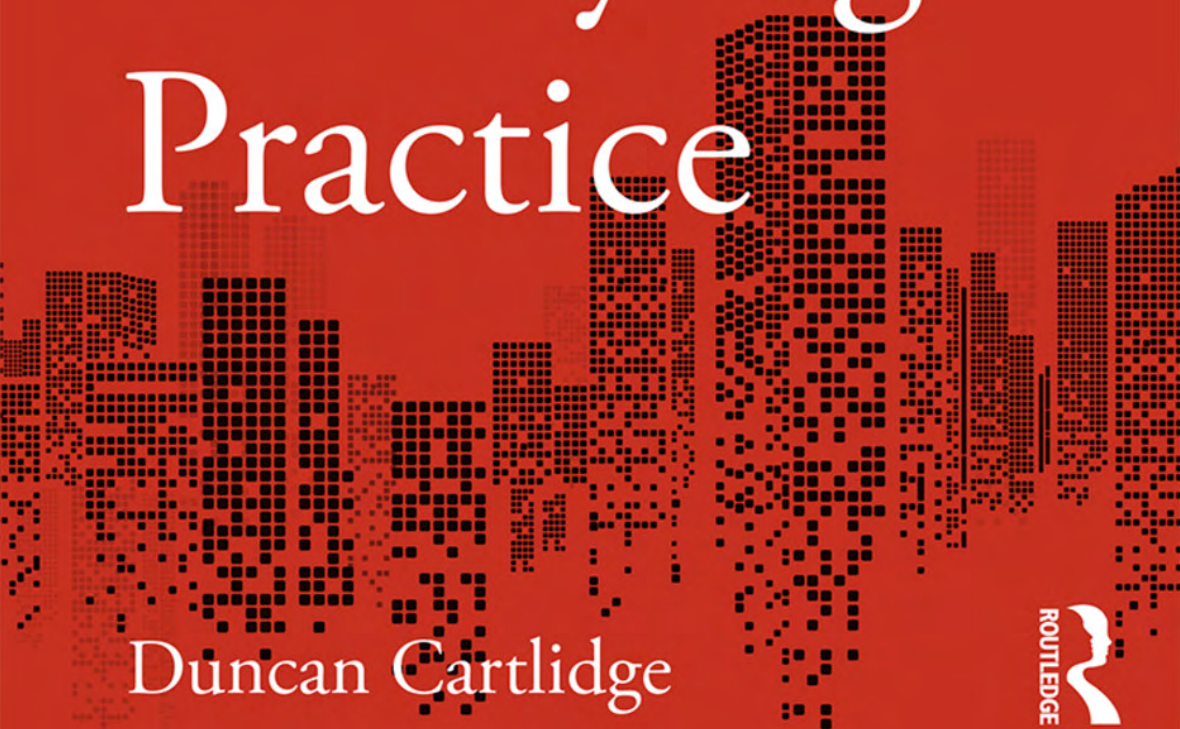
Fourth edition

New Aspects of Quantity Surveying Practice



Duncan Cartlidge

ROUTLEDGE

New Aspects of Quantity Surveying Practice

In this fourth edition of *New Aspects of Quantity Surveying Practice*, renowned quantity surveying author Duncan Cartlidge reviews the history of the quantity surveyor, examines and reflects on the state of current practice with a concentration on new and innovative practice, and attempts to predict the future direction of quantity surveying practice in the UK and worldwide.

The book champions the adaptability and flexibility of the quantity surveyor, while covering the hot topics which have emerged since the previous edition's publication, including:

- the RICS *Futures* publication;
- Building Information Modelling (BIM);
- mergers and acquisitions;
- a more informed and critical evaluation of the New Rules of Measurement (NRM);
- greater discussion of ethics to reflect on the renewed industry interest;
- a new chapter on dispute resolution.

As these issues create waves throughout the industry while it continues its global growth in emerging markets, such reflections on QS practice are now more important than ever. The book is essential reading for all quantity surveying students, teachers and professionals. It is particularly suited to undergraduate professional skills courses and non-cognate postgraduate students looking for an up-to-date understanding of the industry and the role of the quantity surveyor.

Duncan Cartlidge is a Fellow of the Royal Institution of Chartered Surveyors. He is an Associate Lecturer at Glasgow Caledonian University and a former member of the RICS Quantity Surveying and Construction UK World Regional Professional Group Board.

New Aspects of Quantity Surveying Practice

Fourth edition

Duncan Cartlidge

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

Fourth edition published 2018
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

and by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

First edition published by Butterworth Heinemann 2002
Third edition published by Routledge 2011

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
Names: Cartlidge, Duncan P., author.
Title: New aspects of quantity surveying practice / Duncan Cartlidge.
Description: Fourth edition. | Abingdon, Oxon ; New York, NY : Routledge, 2018. | Includes bibliographical references and index.
Identifiers: LCCN 2017019530| ISBN 9781138673724 (hardback : alk. paper) | ISBN 9780415580434 (pbk. : alk. paper) | ISBN 9781315561707 (ebook : alk. paper)
Subjects: LCSH: Quantity surveying.
Classification: LCC TH435 .C365 2018 | DDC 692/.5—dc23
LC record available at https://lccn.loc.gov/2017019530

ISBN: 978-1-138-67372-4 (hbk)
ISBN: 978-1-138-67376-2 (pbk)
ISBN: 978-1-315-56170-7 (ebk)

Typeset in Goudy Oldstyle Std
by Swales & Willis Ltd, Exeter, Devon, UK

Contents

Figures

Tables

Foreword

Few have been affected as much by the economic rollercoaster of the last two decades as those working in the creation of the built environment. Many of the leviathans of the construction consultancy world have disappeared never to return, whilst others have merged – absorbed into large engineering based organisations or fragmented in small units. The result has been a complete shift in the landscape in which we as quantity surveyors operate. One thing has remained true throughout this immense upheaval however, and that is that the role of the quantity surveyor is increasingly concerned with data management rather than data capture. They are also more involved than ever in the management of projects as opposed to simply quantifying them and as a result, this is a truly exciting time to enter the profession.

The ability to operate globally has never been more important and the increase in internationally recognised technical standards, such as the RICS International Property Measurement Standards, reflects this. The introduction of the RICS Black Book Guidance and the much needed suite of New Rules of Measurement has vastly improved standards across the board and has also gone some way to explaining the modern role of the cost manager in the construction process. The principles contained therein are applicable all over the world, essential in today's global economy.

On the ground, projects are becoming increasingly sophisticated as some countries struggle to accommodate the influx of what were formerly rural populations into their already overcrowded towns and cities, while simultaneously striving to protect the global environment. As a primary consumer of raw materials, the construction industry faces an uphill battle to combat its perceived adverse impact on the environment in the pursuit of this continued growth. As a sector we must hold up our hands and admit we have been undeniably slow to react, however in harnessing new digital design technologies, such as 3&4D Building Information Modelling (BIM), we are beginning to see sustainability become a standard consideration when building. The focus is progressively moving toward providing the right information at the right time, clearly defining who does what and when, coupled with a shift toward modern construction methods. In essence, 'going digital' will change almost most everything – resulting in a more productive and profitable industry that builds more sustainable assets.

Subsequently, it is vital that today's professionals keep pace with this ever-evolving technology and that the next generation is equipped to be the effective leaders our sector so desperately needs to keep moving forward. I am confident that by presenting an accessible but comprehensive snapshot of what our profession offers, this book will do a great deal to encourage more men and women to enter the world of quantity surveying – vital when you consider that, as an industry, we are suffering a severe skills shortage and vying with other management based professions to attract the brightest and the best.

Richard Steer, Chairman of Gleeds Worldwide
Fellow RICS, Honorary Fellow RIBA,
Special Fellow CIOB, Fellow APM

Preface to First Edition

The Royal Institution of Chartered Surveyor's Quantity Surveying Think Tank: *Questioning the Future of the Profession*, heard evidence that many within the construction industry thought Chartered Quantity Surveyors were: arrogant, friendless and uncooperative. In addition, they were perceived to add nothing to the construction process, failed to offer services which clients expected as standard and too few had the courage to challenge established thinking. In the same year Sir John Egan called the whole future of quantity surveying into question in the Construction Industry Task Force report *Rethinking Construction* and if this weren't enough, a report by the University of Coventry entitled 'Construction Supply Chain Skills Project', concluded that quantity surveyors are 'arrogant and lacking in interpersonal skills'. Little wonder then that the question was asked 'Will we soon be drying a tear over a grave marked "RIP Quantity Surveying, 1792–2000"?' Certainly the changes that have taken place in the construction industry during the past 20 years would have tested the endurance of the most hardy of beasts. Fortunately, the quantity surveyor is a tough and adaptable creature and to quote and paraphrase Mark Twain 'reports of the quantity surveyor's death are an exaggeration'.

I have spent the past thirty years or so as a quantity surveyor in private practice, both in the UK and Europe, as well as periods as a lecturer in higher education. During this time I have witnessed a profession in a relentless search for an identity, from quantity surveyor to: building economist, to construction economist, to construction cost advisor, to construction consultant, etc. I have also witnessed and been proud to be a member of a profession that has always risen to a challenge and has been capable of reinventing itself and leading from the front, whenever the need arose. The first part of the twenty-first century holds many challenges for the UK construction industry as well as the quantity surveyor, but of all the professions concerned with the procurement of built assets, quantity surveying is the one that has the ability and skill to respond to these challenges.

This book, therefore, is dedicated to the process of transforming the popular perception that, in the cause of self-preservation, the quantity surveyor is wedded to a policy of advocating aggressive price-led tendering with all the problems that this brings, to one of a professional who can help deliver high value capital

projects on time and to budget with guaranteed life cycle costs. In addition, it is hoped that this book will demonstrate beyond any doubt that the quantity surveyor is alive and well, adapting to the demands of construction clients and what's more, looking forward to a long and productive future. Nevertheless, there is still a long hill to climb. During the production of this book I have heard major construction clients call the construction industry 'very unprofessional' and the role of the quantity surveyor compared to that of a 'post box'.

In an address to the Royal Institution of Chartered Surveyor in November 2001, the same Sir John Egan, who had called the future of the quantity surveyor into question, but now as Chairman of the Egan Strategic Forum for Construction, suggested that the future for Chartered Surveyors in construction was to become process integrators, involving themselves in the process management of construction projects and that those who clung to traditional working practices faced an uncertain future. The author would whole-heartedly agree with these sentiments.

'The quantity surveyor is dead – long live the quantity surveyor – masters of the process!'

Duncan Cartlidge
www.duncancartlidge.co.uk

Preface to Second Edition

Wanted: quantity surveyors

Four years have passed since the first edition of *New Aspects of Quantity Surveying Practice*. At that time, *Building*, the well-known construction industry weekly, described quantity surveying as 'a profession on the brink' while simultaneously forecasting the imminent demise of the quantity surveyor, and references to 'Ethel the Aardvark goes Quantity Surveying', had everyone rolling in the aisles. In a brave new world where confrontation was a thing of the past and where the RICS tried to deny quantity surveyors existed at all, clearly there was no need of the profession! But wait; what a difference a few years can make for on 29 October 2004 the same publication that forecast the end of the quantity surveyor had to eat humble pie when the *Building* editorial announced that 'what quantity surveyors have to offer is the height of fashion – Ethel is history'. It would seem as if this came as a surprise to everyone, except quantity surveyors!

Ironically, in 2006, quantity surveyors are facing a very different challenge to the ones that were predicted in the late 1990s. Far from being faced with extinction, the problem now is a shortage of quantity surveyors that has reached crisis point, particularly in major cities like London. The 'mother of all recessions between 1990 and 1995' referred to in Chapter 1 had the effect of driving many professionals, including quantity surveyors, out of the industry for good, as well as discouraging school leavers thinking of embarking on surveying degree courses. As a consequence, there now is a generation gap in the profession and with the 2012 London Olympics on the horizon, as well as buoyant demand in most property sectors, many organisations are offering incentives and high salaries to attract and retain quantity surveying staff. In today's market place a 'thirty-something' quantity surveyor with ten to fifteen years' experience is indeed a rare, but not endangered, species. It would also seem as though the RICS has had second thoughts about the future of the quantity surveyor. A survey carried out by the Royal Bank of Scotland in 2005 indicated that quantity surveyors are the best paid graduate professionals. In November 2005, the RICS announced that, after years of protest, the title quantity surveyor was to reappear as an RICS faculty as well as on the RICS website.

The new millennium found the construction industry and quantity surveying on the verge of a brave new world – an electronic revolution was coming, with wild predictions of the impact that IT systems and electronic commerce would

have on the construction industry and quantity surveying practice; the reality is discussed in Chapter 5.

For the quantity surveyor, the challenges keep on coming. For many years the UK construction industry has flirted with issues such as whole life costs and sustainability/green issues; it now appears that these topics are being taken more seriously and are discussed in Chapter 3. The RICS Commission on Sustainable Development and Construction recently developed the following mission statement: 'To ensure that sustainability becomes and remains a priority issue throughout the profession and RICS' and committed itself to raising the profile of sustainability through education at all levels from undergraduate courses to the APC. In the public sector, the new Consolidated EU Public Procurement Directive due for implementation in 2006 now makes sustainability a criterion for contract awards and a whole raft of legislation due in Spring 2006 has put green issues at the top of the agenda. Links have now been proved between the market value of a building and its green features and related performance.

Following the accounting scandals of the Enron Corporation in 2003, quantity surveyors are being called on to bring back accountability both to the public and private sectors and worldwide expansion of the profession continues with further consolidation and the emergence of large firms moving towards supplying broad business solutions tailored to particular clients and sectors of the market.

Where to next?

Duncan Cartlidge
www.duncancartlidge.co.uk

Preface to Third Edition

Quantity surveying remains a diverse profession with surveyors moving into new areas, some of which are outlined in Chapter 7.

The Preface to the second edition of *New Aspects of Quantity Practice* referred to the increasing interest from both the profession and the construction industry in sustainability and green issues. During the past five years, since the previous edition, sustainability has risen to world prominence and the construction industry, worldwide, has been identified as No. 1 in the league table of polluters and users of diminishing natural resources. It is unsurprising therefore that sustainability has risen to prominence in the industry with many undergraduate and post-graduate programmes now including dedicated modules on sustainable development, and clients, professionals, developers and contractors seeking to establish their green credentials.

Ethics, both personal and business, and professional standards have also risen to prominence. Never before has the behaviour of politicians, public figures and professionals been under such close scrutiny, the age of transparency and accountability can truly be said to have arrived. Although ethics has a long history of research and literature in areas such as medicine, the amount of guidance available for surveyors has been almost non-existent until recently and even now cannot be described as comprehensive.

One thing that has been a common theme throughout the writing of the three editions of this book is that quantity surveyors feel unloved, not least by their professional institution, the RICS. In 2010, quantity surveyors, not for the first time, threatened to leave the RICS in response to the introduction of AssocRICS, a new grade of membership that it was thought, would result in a lowering of entry standards to the institution.

Layered on top of the above is what has been described as the deepest recession since the 1920s, with all the challenges that this brought. As this book goes to press, it is still uncertain how many large public sector projects will be axed as the aftermath of the credit crunch lingers on and continues to impact on the construction industry's order books.

Nevertheless, despite world recessions and new areas of focus for practice, the quantity surveyor continues to prosper, with interest in the profession never higher. Therefore, raise a glass to the quantity surveyor, by any definition, a true survivor.

Duncan Cartlidge
www.duncancartlidge.co.uk

Preface to Fourth Edition

A common theme running through the prefaces to the three previous editions of *New Aspects of Quantity Surveying Practice* was that quantity surveyors were under threat of extinction, and it will come as no great surprise to learn that little has changed with the fourth edition; this time, the menace lurking in the shadows to wipe quantity surveyors off the face of the earth is Building Information Modelling (BIM). The latest indications are the introduction of BIM into UK construction is stalling, for a number of reasons outlined in Chapter 4, nevertheless quantity surveyors cannot afford to ignore the trend to replace drawn data with digital outputs and must adapt accordingly.

Quite rightly, ethics and ethical practice continue to gain a much higher profile in the everyday life of the construction industry and allied professions. For too long construction's image has been blackened with rumours of bribery, bid rigging and dodgy deals and now clear guidelines are available and are discussed in Chapter 5.

Government in the UK still appears to be convinced that they are receiving poor value for money from the UK construction industry and continues to publish what seems to be an endless stream of reports and targets, some of which are addressed in this fourth edition.

On 23 June 2016, it was announced that the United Kingdom had voted to leave the European Union. At the time of writing the fourth edition of this book there is little clarity on what BREXIT will actually mean for the UK's relationship with the EU and it is unclear what level of access the UK and, in particular, UK construction, will continue to have into the EU market. For example, if the UK were to adopt the so-called Norwegian model, it would become a member of EFTA and the EEA, and the UK's obligations, as members of the EEA, would include the adoption of the EU procurement rules. Therefore, for this fourth edition the references and sections on EU public procurement have been retained.

Finally, it is pleasing to report that after years of discontent, peace appears to have broken out between quantity surveyors and the RICS, long may it last.

Duncan Cartlidge
www.duncancartlidge.co.uk

Acknowledgements

My thanks go to the following for contributing to this book:

Ian Trushell BA (Hons), MBA, MLitt, LLM, MSc, PhD, FRICS, FCIArb, FCIOB, FHEA. Ian has 40 years' experience in the construction industry spent entirely with one firm of chartered quantity surveyors, where he was a partner for 25 years. He has wide experience at the highest professional level of all major building types, including public works, public buildings, commercial, educational, hotel and leisure facilities, being particularly experienced in healthcare projects, including major district general hospitals. Ian has acted as partner-in-charge of the full spectrum of construction projects, ranging in value from £150,000 to £30 million. He has specialist in-depth knowledge of civil, highway, mechanical, electrical, lifts, security, process and instrumentation engineering.

