far the most popular approach, but in recent years design and build and management contracting have gained ground, as has the use of PFI techniques for infrastructural development.

Public sector contracts in Spain are governed by a section of the Civil Code (*Ley de Contracto del Estado*), and the public works contracts regulations are published as the *Boletín Oficial del Estado*. Although private sector contracts are also governed by the Civil Code, there is considerable scope for negotiation in the contract terms. The architectural colleges (*Colegios Oficiales de Arquitectura*) publish a standard contract document, the *Pliego de Condiciones Técnicas y Económicas del Colegio de Arquitectos*, for use in the private sector, but evidence suggests that this is mainly used for small projects. Larger projects almost always use bespoke purpose written contracts.

In Portugal, bills of quantities are often provided as part of the tender documentation and standard conditions of contract and specifications (*caderno de encargo*) have historically been commonly used.

In Spain, contractors are frequently provided with a copy of the official estimate with quantities. Each tenderer then measures his or her own quantities and prices the project in order to arrive at a tender figure that is expected to be lower than the

official estimate. Bills of quantities are occasionally used but there is no standard method of measurement.

Contracts may be awarded either to the lowest tenderer (*subasta*) or, particularly if design is involved, to the most suitable contractor bearing in mind experience, etc. in addition to the tender figure (*concurso*). In some cases the client will estimate the contract value and then approach a suitable contractor to ask if he or she will be prepared to do the work for that price (*contracción directa*).

Private sector contracts in Portugal and Spain are not subject to the same degree of regulation as contracts elsewhere and most contractual provisions are open to some degree of negotiation. Spanish contracts may be one of three types:

- A single figure bid stating the length of the contract period.
- A tender including the contractor's priced bill of quantities.
- A tender incorporating both of the above together with proposals for financial savings.

Tenders may be either 'open' – in which case the work is remeasured and valued on completion – or 'closed' – in which case the bill is taken to be accurate. Contractors will often expect lengthy conversations with the client and his or her technical consultants before submitting a bid.

Architects in Spain have an extremely high status in society, enjoy a considerable degree of legal protection, are highly regulated and on construction projects have almost unlimited power. Architects and engineers are organised into a series of provincial professional organisations (*Colegios Oficiales de Arquitectura*) and any individual must be a member in order to be able to practise. The professional colleges take a substantial role in the procurement process, in that:

- Clients must advise the college when an architect has been selected.
- Before a project may proceed beyond basic sketch design, the client must pay all design fees to the college, which retains a percentage and pays the architect.
- The college, on behalf of the authorities, checks the project for compliance with the appropriate regulations.
- Clients may not apply for a building licence without the college's approval (*visado*).

The colleges are grouped together under a national council (*Consejo Superior de los Colegios de Arquitectura de España*), which has established professional standards, codes of conduct and fee scales, although the latter are being phased out. Separate project managers are rare, with the architect usually undertaking the project management role.

There is no separate quantity surveying profession in Spain; perhaps the closest title and role is the *aparejador*, a kind of technical architect who is conventionally employed by the project architect to produce drawings and bills of quantities for use in tendering. Officially an *aparejador*must also be employed to provide technical on-site direction of the works, but this is often not done. They are, however, often appointed by the client to provide post-contract quantity surveying services such as interim valuations, cost and quality monitoring. As with architects, *aparejadores*are organised into provincial colleges (*Colegios Oficiales de Aparejador*).

By contrast, in Portugal, the engineer is the dominant professional, with architects having virtually no role in project supervision.

The Middle East

The construction industry in the Middle East primarily covers such diverse countries as Saudi Arabia, Kuwait, Egypt, the UAE, Bahrain, Oman and Qatar. There is a history of international consultants' and contractors' involvement in construction in these countries, bringing with them their own views and methods of working. As many of these countries have developed using money from their oil industry it is understandable that they would use companies they were familiar with from the engineering sector. American, German and British companies have had a long association with the region and many of the workforce at project level come from India and Sri Lanka. It is important to appreciate this cultural mix when it comes to understanding how procurement has developed here.

Most of these countries have looked to the global construction industry and adopted what they see as the best and most appropriate legislation. Many British consultants have been involved in advising the governments of these countries on procurement legislation. Civil codes and federal laws differ between the countries however they do all operate in a similar way. It is however notable that the Civil Codes in many Islamic countries include an obligation to contract in good faith.

Most projects are designed fully by a design team with bills of quantities produced prior to being tendered on a fixed price lump sum basis. True open tendering is limited in the region however in the public sector open tenders are sought for expressions of interest in a project and pre-qualification of contractors for certain works is normal. Those that are acceptable are then sent full tender documents, often once they have paid a fee refundable on submission of a bona fide tender.

The bills of quantities use the Principles of Measurement (International) (POMI) as the method of measurement and are often indicative only, leaving the contractor to carry the risk for quantities. On large civil engineering projects however the bills are re-measurable to ensure highly inflated prices are not charged. Tender periods tend to be short reflecting a lack of detail in many bills and mid-tender interviews are normal. A two-envelope system for returning tenders is commonplace with the client opening the tenders. The reason for this approach originally was so that only the compliant technical tenders would be passed forward for commercial assessment, however it is usual to open all of the envelopes as most clients would be keen to see the full range of prices. Whatever the tendering procedure may say it is still common for the client to approach a favoured contractor to ask them to lower their price to match the lowest bid received.

The pitfalls of the traditional approach are well known and tender documents can comprise a large proportion of provisional sums to overcome the lack of detailed design. The main contractor's wet trades will normally be procured directly, with other work frequently being covered by provisional sums that are tendered to specialist subcontractors with the client's involvement and approval.

The region has looked to use a more varied range of procurement strategies over the past few years implementing joint ventures and public private partnerships on large-scale projects in order to share risks and bring in overseas investment. Some clients with a large portfolio of projects have looked to develop strategic alliances with their supply chain, investing greatly in sourcing materials and drawing up agreements with suppliers for substantial discounts on repeat business. This works well in a booming economy when price rises can be a real risk for a developer but is difficult to sustain during a recession.

The contracts traditionally used in this region are those published by the International Federation of Consulting Engineers (FIDIC),[1] with the contract being administrated and controlled by the engineer.Many governments have greatly amended these contracts and published their own versions for specific project types, for example residential, commercial and infrastructure projects. Some areas are still very strongly biased towards the FIDIC 87 suite of contracts whereas others have moved to the more modern FIDIC 99 editions. These have variants for design and build and turnkey contracts but no real management form. The clients in this region prefer to use a lump sum contract with as much risk placed on the contractor as possible. Tight control over the contract sum and its adjustment through the variation process is exercised by most governments and quasi-government organisations. They are keen to be seen to be accountable and able to pass audit checks. In times of recession this is not a problem as contractors needing the work will be prepared to accept onerous terms however, as noted during the 2005–08 boom,clients have to be more flexible in their contract requirements in order to secure contractors at a reasonable cost. The level of mark-up most contractors apply in the area is considerably higher than would be the norm in the UK to cover the problems over receiving payment and excessive risk.

Project sizes have also increased in recent years with large-scale developments being undertaken with associated complex funding and contractual situations. The iconic high-rise towers do need the expertise of international designers and contractors and therefore international working standards have also had to be adopted. International investors have also demanded higher standards of quality in the finished products which in turn has led to more skilled tradesmen being drawn in to satisfy these requirements. Health and safety standards have had to be raised and working and living conditions for the work force have had to be brought up to acceptable standards.

The region has looked to use various procurement strategies over the past few years, implementing joint ventures and public private partnerships on large-scale projects in order to share risks. However working collaboratively and developing mutual trust is not easy in the region.

In the public sector the designers' contracts often include target costs for buildings which, if under- or overestimated, trigger burdensome penalty clauses. The apportionment of risk between the designer and contractor is dictated by the scope of the designer's contract, which may be limited to scheme design or may

[1] FIDIC was previously known as the Fédération Internationale des Ingénieurs Conseils.

include full working drawings. Many of the countries in the Middle East have a similar provision to the French system whereby the architect and contractor are jointly responsible for the condition of the building (excluding fair wear and tear) for ten years following completion and decennial (ten-year) defects insurance is almost universal. Consultants also need to maintain their professional indemnity insurance for a period of ten years following completion of a project.

Many countries have tried to protect their own nationals and companies by insisting on local registration for companies wishing to work in their country and this requires local 'sponsorship'.Tendering for construction work without a local trade licence is not possible in some countries and is often a legal requirement.

The People's Republic of China and the Hong Kong Special Autonomous Region

Historically there was a considerable amount of Western investment in Chinese infrastructure during the period following the Opium Wars in the middle of the nineteenth century, but investment reached a peak following the Sino-Japanese war in the 1890s when the so-called 'great powers' (the UK, France, Germany, Belgium, Japan and the USA) all forced their attentions on China. The first flush of investment in Chinese construction ended in 1911 with the establishment of the Republic of China, but foreign investment of one kind or another continued until the Japanese invasion of China in 1937. After the formation of the People's Republic in 1949, when China allied with Soviet Russia, virtually the only foreign investment came in the form of Russian aid. Germany, however, maintained a quiet presence and the present Chinese legal system was largely based upon the German legal code.

Foreign investment really began to take off again in the late 1970s and early 1980s when China decided to modernise its industry and infrastructure and introduced the open door policy. Investment really boomed following the collapse of communism in Russia.

China is a paradox. Officially it is still a communist country but unofficial capitalism is rampant and gained something approaching official blessing when the then premier Deng Xiao Ping confirmed that 'to be rich is glorious'.

The Chinese construction industry

Modern mainland China has two separate and distinct construction industries: the internal industry, which is still officially state controlled through the Ministry of Construction, and the external industry, which is largely not.

China is also a major exporter of construction services in the world market, competing for large projects and earning valuable foreign exchange through companies such as the China State Construction Engineering Corporation, which has been involved in more than 400 projects in more than 50 countries.

The construction industry in the Hong Kong Special Autonomous Region still continues to generally follow the British approach, although European, Japanese and American construction companies working there have all brought elements of their own approach.

The external construction industry

The external construction industry consists of foreign-funded projects where investors prefer to see their projects built by firms they know and trust and controlled by techniques they understand. Many projects, including those by external Chinese investors, are handled from Hong Kong and tend to follow the conventional British system using modifications of the Hong Kong Standard Method of Measurement of Building Works (HKSMM) and standard forms of contract. Construction may, however be carried out by Chinese firms, and project documents will most often be prepared in Chinese. Other nationalities (e.g. US, Japanese and German) sometimes use their own preferred methods, although many use Hong Kong-based consultants and thus follow the traditional British approach. A number of Hong Kong consultants, including quantity surveyors, have now established branch offices in China. One major difference between China and other countries is that China insists that foreign architects work in partnership with a state-controlled local design institute. This is seen as essential in order to ensure that buildings comply with Chinese regulations and it also aids technology transfer.

Many foreign construction companies now operate in China, although mostly in joint ventures with Chinese firms. In 1995 the American company Bechtel became the first overseas construction company to obtain a construction licence allowing it to tender for projects without a local partner.

The indigenous construction industry

The indigenous Chinese construction industry works rather differently. Traditionally, under the communist system, private ownership of land and buildings was not permitted. Projects were therefore identified by either central or local government administration or by a 'development unit'. An initial budget price for the work was calculated by one of the state-run design institutes using a standard published schedule of rates and funds were allocated in the form of a loan from the People's Construction Bank. Once funds were allocated, the project was designed by the design institute, which also prepared schedules of material and estimates of cost by reference to a standard method of measurement and a schedule of rates sanctioned by the Ministry of Construction. Once the pre-construction estimate had been approved, the work was then given to a state-organised construction work unit, materials were supplied according to the schedule and construction went ahead.

