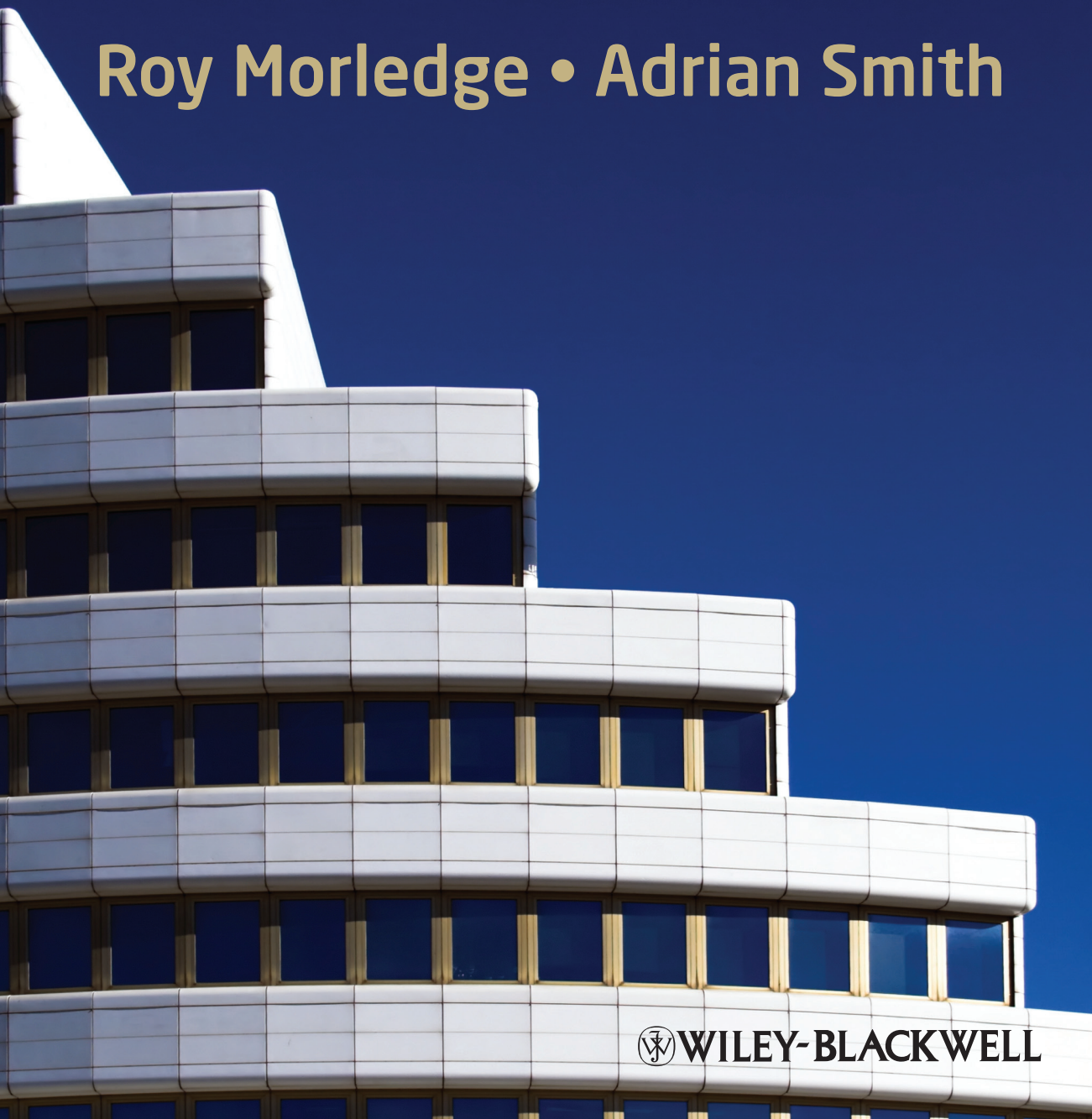
Building Procurement

SECOND EDITION

Roy Morledge • Adrian Smith



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Contents

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.

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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.

References

Business and Enterprise Committee (2008) *Construction Matters*. Ninth Report of Session 2007–08. The Stationery Office. London, UK.

CCF (1999, 2000) *Surveys of Clients' Satisfaction*. Construction Clients' Forum.

Constructing Excellence and Glenigan (2011) *UK Industry Performance Report: Based on the UK Construction Key Performance Indicators*. Constructing Excellence, London, p. 10. Available on-line at http://www.constructingexcellence.org.uk/pdf/KPI_Report_2011.pdf, accessed 15th August 2012.

Egan Sir J. (2002) *Accelerating Change*. Strategic Forum for Construction, Construction Industry Council.

EMDA (2011) *Comparisons of Off-site Housing Manufacture Techniques*. East Midlands Development Agency.

Groak S. (1994) Is construction an industry? Notes towards a greater analytical emphasis on external linkages. *Construction Management and Economics*, **12** (3), pp. 289–293.

Latham Sir M. (1994) *Constructing the Team*. The Stationery Office.

Winch G. (2002) *Managing Construction Projects*. Blackwell Publishing.

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.