Ian has a deep interest in construction law and has acted as arbitrator on a number of occasions and has taken part in several mediations to date. He is a Past Chairman of the Chartered Institute of Arbitrators (Scottish Branch) and a full-time lecturer in surveying at Glasgow Caledonian University, where he lectures on construction law topics. He holds specialist Master's degrees in construction law and mediation, although, unusually, his Bachelor's degree and Doctorate are in modern history.

Crown copyright material is produced with the permission of the Controller of HMSO and Queen's Printer for Scotland.

1 The story so far . . .

Introduction

The quantity surveyor has been an integral part of the UK construction industry for 170 years. The golden age for quantity surveyors could be thought of as the period between 1950 and 1980, when bills of quantities were the preferred basis for tender documentation and the Royal Institution of Chartered Surveyors (RICS) scales of fees were generous and unchallenged. As described in Chapter 2, this situation was due to change beyond all recognition in the later stages of the twentieth century as a client-led crusade from both the public and private sectors for value for money, leaner project completion times and less traditional procurement strategies put new demands on the construction industry and its professions. More recently in 2011, with the UK Government's *Construction Strategy 2011* (Cabinet Office, 2011), the construction industry was tasked with becoming 2D Building Information Modelling (BIM) compliant for all public sector projects by 2016 (2017 for Scotland). How did the industry and quantity surveyors respond to the challenge? All will be revealed in the following chapters.

The catalyst of change

This chapter examines the root causes of the changes that have taken place in the UK construction industry and quantity surveying practice during the latter half of the twentieth century. It sets the scene for the remaining chapters, which go on to describe how quantity surveyors are adapting to new and emerging markets and responding to client-led demands for added value. Two of the most high-profile challenges are: how the construction industry and its associated professionals address the impact of sustainability/green issues, and the introduction of BIM. Two recent reports are also influential: *RICS Futures: Our Changing World* (RICS, 2015) outlines the challenges facing built environment professionals, while the UK Government's *Construction 2025* strategy (Department for Business, Innovation and Skills, 2013b) quantifies the challenge as follows:

- 33 per cent reduction in initial and whole life costs;
- 50 per cent reduction in overall delivery time; and
- 50 per cent reduction in greenhouse gases in the built environment.

If that wasn't enough, the industry and profession have also to cope with the impact of political and economic influences. The construction industry is no stranger to fluctuations in workload, the most recent being the downturn in construction orders following the world financial crisis in 2008 after the collapse of some major financial institutions in America left the world on the brink of a 1920s-style depression. The housing sector was particularly badly affected and the downturn resulted in an 8.2 per cent fall in construction-related jobs (67,000 jobs), the largest of any major industrial sector during this period (www.ons.gov.uk). By 2016, the industry was showing signs of a strong recovery with skills shortages being reported at all levels, but not before a cull of many established construction firms, and many quantity surveying practices running for cover into the arms of large multinational organisations.

Take-overs/acquisitions and mergers

Many of the small and medium-sized (SME) practices that flourished in the period 1960–1990 have now disappeared, the victims of mergers and acquisitions of the ever-growing mega-practices, and, consequently, the surveying profession during this period has polarised into two groups:

- the large multidisciplinary practices capable of matching the problem-solving capabilities of the large accountancy-based consulting firms;
- small practices that can offer a fast response from a low cost base for clients, as well as providing services to their big brother practices.

The recession of 2008–2012 triggered another round of quantity surveying practices mergers and acquisitions, this time somewhat more radical.

One such take-over in 2010 saw the global engineering giant AECOM acquire Davis Langdon for £204 million. Davis Langdon was a practice that was established in 1919 by Horace W. Langdon. AECOM has 45,000 employees internationally. In the period 1945–1980, Davis Langdon and Everest, later to be renamed Davis Langdon, was a flagship chartered quantity surveying practice, known throughout the world. Global organisations, such as AECOM, bring new and different values, and three years after the acquisition Davis Langdon changed their name to 'AECOM Building and Places'. Horace Langdon would be turning in his grave. Such was the status of Davis Langdon and Everest that in 1991 they were tasked by the RICS to prepare the report *QS 2000*, a vision of what quantity surveying practice would look like at the turn of the millennium.

The take-over was not without its problems and subsequently 40 per cent of the long-serving equity partners left the practice in response to the new structure and direction. Ironically, Rob Smith, the then Senior Partner at Davis Langdon LLP, now retired, wrote the Foreword to the second edition of *New Aspects of Quantity Surveying Practice* in 2006 when the practice's future looked bright, and shortly after revealed in the trade press that his earnings for 2005 were £507,000 (*Building*, 2005, no. 44).

The increase in the number of take-overs and acquisitions has seen once large and influential practices such as Davis Langdon subsumed into large multi-sectorial organisations. Some quantity surveyors are being encouraged by their new corporate owners to refer to themselves as cost managers/cost engineers. In addition to AECOM, conglomerates such as Serco and CAPITA have recently swallowed up a number of established quantity surveying practices without perhaps really understanding what they were getting for their money. Many in quantity surveying circles see this trend in take-overs as a change from the traditional ethos of providing client services to maximise profit for shareholders through the control of the head-count. The rise and fall of Davis Langdon is chronicled below:

- 1919 Horace W. Langdon sets up practice in Holborn, London. He is joined two years later by Tom Every to form Langdon and Every.
- 1931 Owen Davis sets up a practice nearby.
- 1944 A close working relationship developed between Davis, Belfield and Bobbie Everest, a quantity surveyor and descendant of George Everest, Surveyor General of India from 1830 to 1843, and the first man to measure the height of Mount Everest, which consequently bore his name. In 1944, they formed the partnership of Davis, Belfield & Everest (DBE).
- 1948–1988 Langdon and Every and DBE expanded during the post-war construction programme and established offices in the UK, the Middle East and Asia Pacific.
- 1988 The two firms merge to form Davis Langdon & Everest, the biggest merger of QS firms to date.
- 2004 Davis Langdon & Everest becomes Davis Langdon LLP.
- 2008 Davis Langdon fail to respond to the rapid downturn in the market, and rather like the *Titanic* continued full steam ahead, see later comments in this chapter on change management.
- 2010 AECOM acquires Davis Langdon's European, Middle East, Australasian, African and US operations for £204 million. Partners in the Asian arm, Davis Langdon & Seah, reject the take-over. This part of the firm is acquired by Arcadis, a Dutch-based design, engineering and management consulting company in 2012.

As the finishing touches are put to this chapter comes news of yet another take-over of a traditional QS practice, Cyril Sweett, by Middle East-owned firm, Currie & Brown, after Cyril Sweett's bankers withdrew their financial support. See comments in Chapter 5 'Ethical practice at home and abroad'. The price paid for Sweett was reported to be £29 million and the take-over, completed by September 2016, de-listed Sweett from the AIM arm of the London Stock Exchange after nine years. The take-over, which will create a combined company of over 2,000 employees, ends nearly 90 years of independence at Sweett. Currie & Brown moved swiftly to end the Sweett brand as it was announced *'You can't have two names in the same marketplace.'* Currie & Brown were reported

as saying they believe cost savings can be made at Sweett, principally through de-listing and cutbacks in property, back office and shared services. By a strange coincidence, Francis Ives, the chairman of Cyril Sweett from 1991–2010, wrote the Foreword to the third edition of *New Aspects of Quantity Surveying Practice*; it's proving to be quite a poisoned chalice!

As dramatic and concerning as the 2008–2012 downturn was, it was the period between 1990 and 1995 that will be remembered, in the words of an eminent politician, as 'the mother of all recessions'. Certainly, from the perspective of the UK construction industry, this recessionary phase was the catalyst for many of the changes in working practices and attitudes that have been inherited by those who survived this period and continue to work in the industry. As described in the following chapters, some of the pressures for change in the UK construction industry and its professions – including quantity surveying – have their origins in history, while others are the product of the rapid transformation in business practices that took place during the last decades of the twentieth century and still continue today. Perhaps the lessons learned during this period have enabled the industry to weather the 2009 financial storm more easily than otherwise would have been the case. This book will therefore examine the background and causes of these changes, and then continue to analyse the consequences and effects on contemporary surveying practice.

Historical overview

1990 was a watershed for the UK construction industry and its associated professions. As illustrated in Figure 1.1, by 1990, a 'heady brew of change' was being concocted on fires fuelled by the recession that was starting to have an impact on the UK construction industry. The main ingredients of this brew, in no particular order, were:

- the traditional UK hierarchical structure that manifested itself in a litigious, fragmented industry, where contractors and sub-contractors were excluded from most of the design decisions;
- changing patterns of workload due to the introduction of fee competition and compulsory competitive tendering;
- widespread client dissatisfaction with the finished product;
- the emergence of privatisation and public–private partnerships;
- the pervasive growth of information technology;
- the globalisation of markets and clients.

A fragmented and litigious industry

Boom and bust in the UK construction industry has been and will continue to be a fact of life (see Figure 1.2), and much of the industry, including quantity surveyors, had learned to survive and prosper quite successfully in this climate. While some are large players, at least 99.9 per cent of firms are SMEs and, of those, some 83 per cent employ no more than one person. The industry tends to rely on a high degree of sub-contracting and a high proportion of self-employment with

over 40 per cent of construction contracting being self-employed (Department for Business, Innovation and Skills, 2012). A positive outcome of this is that it makes the industry highly flexible and responsive to changes in the market demand.

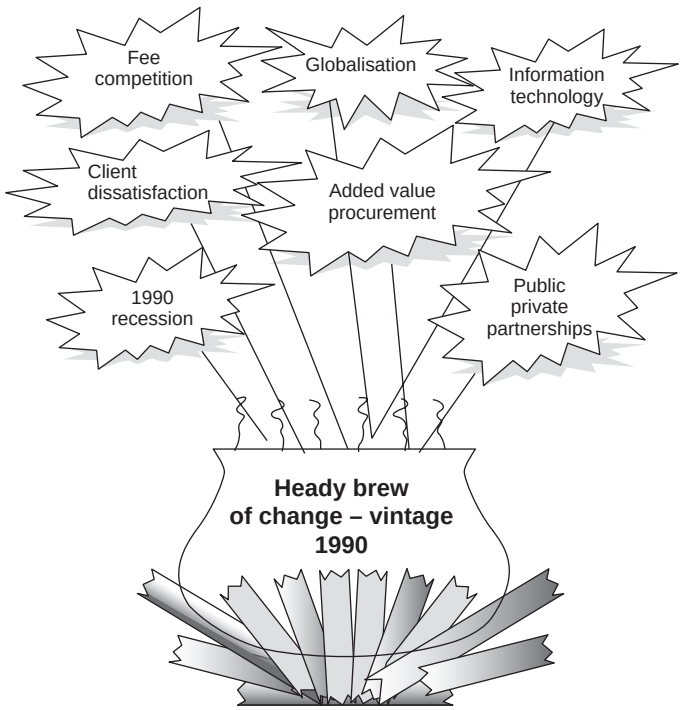


Figure 1.1 The heady brew of change

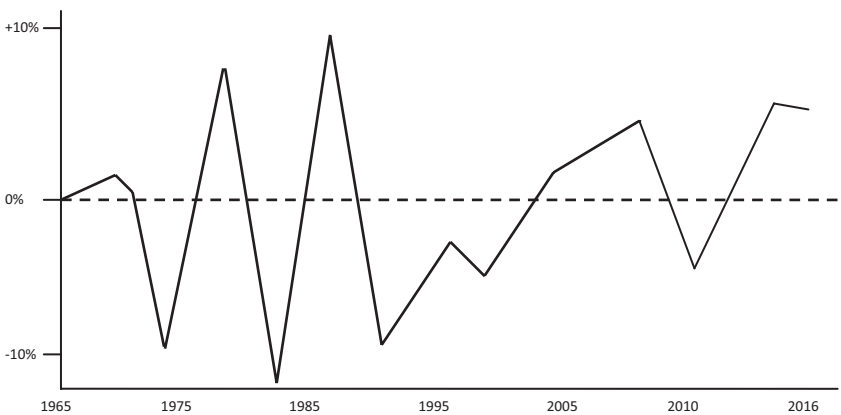


Figure 1.2 Construction output – percentage change, 1965–2016
Source: Department for Business, Innovation and Skills (2016).

Analysis carried out by E.C. Harris in 2013 indicates that for a typical £25 million project the main contractor may be directly managing around 70 sub-contracts, of which a large proportion are small, at £50,000 or less (Department for Business, Innovation and Skills, 2013a). For regional contracts, the size may even be smaller with 70 per cent of sub-contracts being less than £10,000. Notwithstanding the above, the study identified a number of crucial factors which determined successful project delivery:

- the availability of equitable finance;
- certainty of early payment;
- early contractor engagement;
- continuing involvement of the supply chain in design development;
- strong relationships;
- collaboration with suppliers.

The study concluded that construction has a low awareness of waste and duplication, that are embedded in current practice. Table 1.1 presents the construction industry's contribution to the economy in 1997–2014.

The rules were simple: in the good times, a quantity surveyor earned fee income as set out in the Royal Institution of Chartered Surveyors' Scale of Fees for the preparation of, say, bills of quantities, and then in the lean times, endless months

Table 1.1 The construction sector's contribution to the economy, gross value added

Year	*£ billions (current prices)*	*£ billions (2011 prices)*	*Real % change*	*% of economy*
1997	43	79	–	5.5
1998	47	80	1.5	5.7
1999	48	81	1.3	5.6
2000	56	82	0.9	6.1
2001	59	83	1.8	6.2
2002	66	88	5.7	6.6
2003	72	92	4.8	6.8
2004	76	97	5.3	6.8
2005	81	95	–2.4	6.8
2006	86	96	0.8	6.8
2007	91	98	2.2	6.9
2008	90	95	–2.6	6.6
2009	81	83	–13.2	6.0
2010	84	90	8.5	6.0
2011	92	92	2.2	6.3
2012	89	85	–7.5	6.0
2013	92	86	1.4	6.0
2014	103	94	9.5	6.5

Sources: ONS series KKI3, KKP5, KL9D, available at: www.ons.gov.uk

or even years would be devoted to performing countless tedious re-measurements of the same work – once more for a fee. Contractors and sub-contractors won work, albeit with very small profit margins, during the good times, and then when work was less plentiful, they would turn their attention to the business of the preparation of claims for extra payments for the inevitable delays and disruptions to the works. The standard forms of contract used by the industry, although heavily criticised by many, provided the impetus (if impetus were needed) to continue operating in this way. Everyone, including the majority of clients, appeared to be quite happy with the system, although in practice the UK construction industry was in many ways letting its clients down by producing buildings and other projects that were, in a high percentage of cases, over budget, over time and littered with defects. Time was running out on this system, and by 1990 the hands of the clock were at five minutes before midnight. A survey conducted in the mid-1990s by *Property Week*, a leading property magazine, among private sector clients who regularly commissioned new buildings or refurbished existing properties, provided a snapshot of the UK construction industry at that time. In response to the question, 'Do projects finish on budget?', 30 per cent of those questioned replied that it was quite usual for projects to exceed the original budget.

In response to the question, 'Do projects finish on time?', once again, more than 30 per cent of those questioned replied that it was common for projects to overrun their planned completion by one or two months. Parallels between the construction industry ethos at the time of this survey and the UK car industry of the 1960s make an interesting comparison. Austin, Morris, Jaguar, Rolls-Royce, Lotus and marques such as the Mini and MG were all household names during the 1960s; today they are all either owned by foreign companies or out of business. At the time of writing the first edition of this book, Rover/MG, then owned by Phoenix (UK), was the only remaining UK-owned carmaker, now Rover/MG has been confined to the scrap heap when it ceased trading in 2005 amidst bitter recriminations. Rover's decline from being the UK's largest carmaker in the 1960s is a living demonstration of how a country's leading industry can deteriorate, as well as being a stark lesson to the UK construction industry. The reasons behind the collapse of car manufacturing were: flawed design, wrong market positioning, unreliability and poor build quality but, importantly, to this can be added: lack of investment in new technology, and a failure to move with the times and produce what the market, i.e. the end users, demanded. Therefore, when the first Datsun cars began to arrive from Japan in the 1970s and were an immediate success, it was no surprise to anyone except the UK car industry. The British car buyer, after overcoming initial reservations about purchasing a foreign car, discovered a product that had nearly 100 per cent reliability, contained many features as standard that were extras on British-built cars, was delivered on time, and benefited from long warranties. Instead of producing what they perceived to be the requirements of the British car buyer, Datsun had researched and listened to the needs of the market, seen the failings of the home manufacturers, and then produced a car to meet them. Not only had the Japanese car industry researched the market fully, it had also invested in plant and machinery to increase build quality and reduce

defects in their cars. In addition, the entire manufacturing process was analysed and a lean supply chain established to ensure the maximum economies of production. The scale of the improvements achieved in the car industry are impressive, with the time from completed design to launch reduced from 40 to 15 months, and the supplier defects to five parts per million. So why by 1990 was the UK construction industry staring into the same abyss that the carmakers had faced 30 years earlier? In order to appreciate the situation that existed in the UK construction industry in the pre-1990 period, it is necessary to examine the working practices of the UK construction industry, including the role of the contractor and the professions at this time. First, we will take a look back at recent history, and in particular at the events that took place in Europe in the first part of the nineteenth century and helped to shape UK practice (Goodall, 2000).

The UK construction industry: a brief history

Prior to the Napoleonic Wars, Britain, in common with its continental neighbours, had a construction industry based on separate trades. This system still exists in France as 'lots séparé', and variations of it can be found throughout Europe, including in Germany. The system works like this: instead of the multi-trade main contractor that operates in the UK, each trade is tendered for and subsequently engaged separately under the co-ordination of a project manager, or 'pilote'. In France, smaller contractors usually specialise in one or two trades, and it is not uncommon to find a long list of contractors on the site board of a construction project.

The Napoleonic Wars, however, brought change and nowhere more so than in Britain – the only large European state that Napoleon failed to cross or occupy. Paradoxically, the lasting effect the Napoleonic Wars had on the British construction industry was more profound than on any other national construction industry in Europe.