This centrally planned approach has been criticised in recent years as being cumbersome, bureaucratic and uncompetitive and a number of attempts have been

made to introduce some form of competitive tendering.Recent years have also seen the development of the Chinese economy away from communism and towards a system of 'a market economy with Chinese characteristics'. This system appears to be designed to allow China to benefit from capitalist competition while still allowing the state to retain an iron grip on political and economic power. Chinese land law has also been changed: some limited private land and asset ownership is now permitted, particularly in the Special Economic Zones, and the beginnings of a development industry are emerging.

The construction professions

China is also beginning to liberalise its policies towards the construction professions. In the past all construction professionals involved in the indigenous industry were employed by the state, all Chinese university courses were geared towards use of the Ministry of Construction standard documentation, and professional associations were banned as subversive. Graduates therefore tended to be technologists and technicians, following rules laid down by someone else, rather than professionals as the term might be understood in capitalist countries, taking decisions that involve professional judgement.

China is very aware that development of its construction industry towards some kind of competitive model will require a truly professional class. Annual state examinations are now being held for land administrators and construction estimators, and anyone with more than five years' experience can apply. The intention is to turn existing state employees into 'professional' general practice and quantity surveyors or cost engineers. As far as quantity surveyors are concerned, China claims to have 800 000 estimators whom it would like to turn into professional quantity surveyors (as a comparison the Royal Institution of Chartered Surveyors (RICS) presently has somewhere around 70 000 members worldwide across all specialisms). China is also keen to see its professional examinations and degree courses recognised by professional institutions outside China and for some time has been encouraging input from organisations such as RICS, the Institution of Civil Engineers (ICE) and the Chartered Institute of Building (CIOB).

Opportunities for Western companies

China appears to offer many opportunities, although a number of studies have been carried out that indicate that Western construction firms are not likely to get very far on their own. Some Western firms have worked in China, but only generally in construction management or where they have skills or expertise not readily available locally (e.g. building services engineering). Many go through Hong Kong and most overseas joint ventures try to get their affairs governed by Hong Kong law.

The potential market in China is huge but it also has a very large domestic construction industry which China wants to keep fully employed and jealously

protects from outside intervention. China has also historically had a reputation for never buying more than one of anything. Many businessmen over the past 150 years have dreamed that if only they could crack the Chinese market they would be rich – few have succeeded.

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15 Procurement of work to heritage buildings

Introduction

The procurement of construction work to existing buildings has always been arguably more problematic than new-build construction and the problems tend to multiply when the existing building is held to have some particular historical or cultural significance. In general, the older the building the less likely it is that records showing the detail of the building structure exist and the greater the likelihood that specialist expertise, both professional and practical, will be required. Some of this expertise, for example the historical and archaeological skills commonly required to properly 'read' and understand both the form and construction of an existing building and the way in which it was used, will be required only very rarely in new-build construction but are often essential where historic structures are concerned. In addition some of the specialist craft skills, often required as a matter of course in projects involving historic buildings, are becoming increasingly rare and may impose major constraints on the procurement process.

Although this kind of work has always been widely believed to be important, for example in the preservation and repair of significant religious and cultural heritage, it has historically formed only a comparatively minor part of overall construction activity and it has therefore been largely neglected from a procurement point of view. It was pointed out by Davey (1992) that many, perhaps most, of the specialist practitioners commonly engaged in this type of work will not have had the opportunity to work with, and become proficient in the use of, the full range of procurement options available. It is perhaps understandable therefore that:

> Many practitioners will tend to keep with the familiar and adopt a method of procurement which they have used in the past. Although this may produce a satisfactory contract it does not follow that it is the best solution.

There is little evidence to show that, in procurement terms at least, the situation is any different 20 years on, but in recent years the twin desires to protect our built heritage and to ensure greater sustainability in the built environment have sparked a renewed interest in the rehabilitation and adaptive reuse of a wide range of

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existing built assets as an alternative to wholesale demolition and redevelopment, in addition to the historically more common repair and maintenance work. The breadth and scale of such adaptive reuse projects has, in the recent past, ranged over a broad spectrum including:

- In the housing sector, the imaginative refurbishment and adaptation of Victorian terraced housing (Plimmer *et al.* (2008) present a good overview).
- Refurbishment of schools as an alternative to demolition and redevelopment (English Heritage (2010) give some excellent examples).
- Major construction projects designed to display the important features of significant heritage structures whilst at the same time giving them a new lease of life in a totally new context by using them to provide 'state of the art' facilities suited to the modern world. One fine example of a building given a new lease of life is included as a case study at the end of this chapter.
- Projects comprising significant programmes of maintenance and repair, extensions or alterations to historic assets in order to enable them to continue to provide their historic functions but often also with the addition of modern facilities.

Whilst all of the principles of good procurement practice discussed elsewhere in this book apply equally to the procurement of work to heritage buildings, they may need to be modified to take account of the particular challenges which such projects typically present. This chapter presents an overview of these challenges and the way in which they may be met but it must be clearly understood that what is presented here is nothing more than a superficial review. Appropriate measures to safeguard the care and maintenance of the historic or heritage environment will usually require the exercise of a very specialised body of knowledge and specialist advice and expertise should therefore be sought at an early stage.

The heritage challenge

Earl (2003) poses a series of philosophical questions which, he proposes, should be considered by anyone concerned in any way with the care and maintenance of the historic environment. The following issues (paraphrased and condensed) may be particularly pertinent to the procurement of works to heritage structures and environments:

- What are we setting out to achieve?
- What do we mean by historic or heritage structures and environments?
- Why should such structures or environments be treated differently from other structures or environments and how differently should they be treated?
- What are our motives in altering, preserving or conserving rather than merely maintaining and how should those motives influence actions?
- Is every part of the old fabric so sacred that it must at all costs be preserved whatever its state? To what extent might it be permissible to replace worn-out

or disfigured elements and should the replacements be exact copies of the original work or should they be clearly differentiated from it?

- Most historic buildings and environments will have gone through a number of phases of ageing, development, renovation, alteration and reconstruction in the course of their life. If our purpose is to restore the building or environment to its original condition, how is 'original' defined?
- How should the practical consequences of a change of use or an environmental change be accommodated?
- To what extent should we expect the answers to these questions to vary with the age, nature, degree of importance and surrounding environment of the historic structure?

Major issues then which may require consideration in the formulation of an appropriate procurement strategy and programme for such projects will include, amongst others:

- A clear understanding of the type and purpose of the work to be undertaken (for example periodic repair and maintenance, preservation and conservation, restoration, upgrading and refurbishment or adaptive reuse).
- The significance of the existing asset in both historical and cultural terms.
- The degree of statutory protection afforded to the asset.
- Problems arising from the environment surrounding the asset, for example projects carried out in a conservation area or within the confines of a historic estate, which might include the need to preserve the historical, architectural or aesthetic integrity of the asset itself and its surroundings. There may also be a need for archaeological, historical, landscape or architectural investigations at the project inception stage, before and during the design phase, and during the carrying out of the work on site.
- The likely absence of accurate drawings and other records describing the asset and its historical environment and the consequent need for possibly extensive and time-consuming archival study, archaeological exploratory work, measuring and photographic and building condition surveys. Some of these investigations may be particularly time-consuming and expensive, for example there may be a need for special access arrangements (such as the use of scaffolding or hydraulic platforms) or the opening up of elements of the building structure in order to investigate and fully understand the structure and form of the building and its historical, cultural and sociological importance.
- The likely need to prepare additional documentation, for example a heritage impact assessment, conservation statement or a full conservation plan as a prelude to the seeking of planning consent, conservation area consent or listed building consent.
- The likely need to carry out work in a number of separately defined and probably time-separated phases.
- The possibility, and likely availability, of any grant funding for essential repairs and conservation.

Procurement: The heritage context

One of the major difficulties faced at an early stage by those working with historic environments lies in the meaning of the terms used by those charged with protecting the historic environment and whose permission is required before work can be carried out to any structure which enjoys a degree of statutory protection. Conservation, preservation, repair, replacement, reconstruction and restoration are terms which, as Earl (2003) points out to great effect in his essay on the practice of preservation, have historically been used interchangeably. Many construction practitioners inexperienced in the heritage sector would find difficulty in discriminating between them in a modern heritage context.

'Conservation' and 'preservation', at least in terms of their use in connection with historic buildings, are to some extent synonymous and are generally taken to mean the process of arresting the deterioration of historic fabric. The guiding principle of conservation may be summarised as being 'based on a respect for the existing fabric'(ICOMOS 1999). Intervention should not distort the evidence provided by the fabric. The remaining terms are rather more problematic. Repair, replacement, reconstruction and restoration are not in any sense synonymous.

'Repair' implies restoring the functionality of something which has become defective, often by the addition of additional components. Repair of a damaged or decayed structural timber might, for example, comprise cutting out the decayed section and bolting on or piecing in new pieces of timber, perhaps with steel reinforcing plates. English Heritage (Brereton 1995) defines the primary purpose of repair in the context of historic buildings as:

> to restrain the process of decay without damaging the character of buildings and monuments, altering the features which give them their historic or architectural importance, or unnecessarily disturbing or destroying historic fabric.

'Replacement', however, would imply complete removal of the existing damaged timber and insertion of a new timber or, perhaps, a steel section, with no attempt being made to make the work look like anything other than a modern intervention. 'Reconstruction' is usually taken as meaning the process of constructing a modern copy of the historic original.

The modern dictionary definition of 'restoration' in the context of historic artefacts, is 'the process of restoring a building, work of art, etc. to its original condition' (Oxford Dictionary 2011). In effect, it returns the historic fabric to the way it was before it decayed or became damaged. Such a process is plainly problematic; any attempt at 'restoration', even if we were to use traditional materials and techniques, would plainly not return the asset to its original condition, since by definition the new work would not be 'original'. This might appear to be a somewhat pedantic point, but it is, nonetheless, frequently hotly argued among the heritage community. Current authoritative opinions range from that expressed by the Society for the Protection of Ancient Buildings, 'only as a practical expedient on a small scale can a case for restoration be argued' (SPAB 2009a), to the English Heritage (2007) view that:

> Restoration is an intervention made with the deliberate intention of revealing or recovering some element of heritage value that has been eroded, obscured or previously been removed, rather than simply maintaining the status quo. It may also achieve other conservation benefits, for example restoring a roof on a roofless building may make it physically and economically sustainable in the long term.

Even if we accept the English Heritage view, we are faced with a set of further questions, for example:

- If we were to attempt to 'restore' a building or a landscape to a state at which it existed at some time in the past, which particular point in its history would we choose and why?
- Do we have the evidence to be able to reproduce accurately the form, appearance and methods of construction of the missing elements? Worthing and Bond (2008) express the mainstream conservation view when they write that 'restoration of lost features may be justified so long as there is no loss of historic fabric and that sufficient evidence exists for accurate replacement' but the *Venice Charter* (ICOMOS 1964) makes it clear that it is equally important that any modern intervention must be clearly distinguishable from the original fabric 'so that restoration does not falsify the artistic or historic evidence'.
- Are we taking something away from the character and value of what remains by turning an honest (even if heavily repaired, decayed or decrepit) historical artefact into merely a modern copy? A good example might be the 'restoration' of a neglected historic building which, in its unrestored, possibly even ruined, form constitutes an important and valued element in a widely admired and important picturesque landscape.

The practical application of these principles is illustrated in the case study at the end of this chapter.

It should also be noted that the basic philosophy underpinning the way historic built assets have typically been cared for has been perceived differently in different regions of the world and by different cultures. For example in Chinese conservation thinking, buildings tend to be viewed very much as repositories of ideas and collective memory, as reminders of historical events; whilst age is venerated, it is also quite logical to suggest that preserving such buildings in their original, possibly decayed, form might not be necessarily desirable. Modification of such structures at various times, often with the expressed objective of arresting decay but also sometimes with the aim of improved utility, is therefore regarded as perfectly legitimate in maintaining the building 'fit for purpose' (D'Ayala and Wang 2006). Such perceptions were once also current in the western world, but have shifted over time such that much of the work done with the best of intentions during the nineteenth century by some of the most eminent architects of the time is now regarded as nothing less than cultural vandalism. Earl (2003) points out that, in many cases of historical restoration, 'authenticity has not always been an overriding consideration'.

Eugène Emmanuel Viollet-le-Duc, an eminent French architect, archaeologist and mediaeval scholar, believed that restoration was essentially about 're-establishing a state of completion which may never have existed at any given moment in the past' (Earl 2003). His exercise of this philosophy in the reconstruction of Sainte-Chapelle in Paris involved him in demolishing substantial sections of the original mediaeval building and replacing them with his own 'improved' design.

The cathedral 'restorations' by eminent nineteenth-century architects such as George Nicholson, James Wyatt and Sir George Gilbert Scott were heavily criticised at the time by John Ruskin, William Morris and several of their Gothic revival architect peers (for example Augustus Welby Pugin) for their 'destruction' of work originally carried out by, among others, Sir Christopher Wren. Nicholson for example allegedly re-faced Durham Cathedral by chopping between two and three inches of stone from the outer face and Wyatt compounded the sin by putting forward plans to demolish the Norman Chapter House with a view to 'improving' the existing building.

Earl (2003), in a very pertinent observation of the way perceptions of value change over time as societies develop, also makes the point that these men did not perceive what they were doing as anything which would in any way diminish the 'value' of the buildings in their care. Rather, they saw themselves as preserving the value of the building by averting total loss. He concedes that, in many cases, their interventions created unique townscapes, particularly in respect of the settings of buildings such as historic cathedrals, which are now seen as an 'admirable norm, to be preserved in unspoilt completeness'.

Views similar to those of the nineteenth-century architects were once commonly put forward in the name of art. Some commentators have proposed that important historical remains might legitimately be 'improved' to make them artistically more desirable. Pilcher (1947) for example reported that the Reverend William Gilpin, termed by some the 'High Priest of the Picturesque movement', went so far as to suggest, in his 1782 *Observations on the River Wye*, that 'a mallet judiciously used' might render the, in his view insufficiently, ruined gables of Tintern Abbey more attractive.

The modern philosophy underpinning any intervention in heritage buildings has its roots in the Manifesto published in 1877 by the Society for the Protection of Ancient Buildings. The Manifesto (SPAB 2009) established the following four key 'minimum intervention' principles, which still effectively form the bedrock of Western heritage management philosophy:

- The present generation is the custodian of the ancient buildings they have inherited and they should act accordingly.
- Effective and honest repair should always be the first consideration.
- Conservation should do no more than is necessary to look after the building.
- Any permanent new work should be clearly distinguishable from the old and should not reproduce past style.

In 1931 the Athens Conference organised by the International Museums Office established the first attempt at an international code of conservation practice; it was subsequently developed into the International Charter for the Conservation of

Monuments and Sites (ICOMOS) by the Congress of Architects and Specialists of Historic Buildings at a meeting in Venice in 1964. The *Venice Charter* (ICOMOS 1964) became the defining international standard. Subsequent meetings of ICOMOS have published a number of amendments and additions which have had the effect of customising the *Venice Charter* to take account of local circumstances. Arguably among the most significant of these are the *Burra Charter* (ICOMOS 1999) and the *Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas* (ICOMOS 2005). The *Burra Charter* was initially agreed in Australia in 1979 and has been modified on several occasions since. It introduced the concept of cultural significance in addition to architectural and historical significance.

Notwithstanding the above, it is clear that it is not practically possible to preserve in its original state everything which is old or interesting. Sir Neil Cossons, Pro-Provost and Chairman of the Council of the Royal College of Art and Chairman of English Heritage from 2000 to 2007, points out that (Clark 2001, preface):

> Caring for this historic environment is a dynamic process which involves managing change in order to allow future generations to understand what we value and something of their origins. This does not mean keeping everything from the past but it does involve making careful judgements about value and significance. … Crucial to these decisions is an understanding of what matters and why.

Many historic structures, for example much of the eighteenth and nineteenth century industrial heritage and, arguably in the UK, some of the great country houses, have outlived their initial purpose. If they are to survive at all, they must change to accommodate new uses. The problem of course is that as soon as we change the purpose or function of a structure we lose something of the original. We cannot, for example convert an eighteenth century country house into a modern hotel or a nineteenth century cotton mill into residential units or a shopping mall without making compromises. Frequently, it is the extent to which the architectural, historical or cultural significance of the building or its surrounding environment is compromised which is controversial and which has given rise to conflicts between people keen to maximise the profitability of their asset and heritage conservers equally keen to preserve the integrity of the existing building. Nonetheless the concept of adaptive reuse of historic structures to give them a new lease of life is seen as a fundamentally important element in heritage preservation. Russell, Smith and Leverton (2010) present a good overview of the arguments and some excellent examples.

At the root of any successful intervention in the historic built environment lies a clear understanding of the nature and significance of the building and its surroundings; an issue explored in detail by Clark (2001). She adopts a structured methodology termed Conservation Based Research and Analysis (CoBRA), which she explicitly defines as:

> The research, analysis, survey and investigation necessary to understand the significance of a building and its landscape, and thus inform decisions about repair, alteration, use and management.

We therefore need to explore how we might define the significance (the 'value') of heritage buildings and their surroundings and how the assessment of such significance might impact upon the construction procurement process.

The value of built heritage

Professor Randall Mason, a respected academic at the University of Pennsylvania and heritage expert, in the course of a debate at a conference exploring the public value of heritage, is reported to have said (Clark 2006):

> In the US you have to prove that heritage pays; that to protect something will be more profitable than neglecting it. But you also have to realise that, in the case of the heritage vs Walmart, the heritage will never win.

Although Mason's comments were no doubt intended in a light-hearted way, they nonetheless neatly summarise the perennial divide between heritage conservers and commercial interests.

On the one hand conservationists fight to protect and preserve what they perceive to be priceless historic assets which, they contend, often serve both to preserve important elements of local or national history and culture and to provide a community focus through the preservation of what has come to be termed 'collective memory'. On the other hand developers and property owners seek to maximise the commercial worth of their investment. This debate may have very significant impacts upon any associated procurement process. It is also worthy of note that the balance which has historically been struck between these potentially opposing views has tended to shift over time as society's values ebb and flow; compare for example the present vogue for the adaptive reuse of historic buildings with the wholesale demolition resulting from the 'brave new world' approach espoused by the town-centre developers of the 1970s.

Controversial strategic planning and development issues continue to bring the debate into sharp focus; consider the development of the proposed high-speed rail link (HS2) between London and Birmingham, which is said to require the demolition of a large number of historic buildings, and the once abandoned (but now perhaps to be resurrected) scheme for a projected sixth terminal at London's Heathrow Airport which was reported (Beattie 2007) to require the demolition of 'the whole village of Sipson – and 102 listed buildings'.

If Mason's comments were to be held to be universally true, then the only value system which matters would be a financial one and all other notions of value, such as historic importance, cultural significance and aesthetic merit, would be immediately nullified. This is surely an oversimplification: in many countries, the historic built environment receives a degree of protection, usually through some form of listing or scheduling process and through the planning system, although the degree of protection provided is of course subject to politicians accepting a balanced view of the competing demands of the various special interest groups involved. In the UK for example, in early 2012, the extent of the protection offered to heritage assets

through the planning system is considered by many to be at serious risk as a result of government plans to 'rebalance' the planning system in favour of 'sustainable development'.

Such decisions should not to be based solely upon financial considerations, but ought to take into account a fair and balanced reflection of all of the various dimensions of value; the question which then arises is how these alternative dimensions are to be defined. Smith (2010) contends that the following questions are important and presents a review of how these additional dimensions might be measured:

- What aspects of our built heritage should be regarded as 'valuable' and why?
- What 'value' does the built heritage add to society?
- How should we measure how 'valuable' built heritage is both in absolute terms and in relative terms compared to alternatives such as redevelopment?
- How should such 'values' be defined?

Consideration of these alternative dimensions of value, whether in economic, social, cultural or environmental terms, then becomes central to modern notions of how that heritage should be managed, particularly in terms of which elements of our built heritage should be preserved, conserved, restored, maintained, relocated, ignored or demolished or, controversially, whether some of the essence of the built form could be preserved or made available in other ways, thus enabling scarce economic resources, especially land, to be made available for redevelopment.

Tessa Jowell, a former UK Secretary of State for Culture Media and Sport, for example was bold enough to suggest that digital recordings might provide a substitute where the perceived 'value' of redevelopment was seen to exceed the 'value' of preservation (Jowell 2005). Whilst at the time her suggestion was widely ridiculed and effectively dismissed out of hand by the UK heritage community, it has long been recognised that not everything can be preserved and digital methods of recording heritage are already in use elsewhere. Barber *et al.* (2006) for example discuss the use of digital recording in architectural conservation and Siu (2006) describes its use in Hong Kong to record the historic Star Ferry Pier shortly before its very controversial demolition to make way for redevelopment as part of a harbour reclamation scheme.

The alternative dimensions of value also need to consider:

- How heritage issues should impact upon land use and planning policy.
- How large a proportion of society's wealth and other resources should be set aside and how these scarce resources should be allocated between competing heritage demands.
- How heritage resources should be controlled and managed in terms of use and access.
- How and to what extent society should impose controls upon the rights which private property owners presently enjoy in order to ensure that 'valuable' heritage in private ownership is protected and preserved for public benefit.

It must be remembered that it is not simply the significance of individual buildings which is important. Although many inner-city buildings have been preserved in

isolation, modern thinking now recognises that in many cases the true value of an asset, the context of a historic structure, can only be properly understood if it is interpreted either as an integral part of a larger group or as an element in a wider designed landscape.

The importance of cultural significance

The cultural significance of historic assets is a major constituent of value but is extremely difficult to quantify. It is often related not so much to the financial value of assets themselves or their embodied value in terms of their construction but is more to do with their aesthetic value or their symbolic value as repositories of history and memory, a concept neatly encapsulated in the phrase 'buildings are where we store our memories' (MacIntyre 2010). Essentially, a historic asset's cultural significance is its ability to satisfy the needs of the human soul – what we might term in modern language as the 'feel-good factor'.

Clark (2001) picks up the notion of cultural significance in the context of the development of historic assets when she writes that:

> Significance lies at the heart of any conservation action – which for the historic environment means the recognition of a public value in what may well be private property. Historic buildings and their landscapes are significant for many different cultural reasons: for their architecture, for their association with people and memories, beliefs and events or simply because they are old. … That significance may be personal, local, regional, national or international; it may be academic, economic or social. These values can be roughly grouped into academic or scientific values and amenity values, such as the way in which communities value places or the contribution a place makes to the quality of life including economic value.

Cultural significance is not a simple idea. Rather it is a complex and multi-faceted concept which may well mean different things to different cultural or socio-economic groups. It has, in some cases, become almost synonymous with the concept of 'collective memory' but it is important to differentiate between the two. The 'collective memory' of a community may form part of the cultural significance of a heritage asset, perhaps in some extreme cases a major element, but it will rarely if ever be the only aspect of cultural significance to be worthy of consideration. The multi-faceted nature of cultural significance has led some to develop formal typologies which attempt to identify, and in some cases assign weightings to, the individually identified components; these issues are addressed at length by Worthing and Bond (2008).