While it is true that no military action actually took place on British soil, nonetheless the government of the day was obliged to construct barracks to house the huge garrisons of soldiers that were then being transported across the English Channel. As the need for the army barracks was so urgent and the time to prepare drawings, specifications, etc. was so short, the contracts were let on a 'settlement by fair valuation based on measurement after completion of the works'. This meant that constructors were given the opportunity and encouragement to innovate and to problem solve – something that was progressively withdrawn from them in the years to come. The same need for haste, coupled with the sheer magnitude of the individual projects, led to many contracts being let to a single builder or group of tradesmen 'contracting in gross', and the general contractor was born. When peace came, the Office of Works and Public Buildings, which had been increasingly concerned with the high cost of measurement and fair value procurement, in particular in the construction of Buckingham Palace and Windsor Castle, decided enough was enough. In 1828, separate trades contracting was discontinued for public works in England in favour of contracting in gross.

The following years saw contracting in gross (general contracting) rise to dominate, and with this development the role of the builder as an innovator, problem solver and design team member was stifled to the point where contractors operating in the UK system were reduced to simple executors of the works and instructions (although in Scotland the separate trades system survived until the early 1970s). However, history had another twist, for in 1834 architects decided that they wanted to divorce themselves from surveyors and establish the Royal Institute of British Architects (RIBA), exclusively for architects. The grounds for this great schism were that architects wished to distance themselves from surveyors and their perceived obnoxious commercial interest in construction. The top-down system that characterises so much of British society was stamped on the construction industry. As with the death of separate trades contracting, the establishment of the RIBA ensured that the UK contractor was once again discouraged from using innovation. The events of 1834 were also responsible for the birth of another UK phenomenon, the quantity surveyor, and for another unique feature of the UK construction industry – post-construction liability.

The ability of a contractor to re-engineer a scheme/concept design in order to produce maximum buildability is a great competitive advantage, particularly on the international scene. A system of project insurance that is already widely available on the continent is starting to make an appearance in the UK; adopting this, the design and execution teams can safely circumvent their professional indemnity insurance and operate as partners under the protective umbrella of a single policy of insurance, thereby allowing the interface of designers and contractors.

However, back to history. For the next 150 or so years, the UK construction industry continued to develop along the lines outlined above, and consequently by the third quarter of the twentieth century, the industry was characterised by powerful professions carrying out work on comparatively generous fee scales, contractors devoid of the capability to analyse and refine design solutions, forms of contract that made the industry one of the most litigious in Europe, and procurement systems based upon competition and selection by lowest price and not value for money. Some within the industry had serious concerns about procurement routes and documentation, the forms of contract in use leading to excess costs, suboptimal building quality and time delays, and the adversarial and conflict-ridden relationships between the various parties. A series of government-sponsored reports (Simon, 1944; Emmerson, 1962; Banwell, 1964) attempted to stimulate debate about construction industry practice, but with little effect.

During the preparation of the third edition of *New Aspects of Quantity Surveying Practice* the constant stream of government reports, that regaled the construction industry for being inefficient, dysfunctional and providing poor value for money just kept on coming.

Top twelve industry reports since the Egan Report (1998) are:

- *Achieving Excellence*, Office of Government Commerce, 1999;
- *Modernising Construction*, National Audit Office (NAO), 2001;
- *Accelerating Change*, Strategic Forum for Construction, 2002;

- *Improving Public Services Through Better Construction*, NAO, 2005;
- *Be Valuable*, Constructing Excellence, 2005;
- *Review of Housebuilding Delivery*, John Callcutt, 2007;
- *Construction Commitments*, Strategic Forum for Construction, 2008;
- *Construction Matters*, Business and Enterprise Select Committee, 2008;
- *Equal Partners*, Business Vantage and Construction Clients' Group, 2008;
- *Never Waste a Good Crisis* – The Wolstenholme Report, Constructing Excellence, 2009;
- *Construction Strategy 2011*, Cabinet Office, 2011;
- *Construction 2025*, Construction Industrial Advisory Council, 2013.

The five key drivers that need to be in place to achieve better construction are:

1 committed leadership;
2 focus on the customer;
3 integration of process and team around the project;
4 a quality-driven agenda;
5 commitment to people.

It's all well and good producing reports, but does the construction industry take any notice of them? The four key projected processes, according to *Rethinking Construction* (Egan, 1998), needed to achieve change were identified as:

1 *Partnering the supply chain* – development of long-term relationships based on continuous improvement with a supply chain;
2 *Components and parts* – a sustained programme of improvement for the production and the delivery of components;
3 *Focus on the end product* – integration and focusing of the construction process on meeting the needs of the end user;
4 *Construction process improvement* – the elimination of waste.

In addition, seven annual targets capable of being achieved to improve the performance of construction projects were identified as:

1 To reduce capital costs by 10 per cent;
2 To reduce construction time by 10 per cent;
3 To reduce defects by 20 per cent;
4 To reduce accidents by 20 per cent;
5 To increase the predictability of projected cost and time estimates by 10 per cent;
6 To increase productivity by 10 per cent;
7 To increase turnover and profits by 10 per cent.

Eleven years after Egan, the (2009) Wolstenholme Report benchmarked progress against these key drivers and appeared to show progress, albeit many on demonstration projects instead of industry-wide projects, see Figure 1.3.

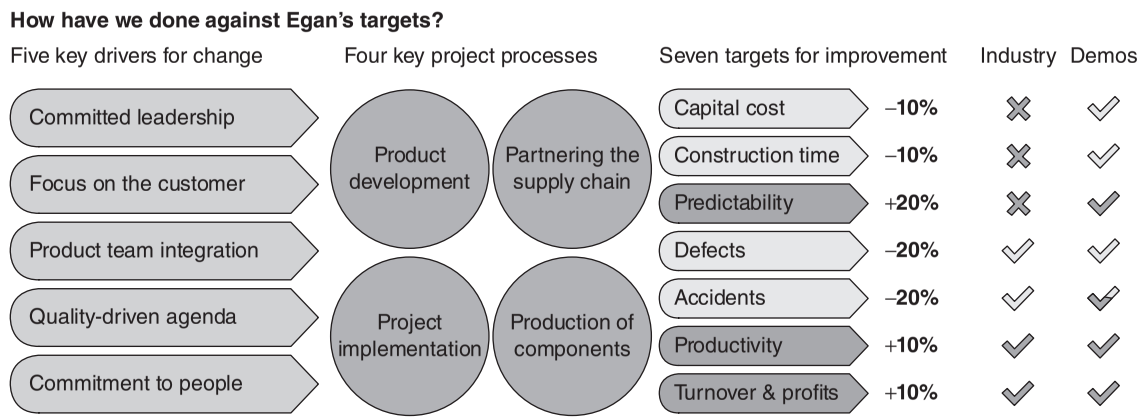


Figure 1.3 How have we done against Egan's targets?

Source: Adapted from Wolstenholme Report (2009).

The Wolstenholme Report concluded that, at its best, UK construction was excellent but there was also evidence of processes that were not so good. Interestingly, Figure 1.3 appears to show that in some areas targets are improving critically, but the three important targets of capital cost, construction time and predictability were still beyond the industry's grasp.

Can there be any other industry that has generated so many reports?

Construction Strategy 2011

The most recent report is the UK Government's *Construction Strategy 2011* (Cabinet Office, 2011). The government's Plan for Growth, published alongside the Budget in 2011, highlighted the critical importance of an efficient construction industry to the UK economy. The report focused on public sector work, as some 40 per cent of industry turnover is in the public sector, with central government being the industry's biggest customer. It was claimed, yet again, in the study that the UK does not get full value from public sector construction; and that it has failed to exploit the potential for public procurement of construction and infrastructure projects to drive growth.

This strategy calls for 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 report called for a reduction in costs of 20 per cent by 2015!

A detailed programme of measures was called for, centered around:

- replacement of adversarial cultures with collaborative ones;
- cost reduction and innovation within the supply chain to maintain market position rather than innovation that is focused on the bidding process, with a view to establishing a bargaining position for the future.

The proposed model for public sector construction procurement in the UK is one in which the following scenario is found:

- 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;
- knowing what projects should cost, rather than relying on lump sum tenders based on inadequate documentation;
- supply chains where the programme is suited, and 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.

Approaches to help achieve this reduction were outlined as:

- the use of Building Information Modelling (BIM). The government will require fully collaborative 2D BIM (with all project and asset information, documentation and data being electronic) as a minimum by 2016. A staged plan will be published with mandated milestones showing measurable progress at the end of each year;
- the introduction of Soft Landings, which aims to ease the transition from completion to commissioning with the alignment of design/construction with operation and asset management;
- reduction of post-handover defects that are a regular feature of construction projects, leading to the cost of remediation (and frequently the higher cost of resolving disputes). Even when there are no latent defects, it is still rare to find that a built asset performs exactly in accordance with its design criteria (and particularly in terms of energy efficiency, for example);
- integration of the design and construction of an asset with the operation phase should lead to improved asset performance. This has been demonstrated in projects which have integrated design and construction with whole-life operation. The same alignment can be created by requiring those who design and construct buildings to prove their operational performance for a period of, say, three to five years. Proposals for this will be developed with the Government Property Unit to ensure alignment with subsequent arrangements for facilities management.

BIM and Soft Landings will be discussed more fully in Chapters 4 and 6.

Construction 2025

In July 2013, another UK Government report, *Construction 2025* (Department for Business, Innovation and Skills, 2013b), hit the book-stands, this time targeted at both the public and private sectors and outlined a vision for the construction industry by 2025. Even more targets were set as follows:

- 33 per cent reduction in the initial cost of construction and whole life costs;
- 50 per cent reduction in overall time from inception to delivery;
- 50 per cent lower greenhouse emissions;
- 50 per cent improvements in exports.

It was not just the UK construction industry that was obsessed with navel-gazing: quantity surveyors had also been busy penning numerous reports on

the future prospects of their profession. The most notable of which were: *The Future Role of the Chartered Quantity Surveyor* (1983), *Quantity Surveying 2000 – The Future Role of the Chartered Quantity Surveyor* (1991) and the *Challenge of Change: QS Think Tank* (1998), and *Our Changing World: Let's Be Ready* (2015), all produced either directly by, or on behalf of, the Royal Institution of Chartered Surveyors (RICS). The 1971 report, *The Future Role of the Quantity Surveyor* (RICS, 1971) paints a picture of a world where the quantity surveyor was primarily a producer of bills of quantities; indeed, the report came to the conclusion that the distinct competence of the quantity surveyor of the 1970s was measurement – a view, it should be added, still shared by many today. In addition, competitive single-stage tendering was the norm, as was the practice of receiving most work via the patronage of an architect. It was a profession where design and construct projects were rare, and quantity surveyors were discouraged from forming multidisciplinary practices and were encouraged to adhere to the scale of fees charges. The report observes that clients were becoming more informed, but there was little advice about how quantity surveyors were to meet this challenge. A mere 27 years later, the RICS (1998) report, *Challenge of Change*, was drafted in a business climate driven by information technology, where quantities generation is a low-cost activity and the client base is demanding that surveyors demonstrate added value. In particular, medium-sized quantity surveying firms (i.e. fewer than 250 employees according to the EU definition) were singled out by this latest report to be under particular pressure owing to particular problems such as:

- competing with large practices' multiple disciplines and greater specialist knowledge base;
- attracting and retaining a high quality workforce;
- achieving a return on the necessary investment in IT;
- competing with the small firms with low overheads.

Interestingly, the *Challenge of Change* report also predicts that the distinction between contracting and professional service organisations will blur, a quantum leap from the 1960s, when chartered surveyors were forced to resign from the RICS if they worked for contracting organisations!

RICS *Futures*

In 2015, the RICS published its latest vision for the industry and the profession; *RICS Futures, Our Changing World: Let's Be Ready* (2015). The report, which reflects global views, starts by outlining social and economic trends and the changing business landscape before concentrating on the changing role of the profession. The debate, according to the RICS, is whether the future industry will demand specialists or generalists. There is strong emphasis on ethical practice, see Chapter 5, as well as a recognition that

the profession must embrace new and emerging technologies, such as BIM, discussed in Chapter 4.

As discussed previously in this chapter, mergers and acquisitions result in significant changes to traditional quantity surveying firms' structures and ownership models. For many professionals, including quantity surveyors, this means adapting to more cross-functional teams and new business cultures. As organisations become larger and provide services to a multitude of industries, the trend towards interdisciplinary working and the demand for generalist skills appears to be growing. This, it is thought, could result in greater awareness of the work processes of fellow professionals, such as architects and engineers, in meeting team goals and client outcomes. Having said this, it is recognised that many firms still require, and will continue to demand, specialist technical skill sets, such as traditional quantity surveying competencies. For firms that offer such services, staff with strong technical knowledge are essential. Larger, more generalist organisations that do not maintain such knowledge in-house will rely on the expertise of specialist organisations, a trend that was highlighted in *The Challenge of Change* (RICS, 1998).

RICS Futures summarised the changing landscape of the profession as shown in Table 1.2.

While on the subject of futures, there is evidence that construction is perceived by many young people as 'being outdoors and getting dirty' and most suited to 'young people who do not get into college or university', from the survey by the CITB (2013) *Construction Skills*. The survey also concluded that construction has difficulty appealing to women (Table 1.3).

Table 1.2 How skills and work in surveying are changing

What's not desirable	*What's needed today*	*What's decreasing*	*What needs to increase*
Silo working	Outcomes focus	Transactional activity	Leadership
Early specialisation	Communication	Administrative tasks e.g. bills of quantities	Client focus
Conflicts of interest	Integrated programme and cost management		Collaboration
		Residential valuation	Ethical behaviour
	Skills for handling greater complexity		Sustainability
			Data analysis
	Interdisciplinary working		Improving productivity of assets
	Change management		
	Advisory services		Risk management
	Understanding new technology		

Source: *RICS Futures* (2015).

Table 1.3 How skills and work in surveying are changing (%)

Construction has more appeal than:	*Young people*	*Parents*	*Career advisors*
Engineering	14	13	6
Manufacturing	18	25	20
Retail	17	33	23

Measuring performance: benchmarking

Benchmarking is a generic management technique that is used to compare performance between varieties of strategically important performance criteria. These criteria can exist between different organisations or within a single organisation, provided that the task being compared is a similar process. It is an external focus on internal activities, functions or operations aimed at achieving continuous improvement (Leibfried and McNair, 1994). Construction, because of the diversity of its products and processes, is one of the last industries to embrace objective performance measurements. There is a consensus among industry experts that one of the principal barriers to promoting improvement in construction projects is the lack of appropriate performance measurement and this is referred to also in Chapter 3 in relation to whole life-cycle cost calculations. For continuous improvement to occur, it is necessary to have performance measures that actually check and monitor performance, to verify changes and the effect of improvement actions, to understand the variability of the process, and, in general, it is necessary to have objective information available in order to make effective decisions. Despite the late entry of benchmarking to construction, this does not diminish the potential benefits that could be derived; however, it gives some indication of the fact that there is still considerable work to be done, both to define the areas where benchmarking might be valuable and the methods of measurement. The current benchmarking and KPI programme in the UK construction industry has been headlined as a way to improve underperformance. However, despite the production of several sets of KPIs, large-scale improvement still remains as elusive as ever. Why is this?

The Xerox Corporation in America is considered to be the pioneer of benchmarking. In the late 1970s, Xerox realised that it was on the verge of a crisis when Japanese companies were marketing photocopiers cheaper than it cost Xerox to manufacture a similar product. It is claimed that by benchmarking Xerox against Japanese companies, it was able to improve their market position and the company has used the technique ever since to promote continuous improvement. Yet again another strong advocate of benchmarking is the automotive industry which successfully employed the technique to reduce manufacturing faults. Four types of benchmarking can broadly be defined: internal, competitive, functional and generic (Lema and Price, 1995). However, Carr and Winch (1998), while regarding these categories as important, suggest that a more useful distinction in terms of methodology is that of output and process benchmarking. Figure 1.4 shows the benchmarking process as presented in the RICS Black Book guidance note.

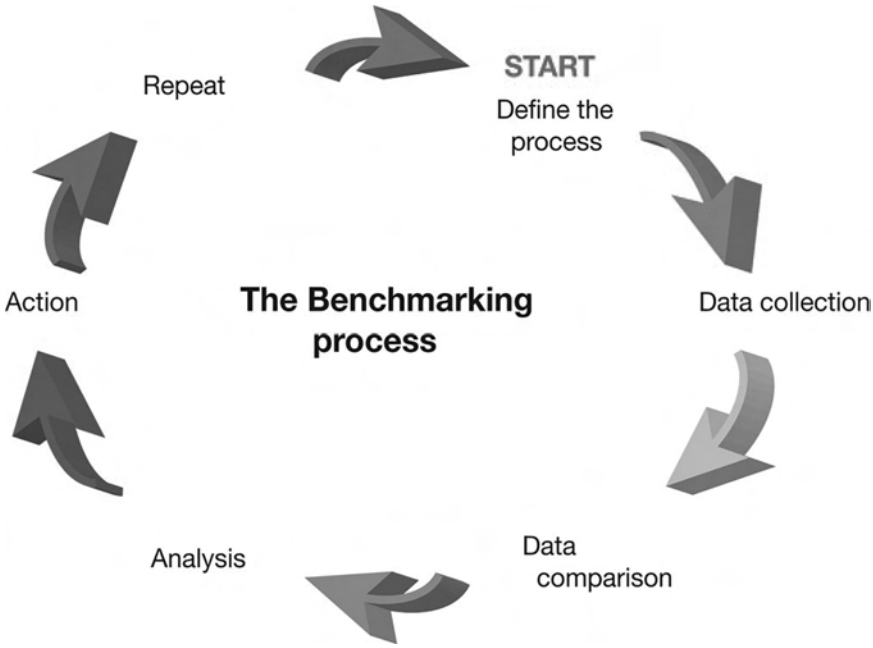


Figure 1.4 Benchmarking process

Source: RICS Black Book, *Cost Analysis and Benchmarking RICS Practice Standards, Guidance Note* (2013).