In terms of the objective assessment of cultural significance, Clark (2001) points out that in a national or international context recognition of the asset through listing or scheduling provides some indication of the measure of importance (the 'value') but she also points out that the significance may be geographically local, or may only apply to some particular, perhaps minority, community group. Debates over the

future of such assets are frequently extremely difficult to resolve satisfactorily, particularly when different stakeholders hold different definitions of the cultural significance associated with a particular asset, each of which is equally worthy in its own way, which may be diametrically opposed. The issue of 'cultural value' is also taken up, perhaps surprisingly, by economist David Throsby (2001, 2006), who argues that cultural assets (including heritage assets) are special because they embody cultural values which, in terms of their contribution to humanity, may well exceed their economic or financial value. He characterises cultural value as comprising the sum of aesthetic value, spiritual value, social value (a sense of identity and place), historical value, symbolic value and authenticity. If this interpretation is accepted, then we must also accept that a purely economic evaluation of a heritage asset may not always be appropriate in representing its actual 'worth'. This point of view is supported by Professor Randall Mason (2005), who writes that:

> The value of historic preservation need not be expressed and analysed only in quantitative terms. Qualitative expressions of the value of preservation often are dismissed by economists simply because they are not susceptible to standard economic (mathematically driven) methods of analysis. But these cultural values – resisting easy quantification and mathematical treatment – are essential to the nature of historic preservation and they must somehow remain part of the discourse on decision-making and other economic discourses on preservation. In other words, applying standard quantitative, market-derived measures of historic preservation will not suffice – a priori – to express the full value of preservation as cultural expression and public good.

The issue of how to define 'the value of heritage' is one which is now at the forefront of the debate about how heritage should be managed and funded in the future. The issue of cultural value, and how it should be assessed, is central to this debate and experts appear to be unsure of how this should be done. Clark (2006) and Smith (2010), amongst others, present a range of observations on different aspects of the problem.

Statutory protection for heritage buildings

Many countries attempt to protect selected elements of their built environment heritage through a variety of scheduling or listing regimes. In the UK, as in many other countries, a distinction is made between listed buildings and scheduled monuments. Any work carried out to a listed building, to a scheduled monument, or within a conservation area will normally require that consent is obtained before work begins.

In the UK, the process of obtaining consent normally requires application to the local planning authority or to the relevant heritage authority (English Heritage, Historic Scotland or Cadw in Wales) prior to the commencement of work. Failure to obtain the necessary consents before beginning work is a criminal offence. There are also a number of statutory amenity societies which must be consulted about

planning applications that affect buildings or landscapes in which they have a special interest. These include:

- The Ancient Monuments Society, founded in 1924 for the study and conservation of ancient monuments, historic buildings and fine old craftsmanship.
- The Georgian Group, dedicated to preserving Georgian buildings and gardens.
- The Victorian Society, dedicated to the preservation of Victorian and Edwardian architecture.
- The Twentieth Century Society, dedicated to safeguarding architecture and design in Britain from 1914 onwards.
- The Garden History Society, dedicated to the conservation of historic designed gardens and landscapes.

Listed buildings

Listed buildings are buildings which are considered to be of such significance that they may be classified as being of national special interest. The major criteria for listing in the UK are:

- Age and rarity: Virtually all buildings dating from before 1700 which survive in anything like their original condition are listed, as are most dating from between 1700 and 1840. A smaller percentage of late-nineteenth and twentieth century buildings are also listed. Buildings must be more than ten years old to be eligible for listing and any building constructed within the previous 30 years would have to be of exceptional importance.
- Architectural interest: This category comprises buildings considered to be exceptionally important because of their architecture, decoration or craftsmanship, or because they represent important advances in materials or techniques.
- Historic interest: These are buildings closely associated with nationally important people or events connected with the nation's social, economic, cultural or military history.
- Group value: These buildings are important because they form part of a particularly important architectural or historic group or are excellent examples of urban planning.

In England decisions as to which buildings should be listed are taken by the Department of Culture Media and Sport with the advice of English Heritage. Similar functions are devolved to the Scottish Parliament advised by Historic Scotland and the Welsh Assembly advised by Cadw. Buildings on the list are graded as follows:

- Grade I buildings (about 2.5% of the total) are of exceptional interest, sometimes considered to be internationally important.
- Grade II* buildings (approximately 5.5% of the total) are particularly important buildings of more than special interest.
- Grade II buildings (approximately 92%) are nationally important and of special interest.

Listed Building Consent must be obtained from the local planning authority prior to the commencement of any work to a listed building. This may be a time-consuming process and preliminary discussions at an early stage with the local authority Conservation Officer are strongly recommended. There is a statutory 21-day period for consultation with amenity societies and other interested parties. Local authorities generally aim to reach a decision on smaller schemes within eight weeks but larger schemes are likely to take much longer. Where the project involves demolition of all or part of a listed building or includes work to a Grade I or II* building (also some classes of Grade II building in London) then the application will be passed to English Heritage, Historic Scotland or Cadw for their expert advice.

Conservation areas

Conservation areas in the UK are defined as areas of special architectural and historic interest. They include:

- Historic town and city centres.
- Historic industrial or fishing communities.
- Eighteenth and nineteenth century suburbs.
- 'Model' housing estates.
- Country houses set in historic parks.
- The route of historic infrastructure such as canals and railways.

In general, conservation areas are designated by local councils and their purpose is to protect specific areas of historic or architectural interest from inappropriate development or alteration. Any work within a conservation area, including alterations or extensions to properties, whether or not they are individually listed, tree cutting and the demolition of any structure will usually require the granting of Conservation Area Consent prior to the commencement of work.

Scheduled monuments

Scheduled monuments are defined as sites or structures of national importance, and are recorded on the Schedule of Monuments compiled and maintained by the UK Government (in England), the Scottish Parliament (in Scotland) or the Welsh Assembly (in Wales) under the provisions of the Ancient Monuments and Archaeological Areas Act 1979. Anyone wishing to carry out any work to, or which is likely to affect, a scheduled monument must first obtain Scheduled Monument Consent from English Heritage, Historic Scotland or Cadw acting on behalf of the Secretary of State for Culture, Media and Sport.

World Heritage Sites

Sites considered to be of worldwide importance are catalogued by the United Nations Educational, Cultural and Scientific Organisation (UNESCO) as World

Heritage Sites. At the time of writing there are 24 such sites in the UK, 20 of which are historic buildings. UK World Heritage sites are administered by the Department of Culture, Media and Sport and all of the buildings included are also either listed or scheduled as historic monuments in their own right.

Managing change in the historic environment

It is clear that, in order to develop a workable procurement strategy for a scheme which involves work to a historic building or a historic landscape, we must demonstrate that an acceptable balance can be achieved between meeting the needs of the client and protecting the interests of other stakeholders. The interests of the client will usually be based upon a commercial decision and achieving the optimum result from the client's point of view will impose both time and cost constraints; in the case of work to a historic building or a historic environment these factors will themselves be constrained by the demands of the historic asset itself. These may not be purely financial and need not necessarily be negative.

English Heritage guidance (Clark 2001) states that the value of a heritage asset should be made explicit through an evidence-based conservation plan or conservation statement and that this will normally be regarded as an essential support to any competitive application for funding from organisations such as the Heritage Lottery Fund.

Planning for conservation

It has already been established that a clear understanding of the history, value and significance of a particular heritage building or site is an essential prerequisite to the commissioning of any construction work which will affect it. Indeed Worthing and Bond (2008) assert that it is only on the basis of this information that an acceptable management strategy for the asset may be developed. Any subsequent work to that asset, be it periodic repair and maintenance, restoration or reconstruction or future change of use may then be procured in such a way as to ensure minimum impact upon those key attributes of value and significance.

Prior to procuring any significant interventions to a heritage asset, a conservation plan or conservation statement will be required. A conservation plan is a detailed document which may be very time consuming to prepare. It is essential for some buildings but may not be appropriate for less important structures. An outline or 'skeleton' conservation plan, usually called a conservation statement, may be sufficient for some buildings.

Conservation plans

A conservation plan is defined by Kerr (2004) as 'a document which sets out what is significant in the place and, consequently, what policies are appropriate to enable that significance to be retained in its future use and development'. It is important to

note that conservation plans should not be seen as essentially negative, placing unnecessary constraints on the future use of a building or site. A conservation plan is usually prepared in the knowledge that assets will evolve over time and, as Worthing and Bond (2008) point out, 'the challenge, which the conservation plan must address, is how to manage change whilst protecting and enhancing that which is embodied in and represented by the site – that is its cultural significance'. Clark (2001) is even more explicit in stressing the positive aspects, when she writes that 'understanding a building at risk can help identify constraints and opportunities *and thus contribute to bringing buildings back into use*' (emphasis added). A conservation plan involves:

- Research to identify the building's value.
- Assessment and articulation of the relative significance of its value from the point of view of all the stakeholders involved.
- Assessment of the extent to which its value may be vulnerable.
- The formulation of potential strategies, policies and practices which will mitigate those vulnerabilities, whilst safeguarding the future use of the asset.

Conservation statements

A full conservation plan is essential for exceptionally significant buildings (for example all buildings listed as Grade I, all Scheduled Monuments and most buildings listed as Grade II*). In contrast, a conservation statement may be sufficient for buildings of lesser importance. A conservation statement uses readily available information sources to formulate a statement of the site's cultural significance, identify major conservation issues and formulate an outline policy for the development of the site.

Asset management plans

A conservation plan or conservation statement forms the foundation for the development of an asset management plan. A management plan develops the policies and processes outlined in the conservation plan or statement and uses them to inform and develop further processes designed to manage the asset in the future, usually through an on-going programme of preventative maintenance, repair, conservation, reconstruction or adaptive reuse. It is a fact of life that, in the modern world, the majority of heritage buildings must 'pay their way' and that finding new uses for old structures, perhaps even, *in extremis*, partial or complete demolition of some elements, may be necessary in order to secure the survival of more important elements of the structure. It should therefore also be noted that it is an important function of the management plan to address and resolve any difficulties and conflicts which may arise between the often rather altruistic conservation plan considerations and the harder-edged and more controversial financial and commercial considerations implicit in the management plan objectives.

Heritage Impact Assessments

A further important tool in the process of assessing the impact of change on the historic environment is the Heritage Impact Assessment (HIA). An HIA, which may be seen as analogous to an Environmental Impact Assessment, is usually prepared in parallel with the initial conservation plan, and developed and extended in parallel with the asset management plan in the event of specific proposals for major interventions to, or adaptive reuse of, the site. It formally assesses the impact (positive as well as negative) which proposed changes may have upon the significant historical and cultural values associated with the building or its environment. Comparative HIAs prepared to assess the relative impacts of a number of alternative schemes may form a useful component of project option appraisal and risk management strategies.

The planning process

Clark (2001) sets out a detailed formal methodology for preparing conservation plans and conservation statements and for carrying out Heritage Impact Assessments within the broader Conservation Based Research and Assessment (CoBRA) framework based upon the following key stages:

(1) Establish the need and justification.
(2) Specify the work.
(3) Define the significance of the building or site.
(4) Establish the impact of the proposals upon the significance.
(5) Mitigate or reduce the impact to acceptable levels.

A conservation statement or full conservation plan, together with an asset management plan and an HIA, may be required as part of an overall Environmental Impact Assessment, as part of an application for funding by national bodies (such as the Heritage Lottery Fund) or international funding organisations (such as the World Bank), as part of a consultation process or as part of an application for the granting of consent (whether planning, scheduled monument, listed building or conservation area consent) by a local authority or national body. The decision as to whether a conservation statement will suffice or whether a full conservation plan is required would need to be agreed at an early stage between the project conservation advisor, where one is appointed, and the appropriate statutory bodies.

Processes such as those outlined above are potentially both time consuming and expensive. Due allowance will therefore need to be made by the procurement advisor, both in decisions regarding appropriate procurement methodologies and in any pre-contract project budgets and programmes.

The role of the conservation advisor

Conservation advisors are typically employed either by a body responsible for granting permission for planned work to take place (for example a local authority)

or as a member of the project team by those seeking to obtain such permission. In either case the work which they carry out will be similar.

It has already been established that specialist skills and advice are required whenever any work is to be carried out to a historic structure; the procurement team should therefore include relevant specialist conservation expertise. Where a traditional design-led process is envisaged, it would be common to select an architect specialising in this type of work, but if this is not the case then a consultant conservation advisor, typically a chartered surveyor with conservation experience or a member of the Institute of Historic Building Conservation, should be considered. In the case of larger schemes or particularly significant buildings, it is also desirable that other members of the consultant team, for example the quantity surveyor and the structural and mechanical services engineers, also have some background in working with heritage buildings.

In the early stages of a project, the central role of the conservation advisor will be to provide advice and guidance to the client and the project team in respect of the important historical and cultural aspects of the structure and its environment. It is therefore likely that the conservation advisor may lead the team preparing the conservation plan or conservation statement, will subsequently advise the client and his team in the preparation and consideration of commercial option appraisals relating to possible future projects, and will be a member of the team which prepares any subsequent asset management plan or Heritage Impact Assessment.

As the project develops, it is likely that the conservation advisor will be retained:

- To advise on any negotiations with interested parties such as the local authority conservation officer, English Heritage, statutory consultees and other stakeholders.
- To provide specialist input to design and specification issues.
- To oversee any pre-contract building or site investigations.
- To advise on risk or contingency allowances to be included in any project documentation.
- To advise upon the selection and appointment of consultants and contractors to undertake the work.

Post contract, the conservation advisor may be retained to provide advice as required on any issues of a historical or archaeological nature which may arise during the construction process. The role of the conservation advisor is discussed in detail by Clark (2001).

Procurement processes and procedures

It has already been established that work to heritage buildings and sites is generally subject to much greater risk and uncertainty than more conventional projects and there is a danger that this may lead to significant time and cost risks both at tender stage and during the construction period. It is therefore much more difficult to manage these projects such that business plan objectives, in particular value for

money (however that may be defined), are achieved. In the past this problem has frequently been addressed simply by including higher than normal contingency sums or by including provisional sum allowances for unforeseen work. Neither of these approaches is particularly effective.

In an attempt to limit risk exposure on heritage projects, some organisations who regularly work in this area have developed standardised procedures for the procurement of projects of this type. One good example is the procedure developed by the government of the Republic of Ireland (Irish Government 2011). Many of the risks may be minimised by adopting a strategy in which the project is divided into two separate contractual packages:

- An investigation contract designed to obtain sufficient information to allow comprehensive designs and specifications for the work to be prepared.
- A works contract under which the construction work may be carried out.

Procurement of the works contract is likely to be straightforward, but particular care may need to be taken with the investigation contract. It is likely that common sense will dictate that some minor elements of the permanent construction work may need to be included within the investigation contract, particularly when the investigation contract includes items for opening up and exposing elements of the structure. It is however important to ensure that there is a clear division between the two contracts, with the majority of the construction work being carried out under in the main contract.

The investigation contract

The purpose of the investigation contract is to allow comprehensive designs and specifications for the main construction work to be prepared. Thus, it should limit the risk of time and cost over-runs on the main contract. Depending upon the type of project, the scale and scope of the work required may be very varied, ranging from desk-based evaluations to complex underground archaeology or a complete and detailed archaeological survey of an existing structure. English Heritage (1994a) provides a useful guide to the building investigation process and Barber *et al.* (2008) present a comprehensive good practice guide to managing archaeology within the development process.

The type of field work involved may range from the excavation of trial pits through the opening up of inaccessible areas of a structure for examination and permanently or temporarily making good elements which have been disturbed to a full scale archaeological survey of a site or structure. The costs involved may be considerable; Heaton (2007), for example, writes that archaeological excavations at the Bath Spa site cost some £500 000 at 2007 price levels.

The investigation contract is therefore a stand-alone contract in its own right and may need to be the subject of a stand-alone procurement exercise, the scope and scale of which will be largely dependent upon the type of work likely to be required. Heaton (2007) states that, historically, even the largest of archaeological contracts have been let using rudimentary documentation often using a simple

lump sum contract. He makes a powerful case for such projects to be let using remeasurement contracts based upon a schedule of rates to provide improved cost transparency.

Plainly for small contracts, a simple contract such as the JCT minor works form, suitably amended, might be sufficient, but for larger projects a more complex form such as the JCT Intermediate Contract or the NEC3 Short Form, again suitably amended and accompanied by a Schedule of Rates listing the range of work items expected to arise might be a better choice.

In 2004, the Institution of Civil Engineers published the *ICE Conditions of Contract for Archaeological Investigation* to provide for archaeological excavations in connection with civil engineering works. The form has now been rebadged as the *Infrastructure Conditions of Contract Archaeological Investigation Version 2011* and is currently published jointly by the ACE and the CECA.

A case study in the procurement of work to historic buildings: The Derby roundhouse

The purpose of this case study is to illustrate how some of the issues and difficulties associated with the procurement of construction works to historic structures may be addressed. With the exception of the historical background, the case study has been compiled largely from information provided by the project architect, Ian Harris of Maber Architects; the project quantity surveyor, Steve Fernie of Armsons; and Mike Atkinson of the contractor, Bowmer and Kirkland.

The case study concerns the rehabilitation and adaptive reuse of a group of iconic buildings, remnants of the former Midland Railway's Derby Locomotive Works, later the British Rail Engineering Ltd (BREL) Derby Locomotive Works. The buildings became redundant following the closure and demolition of the majority of the site in the early 1990s. The remaining buildings comprise the roundhouse (Figure 15.1) and part of the associated workshops, originally built for the North Midland Railway, together with a detached engine house and workshop building, originally built for the Midland Counties Railway.

A number of attempts were made over a period of some 20 years to find alternative uses for the buildings, none of which were successful, and the buildings consequently languished on the English Heritage Buildings at Risk register from the date of its first publication. By the early 2000s, when the present scheme was first initiated, the buildings had suffered fire damage and were in a serious state of decay (Figure 15.2).

Finally, in late 2007, construction work began to rescue the buildings and they now form the core of the Derby College city campus. The completed project was chosen by English Heritage as one of 20 exemplary projects (English Heritage 2008), was awarded a Heritage Award by the East Midlands Centre for Constructing the Built Environment in 2009, and was chosen by the Royal Institution of Chartered Surveyors as Project of the Year 2010.



Figure 15.1 The Derby roundhouse.

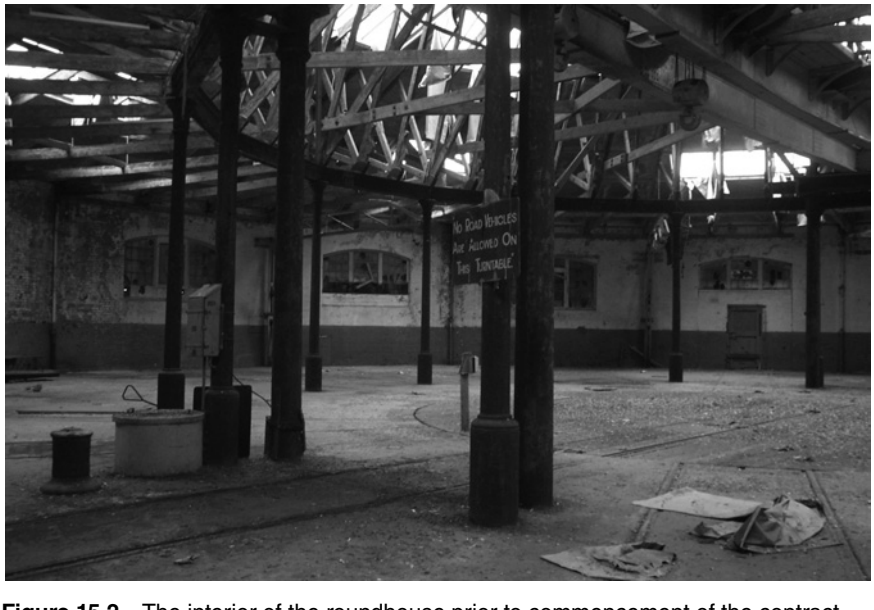


Figure 15.2 The interior of the roundhouse prior to commencement of the contract. (Source: Maber Architects.)

The existing buildings: historical background

The Derby roundhouse together with its associated engine and carriage workshops, was built for the North Midland Railway as a part of the 'Tri-Junct' station scheme (Higginson 1989) to provide joint railway facilities at Derby for the North Midland, Midland Counties and Birmingham and Derby Junction railway companies. The station complex – comprising the station building, the adjoining Midland Hotel (for first-class passengers), the Brunswick Inn (for second-class passengers), the roundhouse and attached workshops, warehousing and workers housing – was designed for the North Midland Railway by Robert Stephenson, joint engineer to the railway with his father George, and the very talented railway architect Francis Thompson (Biddle 1986; Simmons 1991). The complex was built by Thomas Jackson of Pimlico, London (Billson 1996) and opened in 1840 to considerable critical acclaim: the contemporary critic Francis Whishaw (1842) wrote of:

> the admirably contrived and elegant roofs, the spacious platforms, the great length of the whole erection extending to upwards of a thousand feet, – all unite in rendering it the most complete structure of the kind in the United Kingdom, or, perhaps, in the world.

The Midland Counties and Birmingham and Derby Junction railway companies each built their own maintenance facilities on the site and paid a fee to the North Midland for the use of the station until all three companies were merged to form the Midland Railway in 1844. Sadly, the main station building was, somewhat controversially, redeveloped between 1952 and 1985 and the facilities built by the Birmingham and Derby Junction Railway have also been demolished.

The North Midland roundhouse and workshops were designed in 1839 and constructed in 1839–40 at a cost of £62 000 (Glover 1843). Trains ran from a temporary platform until the main station was completed. Robert Stephenson was responsible for the basic engineering layout of the station complex but he appointed Francis Thompson to carry out the architectural work on the line, a collaboration which continued for many years on subsequent schemes. The design of the station complex was therefore the result of collaboration between Thompson as architect and Stephenson as engineer. Billson (1996) attributes the design of all of the North Midland buildings on the site to Francis Thompson. The station and the Midland Hotel lie on one side of the main running lines and the roundhouse complex on the other. The three were linked by an underground tunnel several hundred yards long in order to provide safe passage without crossing the running lines. At some time prior to 1880, the tunnel was supplanted by an overhead footbridge from the station which ran into the roundhouse at first floor level above the main entrance door. The opening cut into the existing arch and the cast iron beam inserted to carry the end of the bridge are both clearly visible in Figure 15.3. The bridge was later removed and was replaced with a more modern structure which came to ground level outside the roundhouse complex. The tunnel was blocked some years ago, but the entrances to the tunnel still existed at the commencement of the present scheme. The entrance to the



Figure 15.3 Main entrance to the roundhouse offices.

roundhouse complex, which was located in the basement of the old engine shed wing, was blocked off in the course of this contract.

The polygonal roundhouse was one of three built between 1839 and 1840, all on lines engineered by the Stephensons, the other two being at Miles Platting on the Leeds and Manchester Railway and at Curzon Street station in Birmingham on the London and Birmingham Railway. All are described in varying degrees of detail by Whishaw (1842), himself a professional civil engineer, and all appear to have been of a similar form. Like Derby, Curzon Street is said to have 16 lines of rail with space for 30 engines and they are of a similar size (Curzon Street being 124 feet in diameter as against Derby's 130 feet). The major difference between the two seems to be that on the Curzon Street building the central portion was left unroofed, a situation which Wishaw considered very inconvenient and which prompted him to comment that 'a sky-light with proper means of ventilation would . . . answer the purpose much better'. The fact that the Derby building had both skylights and a ventilated lantern would appear to point to this being a development from the earlier Curzon Street design. Whishaw plainly considers the roundhouse design to be an evolving standard, simply describing the Miles Platting building as 'of polygonal form, according to Mr. Stephenson's usual plan'. The Curzon Street and Miles Platting buildings have both been demolished, leaving Derby as the oldest surviving roundhouse in the world.