Measuring performance

Through the implementation of performance measures (what to measure) and the selection of measuring tools (how to measure), an organisation or a market sector communicates to the outside world and its clients the priorities, objectives and values that the organisation or market sector aspires to. Therefore, the selection of appropriate measurement parameters and procedures is very important to the integrity of the system.

Key performance indicators (KPIs)

It is true to say that most organisations that participate in the production of key performance indicators (KPIs) for the Construction Best Practice Programme (CBPP) have to date produced benchmarks. Since the late 1990s there has been a widespread government-backed campaign to introduce benchmarking into the construction industry with the use of what are called key performance indicators (KPIs). Benchmarks provide an indication of position relative to what is considered optimum practice and hence indicate a goal to be obtained, but while they are useful for getting a general idea of the areas requiring performance improvement,

they do not provide any indication of the mechanisms by which increased performance may be brought about. Basically, benchmarking tells us that we are underperforming but it does not give us the basis to remedy the underperformance. The production of KPIs, which has been the focus of construction industry initiatives to date, therefore, has been concentrated on output benchmarks. A much more beneficial approach to measurement is process benchmarking described by Pickerell and Garnett (1997) 'as analyzing why your current performance is what it is, by examining the process your business goes through in comparison to other organisations that are doing better and then implementing the improvements to boost performance'. The danger with the current enthusiasm in the construction industry for KPIs is that outputs will be measured and presented but processes will not be improved as the underlining causes will not be understood. According to Carr and Winch (1998), many recent benchmarking initiatives in the construction industry have shown that, while the principles have been understood and there is much discussion about its potential, 'No one is actually doing the real thing.' Benchmarking projects have tended to remain as strategic goals at the level of senior management.

The UK system compared

As discussed earlier in this chapter, there has always been a suspicion, especially by government, that the UK construction industry is inefficient and delivers poor value for money. A report by Turner and Townsend in 2015 (see Table 1.4) seems to suggest that the turn-out cost of construction is higher in the UK than in other countries of the world, despite the fact that the UK has quantity surveyors!

For many years, similar comparative studies have been produced, purporting to show how expensive the UK is for construction, most of which completely ignore factors such as:

Table 1.4 Cost comparison between London and New York in US$

Category	*London*	*New York*
Labour costs	47	78
Margins	5%	6%
Prelims	15%	12.5%
Cost increase forecast	5%	5%
Cost apartments	3,970	2,950
Cost offices	4,410	5,500
Cost warehouse	1,400	1,400
Cost hospital	5,000	5,300
Cost school	2,570	2,250
Cost mall	2,790	3,500
Average cost US$ / m²	**3,357**	**3,488**

Source: Turner and Townsend (2015).

- different regularity systems for planning and building control;
- different legal systems and contracts and procurement routes;
- different expertise and methods of construction;
- quality of the finished product;
- different attitudes towards health and safety issues;
- different employment systems;
- specification levels;
- exchange rates;
- mandatory insurance requirements;
- environmental requirements.

However, on the face of it, Table 1.4 appears to indicate that despite labour costs being 60 per cent higher in New York, and margins being 20 per cent higher, average turn-out costs for a variety of building types in New York are only an average of 3 per cent above London and, in some cases, for example, apartments and schools, New York turn-out costs are actually cheaper!

Over the years, a number of studies have been published. In the mid-1990s, Graham Winch and Andrew Edkins carried out a study on the construction of two identical buildings needed to house a security scanning system as part of the Eurotunnel project. The final analysis demonstrated how the French performed much better than the British in terms of out-turn costs and completion times. Why was this?

The answer would seem to lie in the differences in the organisation of the two projects:

- the French contract included detail design, the norm in France. The French contractor re-engineered the project, simplifying the design and taking out unnecessary costs;
- the simplified French design was easier, cheaper and quicker to build. This meant that there was room for manoeuvre as the client-induced variations mounted;
- the British-run project could only cope by increasing the programme and the budget;
- the researchers' conclusion was that British procurement arrangements tend to generate complexity in the project organisation, while the engineering capabilities of French contractors mean that they are able to simplify the design.

A second comparison in approaches to construction design and procurement was published in 2004 by the Building Design Partnership, entitled *Learning from French Hospital Design*. Given the massive hospital building programme in the UK, the study compared French hospitals with newly built UK hospitals not only from the point of view of design quality but also value for money. The results of the study are given in Table 1.5.

Health warning: when interpreting the cost data in Table 1.5, it should be remembered that direct comparison of cross-border cost information is

Table 1.5 UK and French hospital costs compared

Example	*Floor area (m^2)*	*Total cost (€)*	*Building cost (€/m^2)*
UK examples			
Macclesfield	3,353	7,182,634	2,142
Hillingdon	3,600	5,495,717	1,527
Warley	8,940	17,853,354	2,103
Halton Runcorn	5,493	7,698,900	1,402
French examples			
Montreuil sur Mer	19,691	16,776,184	852
St. Chamond	6,953	11,897,767	1,171
Armberieu	10,551	9,202,711	872
Chateauroux	4,994	6,726,183	1,347

Source: Building Design Partnership (2004).

notoriously difficult due to a range of factors discussed previously. Even so, the following caveats should be noted:

- French hospitals cost between half and two-thirds of UK hospitals per m^2, but per bed they are more or less similar. Area per bed, however, is much higher in France, with single bed wards used universally. The report therefore argues that French bed space outperforms its UK counterparts;
- building service costs, i.e. mechanical and electrical installation, in France are less than half of those of the UK, with French comments that the UK over-specifies. More ambitious automation and ICT are also used in France;
- contractor-led detail design seems to lie behind much of the economy of means; many Egan-advocated processes are used. Interestingly, consultants' fees, compared with the UK, are high as a percentage of cost;
- in spite of the fact that labour and material costs are higher in France than the UK, although concrete, France's main structural material, is 75 per cent of the UK cost, out-turn costs over a range of building types, not simply hospitals, are cheaper in France. However, data released by the firm Gardiner and Theobald seems to indicate recent trends, due in part to the differentials between the British pound and the Euro, have seen the gap close;
- the design quality of French hospitals is generally high, while in the UK standards achieved recently have been disappointing and have come in for some criticism.

Compared with many European countries, UK construction produces high output costs to customers from low input costs of professionals, trade labour and materials. This fact is at the root of the Egan critique, pointing out that the UK has a wasteful system which would cost even more if UK labour rates were equal to those found in Europe. The waste in the system, 20 years plus on from the Latham Report of 1994, is still estimated to be around 30 per cent.

Looking at French design and construction, it is possible to see several of the Egan goals in place, but in ways specific to France. While the design process begins without any contractor involvement, they become involved sooner than in the UK and take responsibility for much of the detailed design and specification. They are more likely to buy standard components and systems from regular suppliers with well-developed supply chains, rather than on a project-by-project basis. Constructional simplicity follows from the French approach, with French architects having little control of details and not appearing to worry too much about doors and window details, for example. In the case of French hospitals, despite the lower cost, the projects contain very sophisticated technology with ICT systems becoming very ambitious.

Therefore, a simple cost comparison demonstrates that French hospital outturn costs are cheaper than in the UK, but what of added value? Health outcomes in France are generally superior to those in the UK due to factors such as bed utilisation and patient recovery times, and single rooms instead of multi-patient wards stop the spread of dangerous so-called 'superbugs'.

Keeping the focus on Europe, for many observers, the question of single-point or project liability – the norm in many countries, such as Belgium and France – is pivotal in the search for adding value to the UK construction product, and is at the heart of the other construction industries' abilities to re-engineer designs. Single-point project liability insurance is insurance that protects all the parties involved in both the design and the construction process against failures in both design and construction of the works for the duration of the policy. The present system, where some team members are insured and some not, results in a tendency to design defensively, caveat all statements and advice with exclusions of liability, and not seek help from other members of the team – not a recipe for teamwork. In the case of a construction management contract, the present approach to latent defect liability can result in the issue of 20–30 collateral warranties, which facilitates the creation of a contractual relationship where one would otherwise not exist, in order that the wronged party is then able to sue under contract rather than rely on the tort of negligence. Therefore, in order to give contractors the power truly to innovate and to use techniques like value engineering (see Chapter 6), there has to be a fundamental change in the approach to liability. Contract forms could be amended to allow the contractor to modify the technical design prior to construction, with the consulting architects and engineers waiving their rights to interfere.

Opponents of the proposal to introduce single-point liability cite additional costs as a negative factor. However, indicative costs given by insurers Royal & Sun Alliance seem to prove that these are minimal, for example, traditional structural and weatherproofing: 0.65–1.00 per cent of contract value total cover, including structural, weatherproofing, non-structural and mechanical and electrical; 1–2 per cent of contract value to cover latent defects for periods of up to 12 years, to tie in with the limitations on provisions of contracts under seal. As in the French system, technical auditors can be appointed to minimise risk and, some may argue, add value through an independent overview of the project.

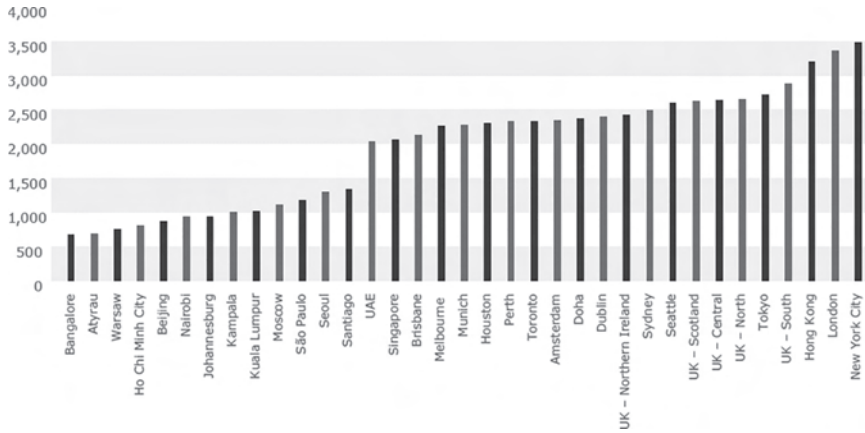


Figure 1.5 Average costs per m^2 of six building types in US$

In international comparison, Figure 1.5 shows the average costs per m^2 for the following building types:

- high-rise apartments;
- prestige offices;
- large warehouse distribution centres;
- general hospitals;
- primary and secondary schools;
- shopping centres, including malls.

Changing patterns of workload

The patterns of workload that quantity surveyors had become familiar with were also due to change. The change came chiefly from two sources:

- fee competition and compulsory competitive tendering (CCT);
- the emergence of a new type of construction client.

Fee competition and compulsory competitive tendering

Until the early 1970s, fee competition between professional practices was almost unheard of. All the professional bodies published scales of fees, and competition was vigorously discouraged on the basis that a client engaging an architect, engineer or surveyor should base his or her judgement on the type of service and not on the level of fees. Consequently, all professionals within a specific discipline quoted the same fee. However, things were to change with the election of the Conservative Government in 1979. The new government introduced fee competition into the public sector by way of its compulsory competitive tendering

programme (CCT), and for the first time professional practices had to compete for work in the same manner as contractors or sub-contractors – i.e. they would be selected by competition, mainly on the basis of price. The usual procedure was to submit a bid based upon scale of fees minus a percentage. Initially these percentage reductions were a token 5 per cent or 10 per cent, but as work became difficult to find in the early 1980s, practices offered reductions of 30 per cent or even 40 per cent on fee scales. It has been suggested that during the 1980s fee income from some of the more traditional quantity surveying services was cut by 60 per cent. Once introduced, there was no going back, and soon the private sector began to demand the same reduction in fee scales; within a few years, the cosy status quo that had existed and enabled private practices to prosper had gone. The Monopolies and Mergers Commission's 1977 report into scales of fees for surveyors' services led the Royal Institution of Chartered Surveyors to revise its byelaws in 1983 to reduce the influence of fee scales to the level of 'providing guidance' – the gravy train had hit the buffers!

Byelaw 24 was altered from:

> No member shall with the object of securing instructions or supplanting another member of the surveying profession, knowingly attempt to compete on the basis of fees and commissions.

to

> No member shall . . . quote a fee for professional services without having received information to enable the member to assess the nature and scope of the services required.

With the introduction of fee competition, the average fee for quantity surveying services (expressed as a percentage of construction cost) over a range of new-build projects was just 1.7 per cent! As a result, professional practices found it increasingly difficult to offer the same range of services and manning levels on such a reduced fee income; they had radically to alter the way they operated, or go out of business. However, help was at hand for the hard-pressed practitioner; the difficulties of trying to manage a practice on reduced fee scale income during the later part of the 1980s were mitigated by a property boom, which was triggered in part by a series of government-engineered events that combined to unleash a feeding frenzy of property development. In 1988, construction orders peaked at £26.3 billion, and the flames under the heady brew of change were dampened down, albeit only for a few years. The most notable of these events were:

- the so-called Stock Exchange 'Big Bang' of 1986, which had the direct effect of stimulating the demand for high-tech offices;
- the deregulation of money markets in the early 1980s, which allowed UK banks for the first time to transfer money freely out of the country, and foreign finance houses and banks to lend freely on the UK market and invest in UK real estate;

- the announcement by the Chancellor of the Exchequer, Nigel Lawson, of the abolition of double tax mortgage relief for domestic dwellings in 1987, which triggered an unprecedented demand for residential accommodation; the result was a massive increase in lending to finance this sector, as well as spiralling prices and land values;
- last but by no means least, the relaxation of planning controls, which left the way open for the development of out-of-town shopping centres and business parks.

However, most property development requires credit, and the boom in development during the late 1980s could not have taken place without financial backing. By the time the hard landing came in 1990, many high street banks with a reputation for prudence found themselves dangerously exposed to high-risk real estate projects. During the late 1980s, virtually overnight, the banks changed from conservative risk managers to target-driven loan sellers, and by 1990 they found themselves with a total property-related debt of £500 billion. The phenomenon was not just confined to the UK. In France, for example, one bank alone, Crédit Lyonnais, was left with Euro 10 billion of unsecured loss after property deals on which the bank had lent money collapsed because of oversupply and a lack of demand; only a piece of creative accountancy and state intervention saved the French bank from insolvency. The property market crash in the early 1990s occurred mainly because investors suffered a lack of confidence in the ability of real estate to provide a good return on investment in the short to medium term in the light of high interest rates, even higher mortgage rates, and an inflation rate that doubled within two years. In part, it was also brought about by greed because of the knowledge that property values had historically seldom delivered negative values. As large as these sums seem, they pale into insignificance to the debts run up by banks like The Royal Bank of Scotland in the period 2005–2008, who reported a £28 billion loss in January 2009 and were only saved from insolvency by a government-led bailout.

The emergence of a new type of construction client

Another vital ingredient in the brew of change was the emergence of a new type of construction client. Building and civil engineering works have traditionally been commissioned by either public or private sector clients. The public sector has been a large and important client for the UK construction industry and its professions. Most government bodies and public authorities would compile lists or 'panels' of approved quantity surveyors and contractors for the construction of hospitals, roads and bridges, social housing, etc., and inclusion on these panels ensured that they received a constant and reliable stream of work. However, during the 1980s, the divide between public and private sectors was to blur. The Conservative Government of 1979 embarked upon an energetic and extensive campaign of privatisation of the public sector that culminated in the introduction of the Private Finance Initiative in 1992. Within a comparatively short

period, there was a shift from a system dominated by the public sector to one where the private sector was growing in importance. Despite this shift to the private sector, the public sector remains, for the moment, influential; in 2008, for example, it accounted for 37 per cent or £30 billion of the UK civil engineering and construction industry's business, with a government pledge to maintain this level of expenditure. Nevertheless, the privatisation of the traditional public sector resulted in the emergence of major private sector clients such as the British Airports Authority, privatised in 1987, with an appetite for change and innovation. This new breed of client was, as the RICS had predicted in its 1971 report on the future of quantity surveying, becoming more knowledgeable about the construction process, and such clients were not prepared to sit on their hands while the UK construction industry continued to underperform. Clients such as Sir John Egan, who in July 2001 was appointed Chairman of the Strategic Forum of Construction, became major players in the drive for value for money. The poor performance of the construction industry in the private sector has already been examined; however, if anything, performance in the public sector paints an even more depressing picture. This performance was scrutinised by the National Audit Office (NAO) in 2001 in its report *Modernising Construction*, which found that the vast majority of projects were over budget and delivered late. So dire has been the experience of some public sector clients – for example, the Ministry of Defence – that new client-driven initiatives for procurement, were introduced. In particular, there were a number of high-profile public project disasters, such as the new Scottish Parliament in Edinburgh, let on a management contracting basis which rose in cost from approximately £100 million to £450 million and was delivered in 2004 – two years late and with a total disregard for life-cycle costs.

If supply chain communications were polarised and fragmented in the private sector, then those in the public sector were even more so. A series of high-profile cases in the 1970s, in which influential public officials were found to have been guilty of awarding construction contracts to a favoured few in return for bribes, instilled paranoia in the public sector, which led to it distancing itself from contractors, sub-contractors and suppliers – in effect, from the whole supply chain. At the extreme end of the spectrum this manifested itself in public sector professionals refusing to accept even a diary, calendar or a modest drink from a contractor in case it was interpreted as an inducement to show bias. In the cause of appearing to be fair, impartial and prudent with public funds, most public contracts were awarded as a result of competition between a long list of contractors on the basis of the lowest price. The 2001 National Audit Office report suggests that the emphasis on selecting the lowest price is a significant contributory factor in the tendency towards adversarial relationships. Attempting to win contracts under the 'lowest price wins' mentality leads firms to price work unrealistically low and then seek to recoup their profit margins through contract variations arising from, for example, design changes and other claims leading to disputes and litigation. In an attempt to eradicate inefficiencies, the public sector commissioned a number of studies, such as the Levene Efficiency Scrutiny in 1995, which recommended that departments in the public sector should:

- communicate better with contractors to reduce conflict and disputes;
- increase the training that their staff receives in procurement and risk management;
- establish a single point for the construction industry to resolve problems common to a number of departments. The lack of such a management tool was identified as one of the primary contributors to problems with the British Library project (Levene, 1995).