In fact the construction of circular workshops laid out in a radial fashion was well known at the time the early roundhouses were designed. One of the best

documented is the Round Foundry constructed in Leeds about 1802–03 by Fenton, Murray and Wood. This building is described in a letter accompanied by a sketch written by James Watt Jr in the course of an industrial espionage expedition to Leeds in 1803 (Leeds Engine Builders 2012):

> Fame has not outdone the magnitude of Murray's new Edifice, it is a rotundo of about 100 feet in diameter with a magnificent Entrance. The Engine is to stand in the middle and the lower rooms to serve as deposits for Engines & other finished goods. The Upper rooms to be for fitting. It is an excellent building & will not look amiss. It is up to the top of the 2nd storey.

Fenton, Murray and Wood built railway locomotives at the Round Foundry from the very earliest days of railway development, supplying the first two locomotives for Blenkinsop's Middleton rack-railway in 1811–12 and building engines to George and Robert Stephenson's designs from 1831 (Grace's Guide 2012). Both George and Robert Stephenson would certainly have known the Round Foundry well and one might reasonably hypothesise that it, or something like it, acted as the inspiration for their later buildings.

The Derby roundhouse was plainly seen as something of a local wonder and excited detailed comment in tourist guide books of the time (see for example the work of Allen and Allen 1840). Glover (1843) described it in the following terms:

> The engine-houses and workshops . . . of the North Midland are very tastefully and admirably constructed. The engine-house is a polygon of sixteen sides, and 130 feet in diameter, and from the floor to the top of the lantern, 48 feet 10 inches, viz. the height of columns 18 feet, roof 23 feet, and lantern, 7 feet 10 inches. The dome or conical roof is lighted by 48 windows. The exterior covering is of slate laid upon board, firmly screwed to the roof beams. Its spacious area will contain more than thirty engines, which may be moved with the greatest facility to any part of the building, by means of 16 lines of rails radiating from a central turntable. To the right are the engine workshops, 184 feet 6 inches long, 70 feet 6 inches wide, the truss beams of the floor supported by 20 massive cast iron columns; the smithy attached is 42 feet long, of the same width. To the left are the carriage workshops, 191 feet 6 inches, by 70 feet 6 inches, the truss beams of the floor of the largest are supported by 16 cast iron columns. These buildings form oblique wings to the polygon.

Whishaw (1842) adds that 'there are two entry-buildings or lobbies, over which are tanks of water for the supply of the locomotives. … Abutting on each of the lobbies … are the turneries, smithy, and other workshops'. The lobbies are plainly apparent in later plans of the Derby Works. What is claimed to be a contemporary drawing of the Curzon Street building (Warwickshire Railways 2012) appears to show a similar single lobby and water tank arrangement. The central turntable, originally hand-cranked but converted to electrical operation many years ago, is still *in situ* and is preserved in the completed scheme.



Figure 15.4 Aerial view of the completed scheme. (Source: Bowmer and Kirkland Ltd.)

Billson (1996) writes that the original Thompson scheme included single-storey works offices linking the two workshop wings, surmounted by a stone campanile. It is known (Smith and Groom 2010) that the John Whitehurst clock was built in 1840 and that the clock face was originally located in the circular opening at the top of the campanile. Billson records that, in 1859–60, the office buildings were raised by an additional storey and a timber cap surmounted by a weather-vane was placed on the top of the clock tower. The office block was raised by a further storey in 1883 and the timber cap to the clock tower was removed and the clock and the original weather-vane were re-sited in the present timber housing. All of these alterations are clearly evident in Figure 15.3. The somewhat incongruous change in roofline across the top of the campanile is believed to be due to replacement of the roof to what remained of the right wing following a fire in the 1950s.

The roundhouse continued to be used as a repair facility until the mid-1980s, at which time it was being used by BREL for the refurbishment of large rail-mounted cranes. After that it seems to have been used as a store.

The roundhouse, the office building and what remains of the 'oblique wings' described by Glover are clearly seen in Figure 15.4. The carriage shop to the left of the clock tower is clearly visible but the engine shop to the right was demolished after being destroyed by fire in 1950. A plan of the Derby Locomotive Works dated 1950 clearly shows that the engine shop was, by then, being used for 'Loco Stores' and the carriage shop was being used as the millwright's shop (loose_grip_99 2012). The roundhouse and carriage workshop are listed Grade II* (English Heritage 1977a, 1994b) and the clock tower is listed Grade II (English Heritage 1977b).



Figure 15.5 The Midland Counties Railway Engine Shed and Workshop with the new Stephenson building in the background. (Source: Maber Architects.)

The Midland Counties engine shed and workshop building is the one- and two-storey red brick structure shown in Figure 15.5. It is now linked to the roundhouse complex by the new Kirtley building. The engineer for the Midland Counties line was Charles Blacker Vignoles; Billson (1996) records that the tender specifications for this building were issued from the engineer's office in Leicester in April 1839. He provisionally attributes the design of the building to a Leicester architect, William Parsons, who was responsible for the design of the company's Leicester station.

Glover (1843) was somewhat less impressed by this building than by the roundhouse, describing it merely as 'a spacious engine shed 134 feet by 52 feet, and workshops 200 feet by 93 feet, the repairing shop is 93 feet by 88 feet; these are substantial brick buildings'. A comparison of Glover's description with Figure 15.4 will show that this building has also been substantially altered since it was first constructed and this is confirmed by the English Heritage list description (English Heritage 1994c) which grades the building as II* and describes it as a 'railway workshop incorporating former beam engine house, fitting and turning shops and smithies, latterly pattern shop and store … with C19 and C20 alterations and additions'.

The North Midland, Midland Counties and Birmingham and Derby Junction Railways merged in 1844 to form the Midland Railway. It made Derby its headquarters and the Derby complex became the Midland Railway Locomotive

Works. Expansion of the works meant that by 1876 production of carriages and rolling stock was transferred to the new Derby Litchurch Lane works, leaving the original works to become a major centre of locomotive building and maintenance for the next 100 years.

The genesis of the project

By mid-2002 the majority of the old locomotive works site was already in the early stages of redevelopment as Pride Park, a major new business and leisure hub centred around the new Derby County Pride Park football stadium. The roundhouse site, seen as a 'flagship' site in Derby Cityscape's master plan to bring £2 billion pounds worth of investment to Derby city centre, was proving very problematic because of the need to find a new use which would both protect and preserve the important listed buildings and would also permit some degree of public access.

The opportunity to use the site for educational purposes arose out of the creation in 2002 of Derby College from the merger of three existing colleges, Wilmorton College, Mackworth College and the Broomfield Hall Agricultural College. The newly created vocational college needed a city centre location close to existing transport links and the college principal, David Croll, took the very brave decision to redevelop the roundhouse site; he became the project's 'prime mover'. The site was seen as a particularly appropriate choice firstly because the vocational nature of courses to be delivered on the site (including engineering, construction, computing and art and design) echoed the site's industrial history and secondly because of the site's strong community links embodied in the memories of the many former workers still living in the city.

Maber Architects, who already had an established reputation as conservation architects, were appointed in 2003, having completed a previous scheme for the college. English Heritage were involved from the beginning of the scheme and report (English Heritage 2008) that they were:

> confident about the ability of the architects and … [were] … from the start, supportive of the overarching vision for the site … [helping] … the local authority to feel similarly confident that the scheme was going to succeed.

A conservation plan and building surveys had been prepared for the site several years previously and English Heritage (2008) report that the project passed smoothly through the planning process. The ground surrounding the buildings had already been excavated to a depth of some 500 mm as part of the wider demolition and remediation contract for the site as a whole and there was, therefore, no need for a further archaeological survey.

The final scheme

The brief for the new development was, in essence, deceptively simple – to provide approximately 18 500 m^2 of twenty-first century vocational teaching and learning space for approximately 2500 students, whilst protecting and preserving as much as



Figure 15.6 'Honest repair' – no attempt is made to make the repair look like anything other than a modern intervention.

possible of the existing listed buildings. In reality, pre- tender processes including development of the brief, project design and securing the necessary approvals and funding for the project took almost four years.

Modern conservation practice holds that interventions to historic fabric should be kept to a minimum and that modern interventions and repairs to existing buildings should, in general be clearly distinguishable from the original work. The architects for this scheme have attempted wherever possible to do this by following the William Morris principle of 'honest repair', with no attempt being made either to disguise the repairs or to make them look like anything other than a modern intervention (see Figure 15.6).

Wherever possible, for example in the case of all brickwork repairs, the work was carried out using reclaimed bricks from elsewhere on the site; where it was not possible, for example in the case of the re-slated roof to the roundhouse, considerable efforts have been made to source reclaimed replacements which match as closely as possible those used in the original building. In only a few instances has it been necessary to intervene to improve, rather than repair, the historic structure. The issue of restoration of missing elements is also a vexed question. Contemporary thought is that, particularly with important listed structures, the restoration of missing features should be approached with great care and, in general terms, imitation of historic features should not be attempted unless there is clear evidence of the form of the original.

Both of these issues were relevant in the case of the roundhouse roof, where the architect proposed to reinstate the missing lantern to the apex of the roof, which had been removed some years earlier. Historic photographs provided sufficient detail for English Heritage and the conservation officer to agree to the restoration but computer modelling of the existing rather unconventional



Figure 15.7 The interior of the refurbished roundhouse.

inverted timber truss structure, allegedly designed by Robert Stephenson himself and therefore of exceptional historic significance, revealed that the design was inadequate to carry the additional load. Additional timbers had therefore to be introduced in positions approved by the conservation officer to make the roof structurally sound.

A further issue concerns the reversal of earlier alterations. There is a strongly held view by some conservation officers that alterations become part of the building's life and history and should therefore be preserved. In the case of the roundhouse office block, the timber windows to the second floor to the right of the clock tower were replaced, probably after the 1950 fire, with much larger steel windows. The architect considered it desirable, on aesthetic grounds, to remove the later windows and reinstate the openings to their original size with new timber windows to match those on the opposite side of the tower.

The final scheme uses the existing roundhouse to provide a 'social hub' and visitor centre for the college. It also provides a space which can be used for external functions (see Figure 15.7). The adjoining former carriage shop is now used as a library and resource space and a multi-purpose theatre (Figure 15.8) and the original Midland Railway building provides teaching space for catering and hospitality courses (Figure 15.9) together with general office space. The original office building and clock tower, now named the Thompson building, contains office accommodation for administration staff.



Figure 15.8 The interior of the old carriage shop. Note the prefabricated 'learning pods' on the upper floor. (Source: Maber Architects.)



Figure 15.9 The new training restaurant, with the training kitchen in the background, in the old Midland Counties workshop building.



Figure 15.10 The new Stephenson building. (Source: Maber Architects.)

It is a further fundamental principle of adaptive reuse that modern interventions should be, as far as possible, reversible so that the building could be returned to its original state if required in the future. The requirement for small differentiated spaces (for example offices for teaching staff or seminar rooms) has therefore been met through the provision of self-contained prefabricated 'pods', delivered to the site complete with all services and finishings pre-installed and located within the existing spaces. The pods are designed to echo railway carriages (see Figure 15.8), thus further reinforcing the character of the existing spaces.

The existing buildings are complemented and supplemented by two major new structures, which aim to capture in a modern way, in terms of their form and structure, the spirit of the early railway pioneers. The Stephenson building (Figure 15.10) provides 24 classrooms and 12 workshops dedicated to construction, hair and beauty, and art courses. It was very carefully designed to provide maximum value for money.

The Kirtley building, which links the old carriage shop and the Midland Railway buildings, houses the college's engineering department and is noteworthy for its innovative use of 'chameleon glass' technology. The glazed curtain walling to the front of the building is coated with a dichroic film, which enables the glazing to change colour depending upon the angle of view (Figure 15.11).

The architects, supported by the consultant quantity surveyor and a number of key specialist companies, conducted a rigorous value management exercise as a part of the design process for the Stephenson and Kirtley buildings, which delivered substantial benefits. The Stephenson building achieved a BREAM Very Good rating for an all-in cost of £1035 per square metre, compared to the Learning and Skills Council norm at the time of £1235 per square metre.



Figure 15.11 The new Kirtley building.

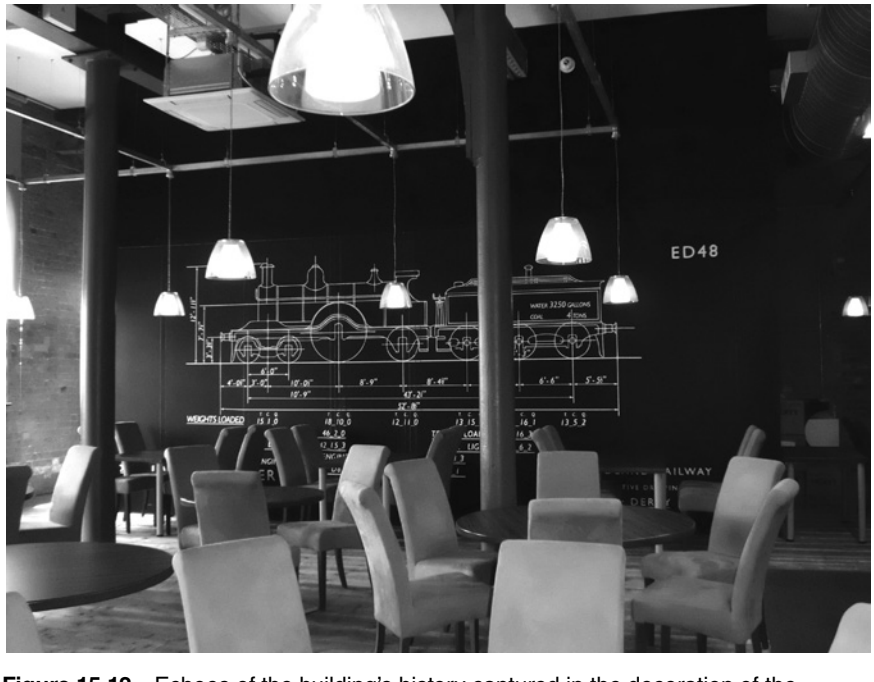


Figure 15.12 Echoes of the building's history captured in the decoration of the training restaurant.

The spirit of the original buildings is also perpetuated in the interior design, which features wall-sized images of notable figures associated with the site and representations of various aspects of steam railway technology (see Figure 15.12).

Site surveys and pre-tender investigations

The extended pre-contract period for this project meant that the architects had time to complete detailed surveys of the existing structures before tenders were invited. In addition to normal building surveys, a number of specialist surveys, including a full asbestos survey, were also carried out.

As an example, detailed brickwork investigations were carried out in conjunction with the local conservation officer and a specialist masonry conservation contractor. Detailed plans were formulated as to the methodologies to be used for brickwork replacement and repair, including specially designed mortar mixes. All of the existing brickwork was heavily stained with soot and defaced with modern graffiti; careful trials were made, also in conjunction with the masonry contractor, to determine the most appropriate methodology and specification for cleaning. The architect reports that there was considerable discussion between himself and the local conservation officer as to whether cleaning was to be permitted at all or whether 'the soot was listed'. The final decision, supported by English Heritage, was that cleaning should be permitted, perhaps on the grounds that if it was not then it was unlikely the adaptive reuse would go ahead at all. A similar approach was taken in respect of the metal and timber windows. Specialist engineers Hutton and Rostron carried out a detailed micro-core survey of every piece of remaining structural timber and the project consultant structural engineers prepared a detailed schedule of timber repairs which was included in the tender documents.

Specialist contractors employed during this stage were paid a fee and no guarantees were given as to whether or not they would be invited to tender for the actual work.

The tender process

The tender process was conducted under OJEU rules, with a prequalification exercise followed by a formal invitation to tender. Bids were invited from five contractors using a two-stage process based upon the JCT 98 Standard Building Contract Without Quantities incorporating a Contractor's Design Supplement for the mechanical and electrical services. The unconventional approach adopted towards the building services installations was brought forward with the intention of accessing value for money and market testing from design to installation, which was perceived to be frequently lacking in a more traditional consultant-led design process. The approach was not unanimously embraced by the project team; in post-completion review it was agreed that it delivered fewer benefits than hoped for and did not promote holistic solutions.

Tender documents comprised detailed drawings supported by full NBS specifications, specialist schedules and a detailed cost plan. Bids were submitted on a

lump sum basis with a Tender Price Analysis based upon an annotated version of the tender cost plan, with the contractor's profit and overhead percentages declared, supported by a detailed written submission.

The extended pre-contract period meant that by the time tenders were invited the architects and quantity surveyor had a detailed knowledge of the existing buildings. Risk was managed at this stage through the use of defined Provisional Sums for specific known risk items, supplemented by the inclusion of a contingency sum worth approximately 8% of the predicted contract value. The contract documentation included no Prime Cost sums or defined subcontractors.

Assessment of stage one was carried out on a price–quality basis (40% price, 60% quality). Following the assessment, which included an interview, the contract was awarded to locally-based contractor with National focus, Bowmer and Kirkland. Stage two of the pre-contract process involved a detailed negotiation with the chosen contractor on the basis of a number of individual specialist work packages and subcontractor quotations to fix the final contract sum.

The project team strongly believe that the traditional procurement approach was the only way in which this very complex project could have been successfully completed. This view was supported by the Learning and Skills Council, who had become very wary of the inflated and unnecessary pricing of risk in many well-detailed higher education projects let using a pure design and build approach.

The partnering process

The project team, strongly led by the project architect, believed from the very beginning of this project that it would only be successful if everyone working on the project shared their own passion and commitment. They took the conscious decision that rather than follow the conventional route of employing a partnering facilitator, they would use the unique nature of the buildings, their own passion for rehabilitating them, and the site's strong resonance in the local community (a large proportion of the local workforce had worked 'at the Loco' and still remembered it with both pride and affection), as the 'glue' with which to bind the project delivery team together.

Accordingly, before the contractor was appointed, the project architect developed a 'toolbox talk' based around a PowerPoint presentation which provided an illustrated history of the site and the design journey. The presentation did not only concentrate on the structures themselves but also provided an appreciation of the wider contribution the original works had made to the development of transport and the economic and social impact, both nationally and locally. This led into an explanation of the resulting design generators, conservation approach, sensitivity and opportunities that the project presented. The project architect believes very strongly that the toolbox talks were a major element in getting all concerned with project delivery to 'buy in', both to the architect's design vision and also to idea of rescuing the buildings themselves. The talks also gave a platform for subcontractors to pick up, suggest ideas and make contributions of their own which undoubtedly added further strength and depth. The architect strongly believes that

the shared enthusiasm and vision was very successful and that all concerned, on and off the site, took a genuine pride in their work. As a result of this, the main contractor's contract manager confirms that the delivery team quickly developed a true partnering spirit of trust and mutual co-operation, resulting in an atmosphere where any disagreements which did arise were resolved quickly and amicably. A formal partnering charter was considered unnecessary.

It is perhaps an indication of the trust which existed between the client, the consultant team and the main contractor that, midway through the original 22-month contract period, a deal was done under which the contractor was given the remaining contingency pot in exchange for absorbing all remaining project risks with the exception of client changes.

Post-contract processes

Post-contract processes generally followed those included in the Standard Building Contract with the architect as contract administrator. Although the client insisted that a project manager be appointed, there is of course no such formal role in the JCT contract structure and the project manager's role tended therefore to be more of a project co-ordinator. Almost inevitably given the nature of the work, Bowmer and Kirkland chose to subcontract most of the construction. Prices for variations were submitted by the contractor based very largely upon subcontractor quotations and were inclusive of all programme implications and the main contractor's profit and overheads at the rates declared in the tender. The prices were then reviewed by the consultant team followed, if necessary, by negotiation before final agreement.

One very significant variation occurred shortly before practical completion, when the Learning and Skills Council asked the college to include a training kitchen and restaurant within the scheme. Additional money was provided and it was understood that an extension to the contract period would be required. The alteration required substantial redesign of the interior of part of the old Midland Counties Building, which had initially been designed to provide teaching space for brickwork and plastering courses. It is perhaps a measure of the strength of the bond between the members of the project team that the variation was incorporated and the additional costs and the necessary extension to the contract period were agreed very quickly and with no adverse contractual consequences.

Practical issues on site

Repairs to historic structures

Despite pre-contract surveys, it is virtually impossible in a project like this to accurately assess the extent of the work required to the existing buildings until initial opening-up works have been carried out. In the words of Mike Atkinson (Bowmer and Kirkland's contract manager), 'it is very difficult if not impossible on a Project such as The Roundhouse to "Know what you don't know"' (Atkinson 2009).

This sentiment is no more true than in the case of the brickwork repairs. Although the architect had been able to determine methodologies and specifications before the contract, the actual work to be done couldn't be determined until scaffolding was erected and the architects were able to inspect the walls at close quarters. Work on site consisted of an architect spending the best part of a year preparing detailed sketches of every elevation to show precisely the work required in terms of the areas to be rebuilt, cut out and replaced or repointed.

Wherever possible, all materials for repairs were sourced from buildings demolished on the site and the contractor established a site-based recycling yard. Where it was not possible to reclaim materials, materials equal in specification to those used in the original buildings were sourced from other demolition sites. Of the waste generated by the project, only 17% went to landfill.

Integration of building services

The integration of the mechanical and electrical services necessary to provide modern levels of environmental performance within listed buildings is always a technical challenge; buildings as important as the roundhouse pose a particular challenge. In this case, engineers made use of the existing ash pits beneath the radial tracks in the floor to form air supply plenums. The pits were sealed at floor level with timber panels incorporating diffuser grilles and ductwork was introduced into the roundhouse basement to provide an air supply to the plenum chambers. Extract ventilation was provided through opening rooflights linked to the building management system. Electrical services are fed by surface-mounted conduits routed along the top of the roof members.

Project timeframe, costs and team

The work on site started on 5th October 2007. The first phase handover (of the roundhouse and the first-phase classrooms) took place in June 2009 and the contract was completed on 13th July 2009.

The total value of the project was £48 million. Table 15.1 shows the cost breakdown of the project (this breakdown excludes furniture, fit-out and VAT). Included in these costs are repairs to the brickwork of around £1 million; repairs to the woodwork of around £2.5 million; and repairs to the roof slating of around £2 million.

Taking into account the additional funding provided for the incorporation of the training kitchen and restaurant, the project finished on time and on budget.

Funding for the project was provided by:

- East Midlands Development Agency.
- Derby and Derbyshire Economic Partnership.
- Heritage Lottery Fund.
- European Regional Development Fund.
- Learning and Skills Council.

Table 15.2 shows the project team and the principal heritage subcontractors.

Table 15.1 Breakdown of costs for the roundhouse project.