In June 1997, it was announced that Compulsory Competitive Tendering would be replaced with a system of Best Value in order to introduce, in the words of the Local Government Minister Hilary Armstrong, 'an efficient, imaginative and realistic system of public sector procurement'. Legislation was passed in 1999, and from 1 April 2000 it became the statutory duty of the public sector to obtain best value. Best value will be discussed in more detail in Chapter 6.

The impact of information technology

As measurers and information managers, quantity surveyors have been greatly affected by information technology. Substantial parts of the chapters that follow are devoted to the influence that IT has had and will continue to have, both directly and indirectly, on the quantity surveying profession (see also Chapter 4). However, this opening chapter would not be complete without a brief mention of the contribution of IT to the heady brew of change. To date, mainly individual IT packages have been used or adapted for use by the quantity surveyor, for example, spreadsheets. However, the next few years will see the development of IT packages designed specifically for tasks such as measurement and quantification, which will fundamentally change working practices. The speed of development has been breath-taking. In 1981, the Department of the Environment developed and used a computer-aided bill of quantities production package called 'Enviro'. This then state-of-the-art system required the quantity surveyor to code each measured item, and on completion the codes were sent to Hastings, on the south coast of England, where a team of operators would input the codes, with varying degrees of accuracy, into a mainframe computer. After the return of the draft bill of quantities to the measurer for checking, the final document was then printed, which in most cases was four weeks after the last dimensions were taken off!

Those who mourn the demise of traditional methods of bill of quantities production should at least take heart that no longer will the senior partner be able to include those immortal lines in a speech at the annual Christmas office party: 'You know after twenty years of marriage, my wife thinks that quantity surveying is all about taking off and working up' – pause for laughter!

As mentioned previously, there had been serious concern both in the industry and in government about the public image of UK Construction plc. The 1990 recession had opened the wounds in the construction industry and shown its vulnerability to market pressures. Between 1990 and 1992 over 3,800 construction enterprises became insolvent, taking with them skills that would be badly needed

in the future, the pattern being repeated between 2008 and 2012. The professions also suffered a similar haemorrhage of skills as the value of construction output fell by double digit figures year on year. The recession merely highlighted what had been apparent for years: the UK construction industry and its professional advisors had to change. The heady brew of change was now complete, but concerns over whether or not the patient realised the seriousness of the situation still gave grounds for concern. The message was clear; industry and quantity surveying must change or, like the dinosaur, be confined to history!

Response to change

In traditional manner, the UK construction industry turned to a report to try to solve its problems. In 1993, Sir Michael Latham, an academic and politician, was tasked to prepare yet another review, this time of the procurement and contractual arrangements in the UK construction industry. In July 1994, *Constructing the Team* (or the Latham Report, as it became known) was published. The aims of the initiative were to reduce conflict and litigation, as well as to improve the industry's productivity and competitiveness. The construction industry held its breath – was this just another Banwell or Simon to be confined, after a respectful period, to gather dust on the shelf? Thankfully not! The UK construction industry was at the time of publication in such a fragile state that the report could not be ignored. That is not to say that it was greeted with open arms by everyone – indeed, the preliminary report, *Trust and Money*, produced in December 1993, provoked profound disagreement in the industry and allied professions.

Latham's report found that the industry required a good dose of medicine, which the author contended should be taken in its entirety if there was to be any hope of a revival in its fortunes. The Latham Report highlighted the following areas as requiring particular attention to assist UK construction industries to become and be seen as internationally competitive:

- better performance and productivity, to be achieved by using adjudication as the normal method of dispute resolution, the adoption of a modern contract, better training, better tender evaluation, and the revision of post-construction liabilities to be more in line with, say, France or Spain, where all parties and not just the architect are considered to be competent players and all of them therefore are liable for non-performance for up to 10 years;
- the establishment of well-managed and efficient supply chains and partnering agreements;
- standardisation of design and components, and the integration of design, fabrication and assembly to achieve better buildability and functionality;
- the development of transparent systems to measure performance and productivity both within an organisation and with competitors;
- teamwork and a belief that every member of the construction team from client to sub-contractors should work together to produce a product of which everyone can be justifiably proud.

The Latham Report placed much of the responsibility for change on clients in both public and private sectors. For the construction industry, Latham set the target of a 30 per cent real cost reduction by year 2000, a figure based on the CRINE (Cost Reduction Initiative for the New Era) review carried out in the oil and gas industries a few years previously (United Kingdom Offshore Operators Association, 1994). The CRINE review was instigated in 1992, with the direct aim of identifying methods by which to reduce the high costs in the North Sea oil and gas industry. It involved a group of operators and contractors working together to investigate the reasons for such high costs in the industry, and also to produce recommendations to aid the remedy of such. The leading aim of the initiative was to reduce development and production costs by 30 per cent, this being achieved through recommendations such as the use of standard equipment, simplifying and clarifying contract language, removing adversarial clauses, rationalisation of regulations, and the improvement of credibility and quality qualifications. It was recommended that the operators and contractors work more closely, pooling information and knowledge, to help drive down the increasing costs of hydrocarbon products and thus indirectly promote partnering and alliancing procurement strategies (see Chapter 3). The CRINE initiative recommendations were accepted by the oil and gas industries, and it is now widely accepted that, without the use of partnering/alliancing, a great number of new developments in the North Sea would not have been possible. Shell UK Exploration and Production reported that the performance of the partners in the North Fields Unit during the period 1991–1995 resulted in an increase in productivity of 25 per cent, a reduction in overall maintenance costs of 31 per cent in real terms, and a reduction in platform 'down-time' of 24 per cent. Could these dramatic statistics be replicated in the construction industry? 'C' is not only for construction but also for conservative, and many sectors of the construction industry considered 30 per cent to be an unrealistically high and unreachable target. Nevertheless, certain influential sections of the industry, including Sir John Egan, accepted the challenge and went further, declaring that 50 per cent or even 60 per cent savings were achievable. It was the start of the client-led crusade for value for money.

The Latham Report spawned a number of task forces to investigate further the points raised in the main report, and in October 1997, as a direct result of one of these groups, Sir John Egan, a keen advocate of Sir Michael Latham's report and known to be a person convinced of the need for change within the industry, was appointed head of the Construction Task Force. One of the Task Force's first actions was to visit the Nissan UK car plant in Sunderland to study the company's supply chain management techniques and to determine whether they could be used in construction (see Chapter 6). In June 1998, the Task Force published the report *Rethinking Construction* (Department of the Environment, Transport and the Regions, 1998), which was seen as the blueprint for the modernisation of the systems used in the UK construction industry to procure work. As a starting point, *Rethinking Construction* revealed that in a survey of major UK property clients, many continued to be dissatisfied with both contractors' and consultants'

performance. Added to the now familiar concerns about failure to keep within agreed budgets and completion schedules, clients revealed that:

- more than a third of them thought that consultants were lacking in providing a speedy and reliable service;
- they felt they were not receiving good value for money insofar as construction projects did not meet their functional needs and had high whole-life costs;
- they felt that design and construction should be integrated in order to deliver added value.

Frustrated by the lack of change in the construction industry, Egan's last act before moving on from and closing down the Task Force in 2002 was to pen his final report *Accelerating Change* (Strategic Forum for Construction, 2002).

As for quantity surveyors, the 1990s ended with perhaps the unkindest cut of all. The RICS, in its Agenda for Change initiative, replaced its traditional divisions (which included the Quantity Surveying Division) with 16 faculties, not unlike the system operated by Organisme Professionel de Qualification Technique des Economistes et Coordonnateurs de la Construction (OPQTECC), the body responsible for the regulation of the equivalent of the quantity surveyor in France. It seemed to some that the absence of a quantity surveying faculty would result in the marginalisation of the profession; however, the plan was implemented in 2000, with the Construction Faculty being identified as the new home for the quantity surveyor within the RICS. This move, however, was not taken lying down by the profession, disillusioned quantity surveyors threatened the RICS with legal action to reverse the decision and in 2004 the QSi was formed by Roger Knowles as 'the only professional body that caters solely for quantity surveyors'. In 2017, the QSi appears still to be open for business but there is no information about the numbers of disillusioned quantity surveyors that it has attracted. QSi membership is still offered for around £80 p.a. although it seems mainly centred around Wolverhampton with little contemporaneous material on its website. QSi has an impressive range of UK branches but few of the branches, according to the website, have membership in double figures.

Following the turmoil of early 2000, the period since the last edition of *New Aspects* has been comparatively peaceful. Ultimately, the existing RICS Faculties were organised into 17 professional groups, one of which is the Built Environment Group where quantity surveying and construction now has its home, which seems to have appeased the rebellious members.

Beyond the rhetoric

How are the construction industry and the quantity surveyor rising to the challenges outlined in the previous pages? When the much-respected quantity surveyors Arthur J. and Christopher J. Willis penned the Foreword to the eighth edition of their famous book, *Practice and Procedure for the Quantity Surveyor* in

1979, the world was a far less complicated place. Diversification into new fields for quantity surveyors included heavy engineering, coal mining and 'working abroad'. In the Willis and Willis book, the world of the quantity surveyor was portrayed as a mainly technical back office operation providing a limited range of services where, in the days before compulsory competitive tendering and fee competition, 'professional services were not sold like cans of beans in a supermarket'. The world of Willis and Willis was typically organised around the production of bills of quantities and final accounts, with professional offices being divided into pre- and post-contract services. This model was uniformly distributed across small and large practices, the main difference being that the larger practices would tend to get the larger contracts and the smaller practices the smaller contracts. This state of affairs had its advantages, as most qualified quantity surveyors could walk into practically any office and start work immediately; the main distinguishing feature between practices A and B was usually only slight differences in the format of taking-off paper. However, owing to the changes that have taken place not only within the profession and the construction industry but also on the larger world stage (some of which have been outlined in this chapter), the world that Willis and Willis described, like the British motor car industry, has all but disappeared forever.

In the early part of the twenty-first century, the range of activities and sectors where the quantity surveyor is active is becoming more and more diverse. The small practice concentrating on traditional pre- and post-contract services is still alive and well. However, at the other end of the spectrum, the larger practices are now rebadged as international consulting organisations and would be unrecognisable to Willis and Willis. The principal differences between these organisations and traditional large quantity surveying practices are generally accepted to be the elevation of client focus and business understanding and the move by quantity surveyors to develop clients' business strategies and deliver added value. As discussed in the following chapters, modern quantity surveying involves working in increasingly specialised and sectorial markets where skills are being developed in areas including strategic advice on public–private partnerships, partnering, value and supply chain management.

From a client's perspective, it is not enough to claim that the quantity surveyor or the construction industry is delivering a better value service; this has to be demonstrated. Certainly there seems to be a move by the larger clients away from the traditional low-profit, high-risk, confrontational procurement paths; Figure 1.6 on p. 31 illustrates the trend away from traditional lump sum contract based on bills of quantities.

The terms of reference for the Construction Industry Task Force concentrated on the need to improve construction efficiency and to establish best practice. The industry was urged to take a lead from other industries, such as car manufacturing, steel making, food retailing and offshore engineering, as examples of market sectors that had embraced the challenges of rising world-class standards and invested in and implemented lean production techniques. *Rethinking Construction* identified five driving forces that needed to be in place to secure

improvement in construction, and four processes that had to be significantly enhanced, and set seven quantifiable improvement targets, including annual reductions in construction costs and delivery times of 10 per cent and reductions in building defects of 20 per cent. The report also drew attention to the lack of firm quantitative information with which to evaluate the success or otherwise of construction projects. Such information is essential for two reasons:

- to demonstrate whether completed projects have achieved the planned improvements in performance;
- to set reliable targets and estimates for future projects based on past performances.

It has been argued that organisations like the Building Cost Information Service (BCIS) have been providing a benchmarking service for many years through its tender-based index. Additionally, what is now required is a transparent mechanism to enable clients to determine for themselves which professional practice, contractor, sub-contractor, etc. delivers best value.

Assessing performance nowadays

The National Building Specification (NBS) National Construction Contracts and Law Survey 2015 is the third of a series of surveys by NBS. In many respects, this survey is more robust than the RICS Contracts in Use surveys as it takes into account a greater number of respondents and a wider range of interests. Procurement routes such as management contracting, construction management, measured term, cost plus and partnering/alliancing are still minority procurement routes being used most often by more than 3 per cent of respondents.

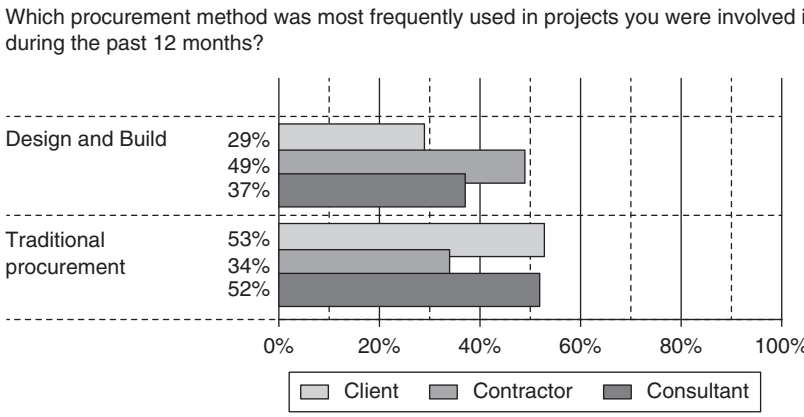


Figure 1.6 NBS survey question: which procurement method was most frequently used?
Source: NBS survey.

The survey illustrates the ongoing decline in traditional procurement. In 2011, 72 per cent of consultants used it most often. In 2012, this had declined to 61 per cent; in the latest survey it is 52 per cent. Similarly, for clients: there was a drop from 59 per cent to 57 per cent and now down to 53 per cent (Figure 1.6).

Although Figure 1.6 appears to reinforce the march of design and build, there is anecdotal evidence that suggests that as the recession took hold in 2009, clients were reverting to single-stage competitive tendering based on bills of quantities. One of the main reasons cited for this was the poor quality control associated with design and build. Another interesting point illustrated in Figure 1.7 in particular is the wide fluctuations in some of the statistics, in particular in relation to construction management and partnering. By 2017, many of the above ingredients of the 1990 heady brew had been factored into UK construction practice.

Change management

As resilient as quantity surveyors have proved to be over the years, there is little doubt that many practices, both large and small, have perished because they failed to adapt to change, as discussed earlier in this chapter. Very often new innovation involves change, either in terms of the organisation or of personnel within the organisation, and the quantity surveyor should be aware and respond to this. Change management refers to the process, tools and techniques to manage the people-side of change to achieve the required business outcome. On occasions a separate change manager may be appointed.

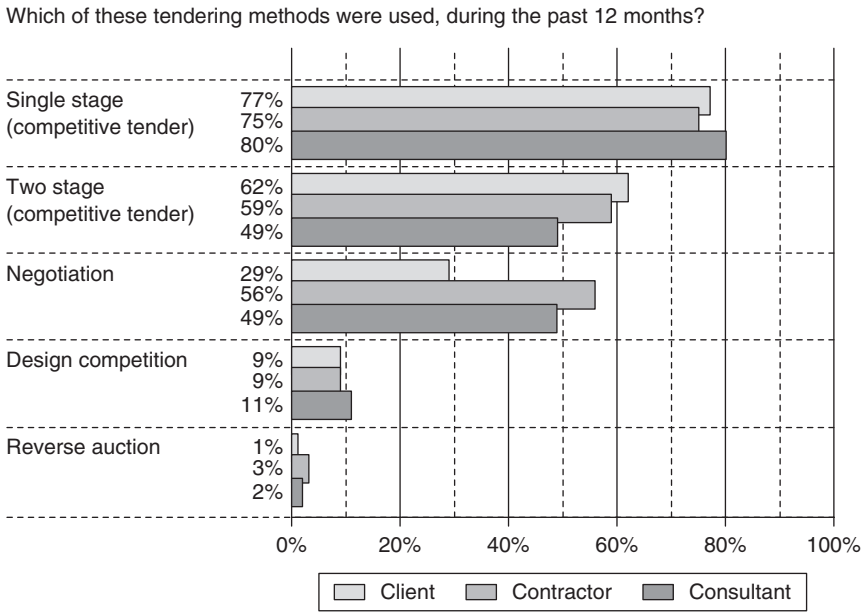


Figure 1.7 NBS survey question: which tendering methods were used?

Source: NBS survey.

Figure 1.8 The change management life-cycle

Change management incorporates the organisational tools that can be used to help organisations and individuals make successful personal transitions, resulting in the adoption and realisation of change. Steps in the change management process (see Figure 1.8) are said to be:

- preparing for change;
- managing change;
- reinforcing change.

In the widest sense, change management is a structural approach to move organisations from their current state to a future state with anticipated business and organisational benefits. It helps organisations to adapt and align to new and emerging market forces and conditions. Delivery and handover of a successful project may well involve organisational change in order to get the maximum benefit from a project; therefore, a well-managed handover is essential and organisations should be able to manage the process successfully.

The steps for an effective change management process are:

- formulating the change by identifying and clarifying the need for change and establishing the scope of change;
- planning the change by defining the change approach and planning stakeholder engagement as well as transition and integration;
- implementing the change by preparing the organisation for change, mobilising the stakeholders and delivering project outputs;
- managing the change transition by transitioning the outputs into business operations, measuring the adoption rate and the change outcomes and benefits and adjusting the plan to address discrepancies;
- sustaining the change on an ongoing basis through communication, consultation and representation of the stakeholders, conducting sense-making activities and measuring benefits.

A quantity surveyor can influence the culture to change by doing the following:

- assessing stakeholder change resistance or support for change;
- ensuring clarity of vision and values among stakeholders;
- creating an understanding among the various stakeholder groups about their individual and interdependent roles in attaining the goals of the change initiative; and
- building a strong alignment between stakeholder attitudes and strategic goals and objectives.

There are a number of change models that have been successfully adopted by business globally, for example:

- Lewin's change management model;
- the McKinsey 7-S model;
- Kotter's 8-step change model.

Lewin's change management model

This change management model was created in the 1950s by psychologist Kurt Lewin. Lewin noted that the majority of people tend to prefer and operate within certain zones of safety. He recognised three stages of change:

- *Unfreeze* – most people make a conscious effort to resist change. In order to overcome this tendency, a period of thawing or unfreezing must be initiated through motivation;
- *Transition* – once change is initiated, the company moves into a transition period, which may last for some time. Adequate leadership and reassurance are necessary for the process to be successful;
- *Refreeze* – after change has been accepted and successfully implemented, the company becomes stable again, and the staff refreeze as they operate under the new guidelines. While this change management model remains widely used today, it takes time to implement. Since it is easy to use, most companies tend to prefer this model to enact major changes.

The McKinsey 7-S model

The McKinsey 7-S model offers a holistic approach to organisation. This model, created by Robert Waterman, Tom Peters, Richard Pascale, and Anthony Athos during a meeting in 1978, has seven factors (7-S) that operate as collective agent of change:

- shared values;
- strategy;
- structure;
- systems;
- style;
- staff;
- skills.

The McKinsey 7-S model offers four primary benefits:

- it offers an effective method to diagnose and understand an organisation;
- it provides guidance in organisational change;
- it combines rational and emotional components;
- all parts are integral and must be addressed in a unified manner.

The disadvantages of the McKinsey 7-S Model are:

- when one part changes, all the parts change, because all the factors are interrelated;
- differences are ignored; and
- the model is complex and companies using this model have been known to have a higher incidence of failure.

Kotter's 8-step change model

Created by Harvard University professor John Kotter, the model causes change to become a campaign. Employees buy into the change after leaders convince them of the urgent need for change to occur. There are eight steps in this model:

1 Increase the urgency for change;
2 Build a team dedicated to change;
3 Create the vision for change;
4 Communicate the need for change;
5 Empower staff with the ability to change;
6 Create short-term goals;
7 Stay persistent;
8 Make the change permanent.

Significant advantages to the model are:

- the process is an easy step-by-step model;
- the focus is on preparing and accepting change, not the actual change;
- transition is easier with this model.

However, there are some disadvantages too:

- steps cannot be skipped;
- the process takes a great deal of time;
- it does not matter if the proposed change is a change in the process of project planning or general operations.

Adjusting to change is difficult for an organisation and its employees and using almost any model is helpful to the quantity surveyor, as it offers leaders a guideline to follow, along with the ability to determine expected results.

Organisational development

Organisational development is a technique to formalise the approaches of organisations that are subject to continuous and rapid change. Ways of implementing organisational development include:

- employing external consultants to advise on change;
- establishing an internal department to instigate organisational change;
- integrating the change process within the mainstream activities of the organisation.

A variety of opinions exist as to which approach is best, as each has its strengths and weaknesses.

Business process re-engineering (BPR)

Business process re-engineering, on the face of it, sounds very similar to organisational development and in practice the two approaches can be difficult to separate. The idea of re-engineering was first propounded in an article in the *Harvard Business Review* in July–August 1990 by Michael Hammer, then a Professor of Computer Science at the Massachusetts Institute of Technology. The method was popularly referred to as business process re-engineering (BPR), and was based on an examination of the way information technology was affecting business processes. BPR promised a novel approach to corporate change, and was described by its inventors as a fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical measures of performance such as cost, quality, service and speed.

The technique involves analysing a company's central processes and reassembling them in a more efficient fashion and in a way that over-rides long-established and frequently irrelevant functional distinctions. A similar approach is adopted by value engineering, see Chapter 6. Throughout this book there is frequent reference to the traditional silo mentality of the construction industry. Silos that are often protective of information, for instance, and of their own position in the scheme of things. Breaking up and redistributing the silos into their different processes and then reassembling them in a less vertical fashion expose excess fat and force organisations to look at new ways to streamline their operations.

One of the faults of the idea, which the creators themselves acknowledged, was that re-engineering became something that managers were only too happy to impose on others but not on themselves. Hammer's follow-up book was pointedly called *Re-engineering the Corporation*. 'If their jobs and styles are left largely intact, managers will eventually undermine the very structure of their rebuilt enterprises,' he wrote with considerable foresight in 1994 (Hammer and Champy, 1994). BPR has been implemented with considerable success by some high-profile organisations, however, it has been suggested that construction, due to its fragmented nature presents a barrier to inter-organisational change.

Less adversarial contracts

Despite its many critics, for many years the default contract recommended by quantity surveyors was the Joint Contracts Tribunal contract, known as the JCT. The main reason for this seems to be that everyone concerned in the

construction process is familiar with the JCT, in all its forms, and more or less knows what the outcome will be in the event of a contractual dispute between the parties to the contract. However, the JCT was often blamed for much of the confrontation that has historically been so much a part of the everyday life in the construction industry and Latham in his 1994 report recommended the use of the New Engineering Contract (NEC). The NEC was first published in 1993 with a second edition (NEC2), when it was renamed the Engineering and Construction Contract (ECC) and a third edition followed (NEC3) in July 2005, with a fourth edition (NEC4) planned for 2017.

According to the NBS *Contracts and Law Report* (2015), NEC3 was used in 30 per cent of contracts surveyed. The NEC is now the default contract for many central government agencies, including the NHS ProCure22, and the Government Procurement Service recommends that public sector procurers use the NEC3 on their construction projects. NEC3 is being used for Crossrail and Transport for London. One of the main differences between NEC and more traditional forms of contract is that the NEC has deliberately been drafted in non-legal language in the present tense which may be fine for the parties to the contract but can cause concern to legal advisors who have to interpret its effect. Another innovation is the inclusion of a risk register, which although it makes possible the early identification of risks, has led to concerns that it may be skewed in the contractor's favour, obliging the Project Manager to co-operate to the contractor's advantage. To date, it appears as though the NEC is a step in the right direction for construction. Few disputes involving the NEC have reached the courts and there is no substantive NEC case law, but time will tell whether that continues to be so when it becomes more universally adopted.

New challenges

As the third edition of *New Aspects of Quantity Surveying Practice* went to print in 2011, sustainability and green issues were just coming to prominence in the world as a whole and the construction industry in particular. In June 2007, the RICS published a guide entitled *Surveying Sustainability*, which attempted to clarify for the professional the many issues surrounding the topic. As well as this guide, a number of other government publications and targets have been and continue to be issued, which, taken together, make addressing sustainability a must for quantity surveyors. Sustainability is so important for the construction industry because construction has been identified as one of the major contributors to carbon emissions (Figure 1.9) and therefore to the great global warming debate, whether or not one actually subscribes to the various theories relating to climate change.

Sustainability and green issues will be discussed in more detail in this book, see Chapter 3, as there is no doubt that it is a topic that will increasingly shape the ways in which buildings are both designed and procured and, therefore, the day-to-day working life of quantity surveyors as they are asked for cost advice/implications on green-related matters.

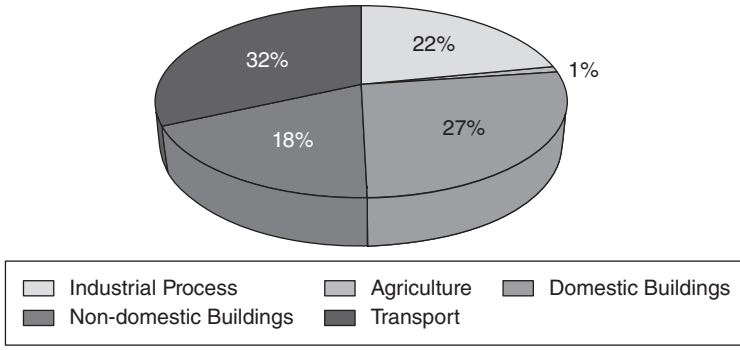


Figure 1.9 Carbon emissions by major sectors

Another matter that has been exercising the mind of quantity surveyors during the recent past is the very future of measurement and the bill of quantities. In 2006, the RICS unilaterally announced 'nobody does measurement any more', and consequently the Standard Method of Measurement (SMM7) for some elements of the profession became redundant. The argument went that because of a lack of recognised industry standard, a new approach was required: the New Rules of Measurement (NRM). A more detailed discussion of the NRM suite will be presented in Chapter 2.

Building Information Modelling (BIM)

Construction Industry Institute research has identified that the average cost of rework can be between 3 and 12 per cent of the project cost, no wonder then that BIM has been seen as an opportunity to get things right, first time, and save an awful lot of money and time. As the brave new world of BIM dawned in 2016, implementation can at best be regarded as patchy with many regarding it as a design tool rather than a platform for greater co-operation. It would appear that in common with other high-profile UK Government targets and policies, not a lot of thought or research went into it before it was announced, not to mention consultation with industry! For example, zero carbon targets announced and then relinquished, the Code for Sustainable Homes introduced and then set aside, incentive grants for low carbon solar and other programmes introduced and then drastically cut because of underestimated cost and demand, a Green Deal announced but not taken up by consumers, etc. The list is endless. BIM is just the latest in a long line. The government needs to talk with industry in order to better understand the needs of industry and their clients rather than introducing unachievable measures and targets. The UK Government's *Construction Strategy 2011*, referred to previously, made a number of demands on the construction industry, perhaps the most high profile of which was that Level 2 BIM was to be

mandatory in all public sector contracts by March 2016, irrespective of value. Wales and Northern Ireland followed suit with Scotland waiting until 2017 when BIM is required for all EU public procurement projects. For this to happen, at the time of writing, there needs to a large shift in the adoption of BIM. The NBS National BIM Report 2015 suggests that only 50 per cent of all organisations surveyed were using BIM.

BIM is primarily an IT-based system that allows greater collaboration between members of the demand and supply side (including quantity surveyors) of the industry at all stages in pre- and post-contract as well as operational. BIM is not new, it has been used in other market sectors for decades and also in other forms in the construction industry. Put simply, BIM is a collaboration platform that uses proprietary software to create a 3D model which is able to be accessed by all members of the construction team. BIM, therefore, is capable of producing a model of a building prior to construction starting on site with the advantages that:

- clashes between different elements can be detected and eliminated;
- alternatives can be investigated;
- time can be saved once work starts on site.

In addition, the following information can be loaded on to the model:

- operation and maintenance data;
- life-cycle cost data;
- health and safety details.

One thing is certain, the way in which BIM has been sold to the construction industry has been a disaster, as, in essence, BIM is not all about software and IT systems – the real challenge for BIM is to encourage greater transparency and collaboration in the construction process. BIM will be discussed more fully in Chapter 4. In 2015, the RICS launched a BIM certified manager scheme for applicants from a wide range of professions including those with 12 months of practical BIM experience either in cost estimating or construction.

Future roles for the quantity surveyor

There can be no doubt that the pressure for change within the UK construction industry and its professions, including quantity surveying, is unstoppable, and that the volume of initiatives in both the public and private sectors to try to engineer change grows daily. The last decade of the twentieth century saw a realignment of the UK's economic base. Traditional manufacturing industries declined while service industries prospered, but throughout this period the construction industry has remained relatively static, with a turnover compared with GDP of 7 per cent. The construction industry is still therefore a substantial and influential sector and a major force in the UK economy. Perhaps more

than any other construction profession, quantity surveying has repeatedly demonstrated the ability to reinvent itself and adapt to change. Is there evidence that quantity surveyors are innovating and moving into other fields of expertise? Quantity surveyors have always been resourceful and adaptable professionals as will be demonstrated in the following pages. In addition to the 'traditional' services, quantity surveyors offer some or all of the following client services on a regular basis:

- acting as employer's agent;
- acting as a project monitor;
- acting as a development manager;
- acting as a taxation advisor;
- working within the infrastructure sector, including the energy sector (oil and gas).

Acting as an employer's agent

The most common situation where an employer's agent (EA) is used is under the JCT (16) Design and Build contract. Design and Build and its variants have over the past 20 years overtaken traditional lump sum contracts based on JCT (16) as the popular form of contract among clients, with more that 40 per cent of contracts being let on this basis in 2016. The employer's agent, as provided in JCT (16) D&B Article 3: Employer's Agent, is employed to administer the conditions of contract, but does not perform the same function as the architect, contract administrator or project manager.

Article 3 gives the EA the full authority to receive and issue the following:

- applications;
- consents;
- instructions;
- notices;
- requests or statements.

The employer's agent has no independent function, but is the personification of the employer, they must act as instructed by the employer and cannot act on their own discretion.

For the chartered quantity surveyor, therefore, the exact position of the employer's agent can be confusing, and in particular the duties, if any, that they owe to the contractor. They must 'otherwise act for the Employer under any of the conditions'.

The JCT (16) D&B contract envisages the employer's agent undertaking the employer's duties on behalf of the employer. The true employer's agent has little or no discretion, and must obey the employer's instructions. The employer's agent has a duty to act in a manner that is independent, impartial and fair in

situations where the EA is required to make decisions on issues in which the employer's and contractor's interests may not coincide.

However, to complicate matters, an employer's agent may also act as a certifier, in which case, the position changes as a certifier has much wider discretion and must act fairly in performing their functions. In order to try to clarify the position of the employer's agent, the RICS has prepared a schedule with a list of potential EA services, with a tick box against each service. The schedule is suitable for use with the RICS Standard and Short Forms of Consultant's Appointment. A separate form of appointment is available for use in Scotland. Please note that since these service documents were published, new legislation and contract documentation, such as the CDM Regulations 2015, RIBA Plan of Work 2013, the Construction Act 2011 (payments), have emerged and surveyors should use the documents for reference only ahead of revised documentation that is being prepared.

Acting on behalf of the client/employer in respect of administration of a 'design and build' contract, potential EA services incorporating issue of notices and certificates, include:

- preparation of Employer's Requirements documentation in association with the client and other consultants;
- instructions in respect of expenditure of provisional sums, interim payment certificates for valuations of works and materials on and off site;
- instructions in respect of variations, changes, confirmation of information and consents, opening up works for inspection, instructing procedure to be adopted in respect of antiquities found on site, advising on conflicts within the contract documentation, value instructions including the effects of postponement of design and/or construction works, including any loss and/or expense and the like;
- statements identifying the part or parts of the works taken into early possession by the employer;
- non-completion certificates;
- certificates of practical completion and accompanying schedules of defective works;
- certificates of making good defects at end of defects liability period or on completion of defects (whichever is later);
- final payment certificate following agreement of final statement of account with contractor and certificate at end of defects liability period;
- costs and expenses properly incurred by the employer should either party determine the contract.

As with general project management appointments, there is no commonly accepted standard role and service for the role of employer's agent. However, assuming a broad role both pre- and post-contract, the following could form the basis of an agreed role.

EA's scope of services

Employer's agents can assist with all facets of pre-construction planning, from assessment of the brief, and communicating this to team members, to identifying the project execution plan. Scope of services can include the following duties.

In the pre-construction phase:

- appointment of the team to suit the procurement and programme constraints;
- production of a comprehensive master programme;
- development of a risk register;
- establishing a management framework;
- development of an information-required schedule and design strategy;
- manage the signing-off of the master plan, master programme, project brief and delivery strategy;
- change control procedures;
- delivery of a procurement route strategy.

In the construction phase:

- pre-qualification and selection of contractor(s);
- preparation of the employer's requirements if a design and build route is selected;
- management of the procurement process;
- refinement of the construction methodology, employer's requirements and contractor's proposals;
- administration of the terms of the contract;
- monitoring the site performance of the contractor to ensure that key milestone dates are achieved;
- management of the phased completion of the project;
- management of flow of information between the contractor and the design team.

In the post-construction phase:

- management of the process of issuing of operation and maintenance (O&M) manuals, and ensuring adequate training is given to any facility management;
- management of the post-construction process to ensure any post-construction issues are rectified.

A true employer's agent must not act unreasonably, dishonestly or capriciously in withholding approvals or certificates but has little or no discretion and must obey the employer's instructions.

Sometimes the role of employer's agent is combined with the role of certifier, who has much wider discretion in performing their duties. A certifier must form and act on their opinion when performing the role. Combining the two roles can create potential conflict.

Acting as a certifier

The role of the certifier is different to and separate from the role of the EA. The employer's agent has very little discretion in carrying out their duties. However, once the role extends to include issuing certificates or approvals and requires the exercise of discretion and professional expertise, then the position becomes more complicated. As with general project management appointments, there is no commonly accepted standard role and service for the employer's agent. However, assuming a broad role, both pre- and post-contract, the following could form the basis of an agreed role.

In the pre-construction phase:

- assistance with all facets of pre-construction planning, from assessment of the brief, and communicating this to team members, to identifying the project execution plan. The scope of service for pre-construction also includes:
    - appointment of the team to suit the procurement and programme constraints;
    - production of a comprehensive master programme;
    - development of a risk register;
    - establishing a management framework;
    - development of an information-required schedule and design strategy;
    - managing the signing-off of the master plan, master programme, project brief and delivery strategy;
    - arranging change control procedures;
    - delivery of a procurement route strategy.

In the construction phase:

- pre-qualification and selection of contractor(s);
- preparation of the employer's requirements if a design and build route is selected;
- management of the procurement process;
- refinement of the construction methodology, employer's requirements and contractor's proposals;
- administration of the terms of the contract;
- monitoring the site performance of the contractor to ensure that key milestone dates are achieved;
- project management of the phased completion;
- project management of flow of information between the contractor and the design team.

In the post-construction phase:

- management of the process of issuing of operation and maintenance (O&M) manuals, and ensuring adequate training is given to any facility management;
- project management of the post-construction process to ensure any post-PC issues are rectified.

Performing project monitoring

Project monitoring is distinct from both project management and construction monitoring and is defined in the RICS Project Monitoring Guidance note (RICS, 2007b) as: protecting the client's interests by identifying and advising on the risks associated with acquiring and interest in a development that is not under the client's direct control, for example, a PF2 project.