Area of work	Cost (£)
Roundhouse	1 854 472
Offices and clock tower	2 463 960
Carriage shop	3 407 731
Midland Counties Building (engine shops)	5 711 850
New build: Kirtley Building	1 783 112
New build: Stephenson Building	4 789 895
Landscape and externals	2 372 199
Stabilisation (pre-start)	374 389
M&E installation	4 818 273
Preliminaries and contract conditions	2 365 845
Contingency expended	1 328 442
Contractor's return	1 285 833
Total	**32 556 001**

Table 15.2 The project team and principal contractors.

Role	Name
Client	David Croll, Derby College, Derby
Project architect	Ian Harris, Maber Associates, Derby
Main contractor	Bowmer and Kirkland, Heage
Civil and structural engineer	Dave Allott, BWB Consulting, Derby
Project management and cost consultancy	Steve Fernie, Armsons, Derby
Repairs to brickwork and masonry	Beech Restoration
Repairs to historic windows	Dorothea Restorations
Installation of electrical services	Goodmarriot and Hursthouse
Installation of mechanical services	Hilton Building Services
Provision of prefabricated learning pods	Norwood Partition Solutions

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16 Summary

This book has highlighted the importance of construction to quality of life and to the economy of a country from the procurement of large-scale public and commercial works through to the heritage sector. The sheer breadth and scale of the construction industry gives rise to a diverse array of procurement approaches in order to cope with the diversity of demand and the complexities of supply. There are few easy answers to the procurement problem. Most customers (usually referred to as clients), in terms of absolute numbers, are inexperienced and relatively naïve in the procurement of construction work but are nonetheless aware of the need to secure maximum value for money from their construction project. For this group of clients, the decision to embark on a construction project is probably one of the most significant financial investments they will ever make. They therefore need to be considered as a special class of client by those construction professionals charged with providing them with procurement advice.

At the other end of the scale, the continuing drive by central government, at least in the UK, towards reinventing the public sector as an educated 'best practice' construction client has led more clients, largely but by no means exclusively from the public sector, to seek to form increasingly close collaborative relationships not only with contractors but with the extended supply chain. This group of clients, who are regular purchasers of building work, are able to use their enhanced knowledge in conjunction with relatively consistent and sizeable buying patterns to develop relationships with the supply side and to lever real advantage through collaboration and strategic alliancing. This enhanced knowledge base has also led to clients adopting a more discriminating interest in the quality of the procurement approaches on offer, and this in turn has led to significant improvements in procurement practice. Nonetheless there are still further improvements to be made and practitioners continue to have to 'raise their game', in order to convince clients that their advice will genuinely provide improved value for money.

In terms of the projects on offer, increasing interest in the rehabilitation and adaptive reuse of historic buildings as an alternative to either demolition or development on green-field sites gives rise to the need to learn new knowledge

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and skills, as is clearly shown by the case study included in Chapter 15, if such projects are to be judged truly successful.

On the supply side, the landscape is still dominated, at least in terms of numbers, by small firms, often specialist in character, who focus only upon their part of the project and usually work as subcontractors to larger firms. Larger construction firms act as contractors and tend to take on the role of coordinating these subcontractors. This results in an industry where market conditions can be very varied and where the majority of customers tend to be disadvantaged because of their relative inexperience and ignorance of the processes involved in procurement.

In most cases, investment in a building project is potentially a very high risk, particularly to this inexperienced majority of clients who seek to procure construction relatively rarely and on whom the extent of expenditure has a significant impact in terms of their financial structure. The procurement methodology developed for the project is increasingly seen as the primary risk management mechanism for many of the project's systemic risks.

Real estate has proved to be better than most other forms of investment over time and the value of an efficient and functional building is significant to most clients. Saxon (2003) illustrates the enormous multiplying factor where good design delivers high value.

Government, the industry and its representative bodies have been seeking performance improvement over the last 20 years and enormous debate has taken place, with a number of reports and proposals being published. All these have focused upon process and there is now a wealth of useful advice available to clients and their project teams, emphasising amongst other aspects the importance of early integration and the benefits of collaborative procurement processes in achieving value for money. Nonetheless, despite recent acknowledged improvements in procurement practice, performance of the industry in terms of benchmarked project delivery continues to suggest a need for still further improvement.

Construction professionals have historically been perceived by clients to be rather resistant to change or innovation and there has been a tendency to pursue traditional practices which are known and well documented, perhaps on the basis that change is risky, and that 'it's best to stick with what you know'. Sadly, in some pockets of the industry, this continues to be the case even if those practices are demonstrably less relevant in the market or to the economic conditions that exist at the time. This book has sought to explore best practice in the context of transition and has explored both new and existing approaches.

Equally, investment in research and innovation still forms a significantly smaller proportion of construction output than is the case in other sectors of the economy, perhaps as little as one tenth of that expended elsewhere, and mostly emanating from the work of product suppliers or specialist firms rather than design or construction teams. New products are adopted when confidence in them is built by some form of certification or when legislation requires their use.

In this scenario the difficulty associated with achieving the right building delivered at the right time for the right cost is significant. The key to a successful outcome rests with the client who must:

- Identify the key performance indicators against which project performance can be judged, consistent with the business case for the project.
- Attempt to establish realistic time and cost parameters.
- Adopt an appropriate procurement strategy that reflects the above two points as well as the client's attitude to risk.

Many clients wrongly assume that they can obtain reliability (defined in terms of early estimates, programme and functionality) in the purchase of a new building even though design is incomplete. They rely upon construction professionals to advise them, and confirm that, as the Construction Clients' Forum (1998) expressed, 'clients do not like unpleasant surprises'.

Those procurement strategies that are most commonly adopted have been summarised and reviewed, but as Hughes (2004) pointed out, there are so many potential variables in each case that there is a wide range of amendments which may need to be made to the standard model.

There is still a tendency for some, generally inexperienced, clients to focus upon initial capital cost and to ignore both long-term output value and costs in use. Perhaps this is understandable where clients in the normal course of their business tend to purchase products which can be seen to be tried and tested rather than projects which need to be designed. Additionally they have been less aware of the importance of establishing a bespoke procurement strategy for their project. This has resulted in the dominance of price-led procurement approaches to both design and the selection of consultants and constructors, which has not encouraged collaboration or much focus upon a best value output.

Europe has an increasing influence on UK law and to some extent upon how things are done. There is no doubt that the UK construction industry can learn from some of the commonly adopted practices in countries around the world with large and sophisticated construction industries. This book has summarised some of these practices and particular attention is drawn to the way in which the interests of clients are protected by mandatory responsibility and insurance.

Building procurement is a project-based activity using a temporary project team. The client provides the rationale for the project, initiates the process and is usually the end user. Wherever possible the client, as the consistent influence throughout the life of the project, should be empowered to achieve a successful output through appropriate and timely advice from carefully selected advisers.

It is likely that construction supply will increasingly be provided by 'fix it' specialist builders able to employ and train their employees, by smarter builders focusing on niche markets and by an increase in the development of design and build joint ventures brought together for larger projects.

Where clients are able to develop an increased awareness of the importance of their role in the process and a consequential empowerment in terms of setting project strategy they will be increasingly able to achieve project success in terms of their own key performance indicators.

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Appendix
Procurement route selection checklists

These checklists aim to establish information about client needs and the project under consideration. This information can be further developed, taking into account the characteristics of various procurement strategies and their associated risk. Time, design and cost are key criteria in the selection mechanism, as is the inherent risk of a strategy and its apportionment.

Checklist 1: Time

(1) The following questions should be considered:
- 1.1 Is completion needed by a specific date?
- 1.2 Is completion needed in the shortest possible time?
- 1.3 Is the client prepared to pay more for earlier completion?

(2) Does the answer to question 1.1 suggest a total project time that is faster than 'normal', in the judgment of the client's advisors?

(3) Define the reason for the identified completion or 'move in' date:
- 3.1 end of lease?
- 3.2 sale of premises?
- 3.3 new business opportunities?
- 3.4 unsuitability of present premises?
- 3.5 company restructuring?
- 3.6 business milestone?
- 3.7 other?

(4) Is the need for completion by a specific date or within a specific time frame more important than:
- 4.1 certainty of construction cost before work starts?
- 4.2 spending an extended time on design?

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(5) What is the approximate value, in sterling, to the client of the building or facility in terms of contribution, rental or cost savings per month?

(6) If the building is completed later than the specified or desired date, will the client:
- 6.1 stay in his or her existing premises?
- 6.2 find temporary accommodation?
- 6.3 close down?
- 6.4 adopt some other course?

This evaluation should provide the following information:

- Specified completion time.
- Reason for completion time.
- Whether required completion time is relatively fast.
- Whether time is seen as the predominant client need.
- The potential financial implications of earlier or later completion.
- What action the client may take if the dates are not achieved.

Checklist 2: Design

(1) Does the client have clear ideas about the building's functionality and the desired design?

(2) Does the client have a view about specific building life requirement?

(3) Does the site (if selected) pose any particular problems for the designer in respect of:
- 3.1 shape or topography?
- 3.2 access?
- 3.3 storage space?

(4) Does the building type suggest relative design complexity?

(5) Does the building type suggest emphasis upon functionality or adaptability?

(6) Does the building type suggest highly complex mechanical, electrical or engineering installations?

(7) Is it anticipated that extensive changes to design may be required during the construction phase?

(8) Does the client wish to emphasise low running costs?

(9) Does the client wish to emphasise low maintenance costs?

(10) Does the client wish to emphasise product quality, at a higher potential cost?

This evaluation should provide the following information:

- Whether the client has clear ideas about his or her needs.
- Whether the site poses complex design problems.
- Whether the building design is complex.
- Whether functionality is particularly important.
- Whether the client has a long-term view about the building.

Checklist 3: Cost

(1) What is the client's maximum budget?

(2) Can the budget be allocated as below:
  2.1 land purchase and fees?
  2.2 construction, including fees?
  2.3 fittings and plant?
  2.4 contingencies?
  2.5 other (define)?

(3) Will the client need to have a fixed contract price for the construction element of the budget or will a reasonably accurate budget be adequate?

(4) Will the client need to consider the cost of total building life?

(5) What is the client's willingness to pay more to achieve a quicker completion date or to obtain higher quality?

This evaluation should provide the following information:

- Total maximum spending capacity.
- Total construction spending capacity.
- Need for consideration of whole life costs.
- Need for pre-construction cost certainty.

Analysis

The responses to the checklists should enable the following key factors to be established:

- Whether the project is feasible in terms of time and viable in terms of cost.
- If the project is required to be completed by a specified date, whether this is vital to the project's success in terms of client needs or whether slippage can be accommodated if cost is considered.

- If relative speed is required, whether the client can accept less cost certainty and potentially increased costs.
- Whether the project is complex in terms of design or site-related problems.
- Whether the need to ensure that the project can be built within a budget is a priority.
- Whether whole life costs need to be considered.

These factors will affect the choice of procurement strategy.

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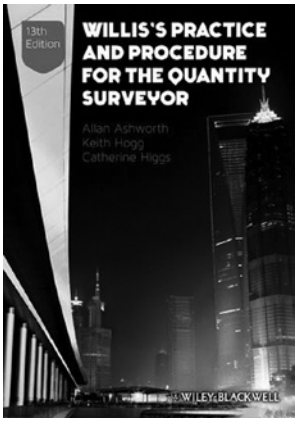


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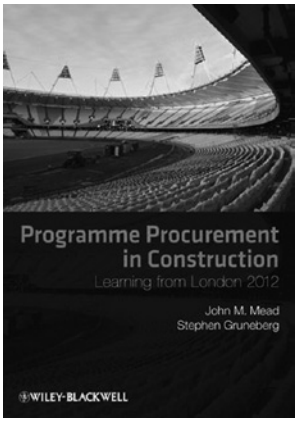


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