Project monitoring can be carried out for a range of clients, including:

- a funding institution which acquires the scheme as an investment on completion;
- a tenant or purchaser which enters into a commitment to lease or purchase a property on completion;
- a bank where a loan matures at the end of the development period;
- grant funders;
- private finance initiative funders and end users.

Note, when used on PF2 contracts, the advice also includes a commentary on the whole life costs for the period of the concession agreement. There the role of a project monitor is principally on a design and build project where he/she monitors the performance of the developer and its team for the client.

Project monitoring deals with matters relating to:

- land and property acquisition;
- statutory compliance;
- competency of the developer;
- financial appraisals;
- legal agreements;
- construction costs and programmes;
- design and construction quality.

The key stages in project monitoring are said to be:

- initial audit role;
- progress reporting;
- practical completion.

Benefits to the client are:

- enhanced risk management;
- enhanced financial management;
- enhanced programme management;
- enhanced quality management.

Acting as a development manager

The RICS Guidance Note on Development Management defines the role as: 'The management of the development process from the emergence of the initial development concept to the commencement of the tendering process for the construction of the works.' The role of the development manager, therefore, includes giving advice on:

- development appraisals;
- planning application process;
- development finance;
- procurement.

There are several definitions of the term development manager and there follows a comparison of the development management process as defined by:

- the RICS Guidance Note;
- the CIOB's Code of Practice for Project Management for Construction and Development;
- the Construction Industry Council (CIC) Scope of Services (major projects) (Table 1.6).

Table 1.6 Construction Industry Council (CIC) Scope of Services (major projects)

Development management process	*RIBA's Outline Plan of Work 2013*	*CIOB's Code of Practice for Project Management for Construction and Development*	*CIC's Scope of Services (major works)*
Phase 1 – Developer's initial concept	A Appraisal	1 Inception	1 Preparation
Phase 2 – Site acquisition strategy	A Appraisal	2 Feasibility (site selection and acquisition)	1 Preparation
Phase 3 – Outline appraisal	B Strategic brief and C Outline proposals	3 Feasibility	2 Concept
Phase 4 – Outline planning permission	C Outline proposals	4 Strategy	2 Concept and part of 3 Design development
Phase 5 – Full planning permission	D Detailed proposals	5 Pre–construction	3 Design development

Source: Adapted from RICS *Guide on Development Management* (2009).

Performing development appraisals

It is important that development appraisals and valuations are determined and carried out in accordance with the RICS valuation standards, referred to colloquially as the red book.

New infrastructure channel

In the spring of 2017, RICS isurv launched a new infrastructure channel. The infrastructure covers a very wide area including:

- civil engineering;
- oil and gas;
- petrochemicals;
- railways.

The full range of opportunities in infrastructure is shown in Figure 1.10.

Working in the oil and gas industries

Quantity surveyors, or cost engineers, as they are often referred to in the oil and gas sector, are usually engaged at the preliminary stages in preparing cost estimates for the construction of oil rigs, refineries, laying of pipelines or a shutdown

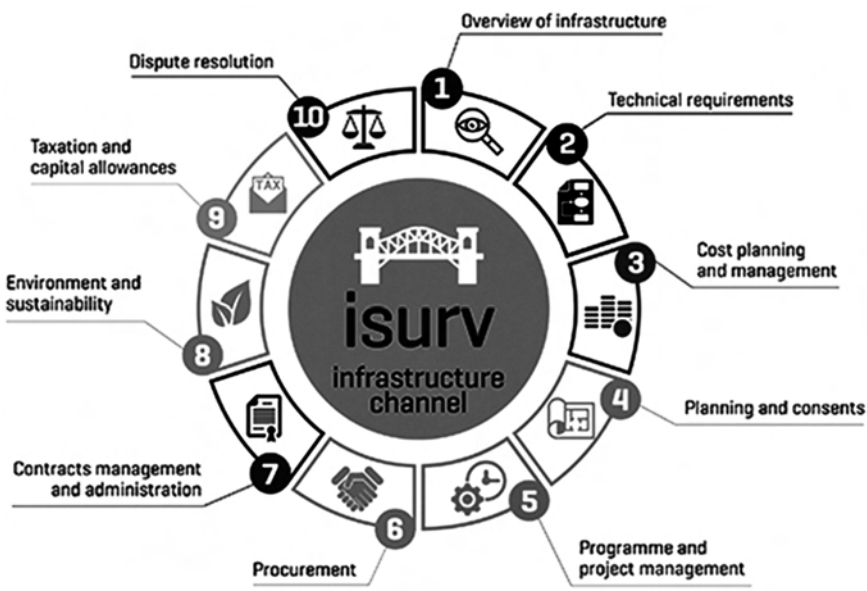


Figure 1.10 The RICS isurv infrastructure channel

for maintenance. As is the case for the building sector, cost engineers must have a working knowledge of drawings, terminologies and the specific skills required for mechanical and pipe work. Often oil and gas facilities are linked to one another and therefore any shutdown period needs to be planned carefully. Timing is vital, whether the project is new-build, upgrade or maintenance. Services provided by cost engineers include:

- cost estimates;
- tender documentation;
- pre- and post-contract administration;
- monthly valuations;
- financial reports;
- evaluating contractual claims;
- agreeing final accounts;
- project management;
- facilities management;
- technical audits.

For the quantity surveyor working as a cost engineer seeking to gain corporate membership of the RICS, the APC built infrastructure requires the candidate to select from a range of Level 3 competencies that include:

- energy (utilities, renewable sources and nuclear);
- mining and resources;
- oil and gas;
- petrochemicals;
- transport: including road, rail, aviation and ports.

Bibliography

Banwell, Sir H. (1964) *Report of the Committee on the Placing and Management of Contracts for Building and Civil Engineering Work*. HMSO.

Building Design Partnership (2004) *Learning from French Hospital Design*. Building Design Partnership.

Burnside, K. and Westcott. A. (1999) *Market Trends and Developments in QS Services*. RICS Research Foundation.

Business and Enterprise Select Committee (2008) *Construction Matters*. Business and Enterprise Select Committee.

Business Vantage and Construction Clients' Group (2008) *Equal Partners*. Business Vantage and Construction Clients' Group.

Cabinet Office (2011) *Construction Strategy 2011*. HMSO.

Callcutt, J. (2007) *Review of Housebuilding Delivery*. HMSO.

Carr, D. and Winch, G. (1998) *Construction Benchmarking An International Perspective*. Bartlett Research.

CITB (2003) *Construction Skills*. Available at: www.citb.co.uk/research/research-reports/skills-training-construction-industry/

Constructing Excellence (2005) *Be Valuable*. Available at: www.constructingexcellence.org.uk

Cook, C. (1999) QS's in revolt. *Building*, 29 Oct, p. 24.

Department for Business, Innovation and Skills (2012) *Business Population Estimates for UK and the Regions*. HMSO.

Department for Business, Innovation and Skills (2013a) *Supply Chain Analysis into the UK Construction Sector*, ed. E.C. Harris LLP. HMSO.

Department for Business, Innovation and Skills (2013b) *Construction 2025: Industrial Strategy for Construction – Government and Industry in Partnership*. Available at: www.gov.uk/government/publications/construction-20

Department of the Environment, Transport and the Regions (1998) *Rethinking Construction*. HMSO.

Edkins, A.J. and Winch, G.M. (1999) Project performance in Britain and France: the case of Euroscan. Bartlett Research Paper 7.

Egan, Sir J. (1998) *Rethinking Construction: The Egan Report*. The Construction Task Force.

Emmerson, Sir H. (1962) *Survey of Problems before the Construction Industries*. HMSO.

Goodall, J. (2000) Is the British construction industry still suffering from the Napoleonic Wars? Address to National Construction Creativity Club, London, 7 July.

Government Strategic Forum (2008) *The Strategy for Sustainable Construction*. Strategic Forum.

Hammer, M. and Champy, J. (1994) *Re-engineering the Corporation*, Nicholas Brealey.

Hoxley, M. (1998) *Value for Money? The Impact of Competitive Fee Tendering on the Construction Professional Service Quality*. RICS Research Foundation.

Infrastructure and Projects Authority (2016) *Construction Strategy 2016–20*. HMSO.

Latham, Sir M. (1994) *Constructing the Team*. HMSO.

Leibfried, K.H.J. and McNair, C.J. (1994) *Benchmarking: A Tool for Continuous Improvement*. HarperCollins.

Lema, N.M. and Price, A.D.F. (1995) Benchmarking performance improvement towards competitive advantage. *Journal of Management of Engineering*, 11: 28–37.

Levene, Sir P. (1995) *Construction Procurement by Government. An Efficiency Scrutiny*. HMSO.

NAO (National Audit Office) (2001) *Modernising Construction*. HMSO.

NAO (National Audit Office) (2005) *Improving Public Services Through Better Construction*. HMSO.

NBS (2015) *Contracts and Law Report*. NBS.

Office of Government Commerce (1999) *Achieving Excellence*. HMSO.

Pickerell, S. and Garnett, N. (1997) *Rethinking IT in Construction and Engineering: Organisational Readiness*. Routledge.

RICS (Royal Institution of Chartered Surveyors) (1971) *The Future Role of the Quantity Surveyor*. RICS.

RICS (1983) *The Future Role of the Quantity Surveyor*. RICS.

RICS (1988) *Challenge for Change*. RICS.

RICS (1991) *Quantity Surveying 2000: The Future Role of the Chartered Quantity Surveyor*, RICS.

RICS (1998) *Challenge of Change: QS Think Tank*. RICS.

RISC (2007a) *Surveying Sustainability*. RICS.

RICS (2007b) *Project Monitoring, RICS Guidance Note*. RICS.

RICS (2009) *Development Management, RICS Practice Standards, Guidance Note*. RICS.

RICS (2013) *Cost Analysis and Benchmarking RICS Practice Standards, Guidance Note*. RICS.

RICS (2015) *RICS Futures, Our Changing World: Let's Be Ready*. Available at: www.rics.org/futures

Simon, Sir E. (1944) *The Placing and Management of Building Contracts*. HMSO.

Strategic Forum for Construction (2002) *Accelerating Change*. Strategic Forum for Construction.

Strategic Forum for Construction (2008) *Construction Commitments*. Strategic Forum for Construction.

Thompson, M.L. (1968) *Chartered Surveyors: The Growth of a Profession*. Routledge & Kegan Paul.

Turner and Townsend (2015) International construction market survey 2015: global rebalancing a changing landscape. Available at: www.turnerandtownsend.com./en/insights/international-construction-market

United Kingdom Offshore Operators Association (1994) *CRINE, Cost Reduction Initiative for a New Era*. United Kingdom Offshore Operators Association.

Wolstenholme Report (2009) *Never Waste a Good Crisis*. Constructing Excellence.

2 Joined-up cost management

For many within the construction industry, measurement and the quantity surveyor are synonymous. For years, quantity surveyors, using a variety of protocols, have provided quantities and schedules for the industry to calculate estimates, tenders and final accounts. In the past, the popularity of measurement was, in the main, due to the widespread use of bills of quantities, which has declined in the past few years, while other methods of procurement, not so dependent on a detailed bill of quantities, have become more popular with clients. Once a key element of quantity surveying diploma and degree courses, measurement has now been confined to the status of just another subject.

Measurement protocols

Standard Methods of Measurement of Building Works

For nearly one hundred years, the Standard Method of Measurement was the industry model for preparing bills of quantities. It first appeared in 1922 and was based on 'the practice of the leading London quantity surveyors'. It was an attempt to bring uniformity to the ways in which quantity surveyors measured and priced building works. For years the Standard Method of Measurement was in the co-ownership of the RICS and the Building Employers Confederation (BEC).

The seventh edition appeared in 1988 as a joint publication between the RICS and BEC and was last revised in 1998. However, in 2011, the RICS bought out BEC's share to become the sole owners of the SMM7 copyright, although the process was not straightforward, rather like a married couple getting divorced, with the RICS and BEC trading insults and press releases. In addition to being used in the UK, the various UK standard measurement protocols for measuring building works have been the basis for the preparation of methods of measurement that are used in, for example, Malaysia and Hong Kong.

Other methods of measurement that have been developed to cater for particular industry or trade practices are discussed below.

Civil Engineering Standard Method of Measurement (CESMM4)

Sponsored and published by the Institution of Civil Engineers, the first edition of CESMM4 appeared in 1976 in order to 'standardise the layout and contents of Bills of Quantities and to provide a systematic structure'. The current fourth edition was published in 2012.

The two standard methods of measurement described above reflect the different approaches of the two industries, not only in the nature of the work, but also the degree of detail and the estimating conventions used by both sectors. This in turn reflects the different ways in which building and civil engineering projects are organised and carried out. In general, the New Rules of Measurement 2 (NRM2) has more emphasis on detail, whereas the CESMM4 takes a more inclusive, method-related approach to the measurement process. Building work comprises many different trades whereas civil engineering works consists of large quantities of a comparatively small range of items. Having said this, the two methods of measurement have tended to converge in their measurement approach to some work sections, such as excavation.

Other methods of measurement include:

- standard method of measurement for highways;
- standard method of measurement for roads and bridges;
- standard method of measurement for industrial engineering construction, which provides measurement principles for the estimating, tendering, contract management and cost control aspects of industrial engineering construction;
- RICS international method of measurement.

The RICS professional statement: *RICS Property Measurement* (2015)

A recent addition to the numerous measurement protocols is the RICS professional statement: *RICS Property Measurement* (2015). The *RICS Property Measurement* updates the RICS *Code of Measuring Practice* (6th edn) (2007) and incorporates the International Property Measurement Standards (IPMS). It comprises the following three elements:

- *Part 1* – Professional statement: office measurement – this part should now be used for the measurement of offices only and is mandatory for RICS members;
- *Part 2* – International standards – applicable to offices only;
- *Part 3* – *Code of Measuring Practice* (6th edn) (2007) which now has global coverage (previously it was for the UK only), and is to be used for all property except offices, i.e. residential, industrial, retail and mixed use.

International Construction Measurement Standards (ICMS) and International Property Measurement Standards (IPMS)

The International Construction Measurement Standards (ICMS) Coalition was established by non-profit organisations representing professionals in more than 140 countries. Collectively, the group aims to create overarching international standards that will harmonise cost, classification and measurement definitions, in order to enhance comparability, consistency and benchmarking of capital projects.

The standards offer a framework of 13 project categories, each identifying a different type of construction project, and a template against which costs can be classified, recorded, analysed and reported. The project categories are consistent with the United Nations International Standard Industrial Classification of All Economic Activities, Revision 4. The hierarchical framework has four levels:

- level 1: project category;
- level 2: cost category;
- level 3: cost group;
- level 4: cost subgroup.

The composition of levels 2 and 3 is the same for all project categories. Although discretion is allowed in the contents of level 4, some examples of the contents of level 4 are given in Appendices A, B and C of the NRM2.

This standard provides definitions, scope, attributes and values, units of measurement and explanatory notes for each project category. It provides guidance on the following:

- how the standard is to be used;
- the level of detail to be included;
- the method of dealing with projects combining different project types; and
- the approach to be taken to ensure that like is compared with like, especially taking account of different currencies and time frames.

In respect of buildings, the various cost analysis standards worldwide require the measurement of a gross floor area, either external (gross external floor area; GEFA) or internal (gross internal floor area; GIFA). This permits the representation of overall costs in terms of currency per GEFA or GIFA. Research undertaken elsewhere has identified that these gross floor areas can vary considerably between countries. Measurement guidelines and definitions also vary considerably between countries. The linking of the ICMS with the IPMS provides a valuable tool for overcoming these inconsistencies. The ICMS requires a cost report to include both GEFA (IPMS 1) and GIFA (IPMS 2) measured in accordance with the rules set out in IPMS. These are summarised in Appendix F of the NRM1.

The model prioritised setting measurement standards for buildings and selected categories of civil engineering. The civil engineering categories chosen for this first edition of ICMS are those that are most commonly required and cover:

- transport;
- energy;
- oil and gas; and
- the utility sectors.

Further categories will be added in the future. The standards are due for publication in 2017 and will in time become mandatory for RICS members replacing;

The RICS *Code of Measuring Practice* (6th edn) (2007)

The aim of the code is to provide succinct, precise definitions to permit the accurate measurement of buildings and land, the calculation of the sizes (areas and volumes) and the description or specification of land and buildings on a common consistent basis. It is particularly useful when preparing cost plans and giving cost advice. The code is for international application and includes three core definitions that are used in a variety of situations as noted, as follows (see www.rics.org).

GEA

This approach to measurement is recommended for:

- building cost estimation for calculating building costs for residential property for insurance purposes;
- town planning applications and approvals;
- rating and council tax bands.

GIA

This approach to measurement is recommended for:

- building cost estimation;
- marketing and valuation of industrial buildings, warehouses, department stores;
- valuation of new homes;
- property management – apportionment of services charges.

GIA is the area of a building measured to the internal face of the perimeter walls at each floor level.

Net internal area (NIA)

This approach to measurement is recommended for:

- marketing and valuation of shops, supermarkets and offices;
- rating shops;
- in property management, it is used for the apportionment of services charges.

NIA is the usable area within a building measured to the internal face of the perimeter walls at each floor level.

The RICS New Rules of Measurement Suite (NRM1, 2 and 3)

As previously stated in the introduction to this chapter, the *Standard Method of Measurement of Buildings Works* (SMM), described by RICS Books as a 'landmark publication' has, for as long as anyone can remember, been the standard set of rules and measurement conventions that quantity surveyors refer to when preparing bills of quantities. After all, it makes sense that if we need to quantify items of labour and materials that we should use a common set of rules. Traditionally, the rules of measurement have been a document drawn up by both sides of the construction industry, from the client side, the RICS and from the contracting side, the Construction Confederation. It is fair to say that the SMM in all its editions has benefited from a captive market and royalties from the SMM over the years must have been substantial. The SMM also forms the basis of methods of measurement that are used in Malaysia and Hong Kong. Imagine the outrage, therefore, at the Construction Confederation when in June 2006 the RICS announced that they were going alone and were to draw up and publish New Rules of Measurement. The reason behind this move was the belief on the part of the RICS that 'Nobody produces bills of quantities any more.' This statement was later clarified as meaning that measurement was still taking place, but in a variety of differing formats and conventions and one of the consequences in changing practice was that the Building Cost Information Service was finding it increasingly difficult to obtain cost data from the industry in a form that was meaningful. In 2003, the RICS Quantity Surveying and Construction Professional Group commissioned a report 'Measurement-based procurement of buildings' from the Building Cost Information Service, which came to a number of conclusions. The report was based on a survey of practising consultants and contractors and was carried out during 2002. As with most surveys of this nature, the response rate was low with only some 20 per cent of consultants responding and only 12 per cent of contractors. It confirmed that measurement still had an important part to play in the procurement of buildings, and perhaps not surprisingly, it found that measurement was used by clients, contractors, sub-contractors and suppliers. Following the report, the group established a steering committee with a brief to identify and develop client-focused common standards of measurement at each level of the hierarchy in the construction process. Figure 2.1 illustrates a project overview of the NRM in which the various strands of the

Figure 2.1 Project overview of the NRM

initiative can be identified. One reason for the above trend is the rise in the use of design and build, and a rise in the use of contractor's bills of quantities with few of them being prepared to a standard format. Further, the allegation was that SMM7 was out of date and represents a time when bills of quantities and tender documents were required to be measured in greater detail than is warranted by current procurement practice and, therefore, a new approach was required. The RICS Contracts in Use Survey 2007 commented on the traditional approach to measurement:

> Bills of quantities refuse to die. It should be noted that while the use of the 'with quantities forms' have declined, there are still SMM7 Bills of Quantities being measured. It will be interesting in future years to see what is happening in the market when the RICS publishes NRM2, the procurement section of the NRM suite of documents

Interestingly, by the end of 2017, very little had happened, as the industry, i.e. clients, quantity surveyors and contractors have been very slow to adopt the New Rules of Measurement. Currently the situation appears to be:

- quantity surveyors will use NRM2 if asked to by the client;
- contractors will engage with NRM2 if they receive a bill of quantities prepared in NRM2 format.

The reasons for the slow adoption appear to be:

- the initial slowness of software companies to produce bill of quantities packages in NRM2 format;
- the reluctance of the industry to invest in training during recent recessions;
- a reduction in the numbers of bills of quantities being prepared;
- lack of co-ordination between NRM2 and the National Building Specification (NBS), which is likely to persist for some time into the future.

Another important factor must be that SMM7 is still widely available, albeit with the caveat that it is not recommended guidance. This seems to be a strange contradiction as the original intention of the RICS Quantity Surveying and Construction Professional Group Board was to 'turn off' SMM7 with the launch of NRM2, to encourage the adoption of the latter document; this surely sends mixed messages to the profession. The situation is even more confusing when the RICS include a note in NRM2 regarding the status of the document namely,

> The status of the rules of measurement is the same as other RICS guidance notes and as such if an allegation of professional negligence is made against a surveyor, a court is likely to take account of the contents of any relevant guidance notes published by the RICS in deciding whether or not the surveyor had acted with reasonable competence

The New Rules of Measurement are published in three volumes in both hard copy and free download:

- Volume 1: *Order of Cost Estimating and Cost Planning for Capital Building Works* (NRM1)
- Volume 2: *Detailed Measurement for Building Works* (NRM2)
- Volume 3: *Order of Cost Estimating and Cost Planning for Building Maintenance Works* (NRM3)

The first volume, *Order of Cost Estimating and Cost Planning for Capital Building Works*, was launched in March 2009 with a second edition, containing minor amendments, in 2012. With 310 pages, NRM1 aims to provide a comprehensive guide to good cost management of construction projects; however, it is volume 2, the section dealing with works procurement, or measurement, that has caused a furious reaction from the Construction Confederation, who issued a legal challenge in September 2009, on the basis that it will gain no royalties from the sale of the new rules and that they have been drawn up without its input. The New Rules of Measurement have therefore been largely produced in agreement with the trade and sub-contracting bodies, the main

contractors have not been consulted. However, the Confederation claimed that the New Measurement Rules are based on information contained in the previous SMM editions and that there are consequently copyright issues arising from the new publication.

The launch of NRM2 by the RICS could have been timely as the Construction Confederation announced that it would be winding up following the statement from the Confederation of British Industry (CBI) that it would launch a superbody of 24 construction bosses called the Construction Council to lobby on construction issues. In October 2009, the Construction Confederation ceased trading with pension debts of £20 million.

The rationale for the introduction of the NRM2 is that it provides:

- a standard set of measurement rules that are understandable by all those involved in a construction project, including the employer, thereby aiding communication between the project/design team and the employer;
- direction on how to describe and deal with cost allowances not reflected in measurable building work;
- in addition, it was thought that the SMM7 was UK-centric and a more universal approach was now required.

The structure of NRM1 *Order of Cost Estimating and Cost Planning for Capital Building Works* is:

- *Part 1* places rules of measurement in context with the RIBA Plan of Work and the Office of Government Commerce Gateway Process[1] as well as explaining the definitions and abbreviations used in the rules (Figure 2.2);
- *Part 2* describes the purpose and content of an order of cost estimate and explains how to prepare an order of cost estimate using three prescribed approaches: floor area, functional unit and elemental method;
- *Part 3* explains the purpose and preparation of elemental cost plans;
- *Part 4* contains tabulated rules of measurement for formal cost plans.

Joined-up cost management

The basic premise for introducing New Rules of Measurement was that SMM7 was no longer fit for purpose for a number of reasons and that, in addition, it did not adequately address changes in procurement strategies. SMM7 also presents problems when it comes to cost advice as it does not reflect the modern approach to compiling cost plans and creates difficulties in capturing cost data.

As a result, elemental cost data is not being recorded in a format that can easily be used for modern procurement strategies. The Building Cost Information Service Standard Form of Cost Analysis (SFCA) was first produced in 1961 when the bill of quantities was king and subsequently revised in 1969 and 2008 and has been the industry norm for the past 40 years. The SFCA is presented in element format but in truth has not really changed its format since its original launch, whereas the industry has moved on and changed!

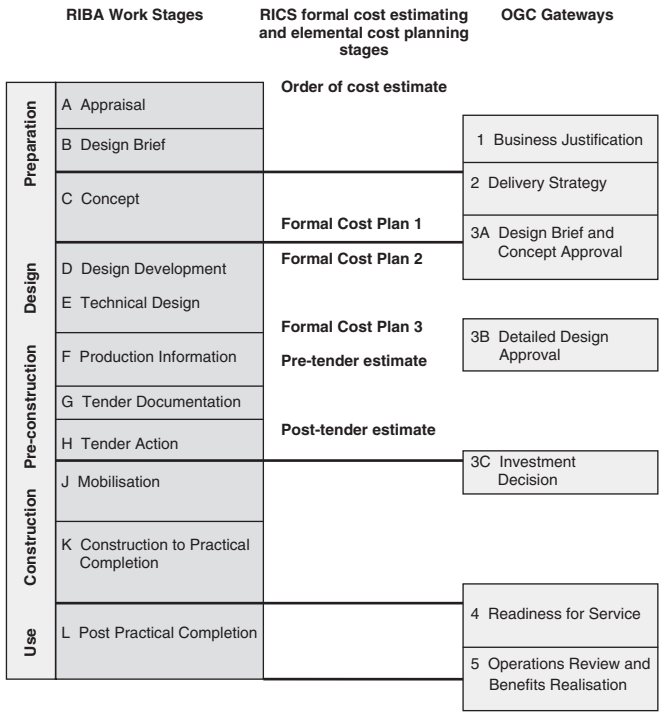


Figure 2.2 The RICS formal cost estimation and cost planning stages in context with the RIBA Plan of Work and OGC Gateways

Source: Copyright RIBA 2008.

Another factor that drove NRM1 was that there is currently no specific advice on the measurement of building works solely for the purpose of preparing cost estimates and cost plans. As someone who has tried to teach cost planning and estimating for the past 40 years, I am acutely aware that students, as well as practitioners, are often confused as to how estimates and cost plans should be prepared, resulting in the process taking on the air of a black art! This situation has led to an inconsistent approach, varying from practice to practice, leaving clients a little confused. It is also thought that the lack of importance of measurement has been reflected in the curriculum of degree courses, resulting in graduates unable to measure or build up rates, a comment not unknown in the past 50 years or so.

NRM1 is divided into two distinct sections:

- Rules for preparing order of cost estimates (early indications of likely cost).
- Rules for preparing cost plans in a variety of differing detail:
    - formal cost plan 1;
    - formal cost plan 2;

- formal cost plan 3;
- pre-tender estimate.

In addition, the NRM approach divides cost estimates and cost plans into five principal cost centres:

- works cost estimate;
- project/design team fees estimate;
- other development/project cost estimate;
- risk allowance estimate;
- inflation estimate.

The Order of Cost Information and Cost Plan Stages have differing recommended formats, see Tables 2.1 and 2.2. For Order of Cost Estimates, the recommended format is as follows:

- building works;
- main contractor's preliminaries;
- main contractor's profit and overheads;
- project/design team fees;
- other development/project costs;
- risk;
- inflation;
- capital allowances, land remediation relief and grants;
- VAT assessment.

Table 2.1 RICS New Rules of Measurement – Order of Cost Estimate format

Ref	*Item*	£
1	Building Works	
2	Main Contractor Preliminaries	
3	Main Contractor Overheads and Profit	
	Works Cost Estimate	
4	Project/Design Team Fees	
5	Other Development/ Project Costs	
	Base Estimate	
6	Risk Allowances:	
	Design Development Risk	
	Construction Risks	
	Employer Change Risks	
	Employer Other Risks	
	Cost Limit (excluding inflation)	
7	Inflation:	
	Tender Inflation	
	Construction Inflation	
	Cost Limit (including inflation)	

Table 2.2 RICS NRM1 Formal cost plan format

Group element	*Element*
0 Facilitating works	
1 Substructure	
2 Superstructure	
	2.1 Frame
	2.2 Upper floors
	2.3 Roof
	2.4 Stairs and ramps
	2.5 External walls
	2.6 Windows and external doors
	2.7 Internal walls and partitions
	2.8 Internal doors
3.1 Internal finishes	3.1 Wall finishes
	3.2 Floor finishes
	3.3 Ceiling finishes
4 Fittings, furnishings and equipment	
5 Services	5.1 Sanitary appliances
	5.2 Services equipment
	5.3 Disposal installations
	5.4 Water installations
	5.5 Heat source
	5.6 Space heating and air conditioning
	5.7 Ventilation systems
	5.8 Electrical installations
	5.9 Gas and other fuel installations
	5.10 Lift and conveyor installations
	5.11 Fire and lightning protection
	5.12 Communication, security and control systems
	5.13 Special installations
	5.14 Builders' work in connection with services
	5.15 Testing and commissioning of services
6 Complete buildings and building units	
7 Works to existing buildings	
8 External works	

There are, therefore, two distinct stages in the preparation of initial and detailed cost advice:

- estimate = an evolving estimate of known factors. Is the project affordable? The accuracy at this stage is dependent on the quality of the information. Lack of detail should attract a qualification on the resulting figures;
- cost plan = a critical breakdown of the cost limit for the building into cost targets for each element.

RICS New Rules of Measurement 1: Order of Cost Estimate format

A feature of NRM1 is the detailed list of information that is required to be produced by all parties to the process: the employer, the architect, the mechanical and electrical services engineers and the structural engineer all have substantial lists of information to provide. There is an admission that the accuracy of an order of cost estimate is dependent on the quality of the information supplied to the quantity surveyor. The more information provided, the more reliable the outcome will be, and in cases where little or no information is provided, the quantity surveyor will need to qualify the order of cost estimate accordingly.

The development of the estimate/cost plan starts with the order of cost estimate.

Works cost estimate: Stages 1–3

The works cost estimate has three constituents:

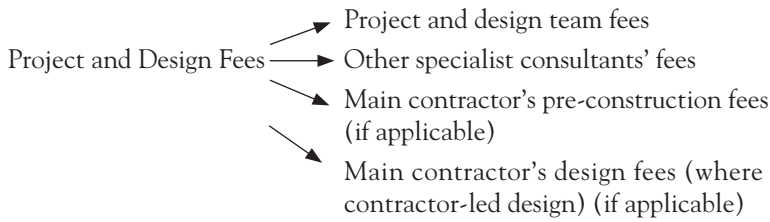
- building works estimate;
- main contractor's preliminaries;
- main contractor's overhead and profit.

At this stage, the main contractor's preliminaries and overheads and profit are included as a percentage with sub-contractors' preliminaries and overheads and profit being included in the unit rates applied to building works. NRM1 aims to establish a uniform approach to measurement based on the RICS *Code of Measuring Practice* (6th edn) (2007), in which there are three prescribed approaches for preparing building works estimates, namely:

1 Cost per m^2 of floor area: Building works estimate = the floor area of the proposed project × a cost /m^2 of a previous similar project, which could be in the following formats:
    - gross external area (GEA);
    - gross internal area (GIA/GIFA);
    - net internal area (NIA).
2 Functional unit method: Building works estimate = Number of functional units × cost per functional unit. A list of suggested functional units are included in Appendix B of NRM1.
3 The elemental method: Building works estimate = Sum of elemental targets. Cost target (for element) = element unit quantity (EUQ) × element unit rate (EUR). It can be seen from Tables 2.1 and 2.2 the amount of detail required to be given with this approach. although the choice and the number of elements used to break down the cost of building works will be dependent on the information available. Rules for calculating EUQ are included in Appendix E of NRM1.

Project and design fees: Stage 4

In the spirit of transparency, the costs associated with project and design fees are also itemised along the following lines:



Other development and project costs estimate: Stage 5

This section is for the inclusion of costs that are not directly associated with the cost of the building works, but form part of the total cost of the building project, for example, planning fees.

Risk allowance estimate: Stage 6

Risk is defined as the amount added to the base cost estimate for items that cannot be precisely predicted to arrive at the cost limit. The inclusion of a risk allowance in an estimate is nothing new; what perhaps is new, however, is the transparency with which it is dealt with in NRM. It is hoped therefore that the generic cover-all term 'Contingencies' will be phased out. Clients have traditionally homed into contingency allowances wanting to know what the sum is for and how it has been calculated. The rate allowance is not a standard percentage and will vary according to the perceived risk of the project although just how happy quantity surveyors are about being so up-front about how much has been included for unforeseen circumstances or risk is a matter of debate. It has always been regarded by many in the profession that carefully concealed pockets of money hidden within an estimate for extras/additional expenditure is a core skill. So how should risk be assessed at the early stages in the project? It is possible that a formal risk assessment should take place, and this would be a good thing, using some sort of risk register. Obviously, the impact of risk should be revisited on a regular basis as the detail becomes more apparent and risk allowances are incorporated into the elemental costs.

Risks are required to be considered under four headings:

- design development risks, for example, design development and environmental issues;
- construction risks, for example, site restrictions, existing services;
- employer's change risk, for example, changes in the scope of the works or the brief;
- employer's other risk, for example, early handover, postponement/acceleration.

Inflation estimate: Stage 7

An allowance is included for inflation under two headings:

- tender inflation; an allowance from the period from the estimate base date to the return of the tender;
- construction inflation; to cover increases from the date of the return of tender to a mid-point in the construction process.

Inflation should be expressed as a percentage using the retail price index, the tender price index or the BCIS building cost indices. This adjustment is of course in addition to any price adjustments made earlier in the process when adapting historic cost analysis data. In addition, care should be taken not to update previous rates that were based on a percentage addition, e.g. main contractor's preliminaries, main contractor's overheads and profit, and project/design team fees, as these will be adjusted automatically when the percentages are applied.

Finally, it is suggested that other advice could be included relating to:

- VAT;
- capital allowances;
- land reclamation relief;
- grants.

Giving tax advice on capital allowances has been a stock in trade for many quantity surveyors for some time, but it really needs specialist, up-to-date information in order to avoid potential problems. In addition, particularly with VAT, the tax position of the parties involved may differ greatly and advice should not be given lightly.

From this point on, advice is given by the preparation of formal cost plans 1, 2 and 3. It is anticipated that for the formal cost plan stages, the elemental approach should be used and this should be possible as the quantity and quality of information available to the quantity surveyor should be constantly increasing. Table 2.3 demonstrates the degree to which detail increases during this process.

Table 2.3 The preparation of formal cost plans

Level 1	*Level 2*	*Level 3*
Group element	*Element*	*Sub-element*
3 Internal finishes	1 Wall finishes	1 Finishes to walls
	2 Floor finishes	1 Finishes to floors
		2 Raised access floors
	3 Ceiling finishes	1 Finishes to ceilings
		2 False ceilings
		3 Demountable special ceilings

At the formal cost plan stages, NRM1 recommends that cost advice is given on an elemental format, and to this end Appendix 4 of NRM1 contains comprehensive rules for the measurement for building works: 'Tabulated rules of measurement for elemental cost planning', enabling quantities to be measured to the nearest whole unit, providing that this available information is sufficiently detailed. When this is not possible, then measurement should be based on GIFA. From formal cost plan stage 2, cost checks are to be carried out against each pre-established cost target based on cost significant elements. One thing that is clear is that if the NRM1 approach is followed, it appears to be labour-intensive and one thought is that the cost planning stages and procurement document stages will morph so that the final cost plan becomes the basis of obtaining bids. Part 4 of NRM1, the tabulated rules of measurement, gives the quantity surveyor, for the first time a set of rules for the preparation of cost plans that comply with the rules for preparing a standard form of cost analysis.

Another purpose to which NRM1 is now being put is to use Part 4, the tabulated rules of measurement, to prepare builder's quantities or so-called dirty bills of quantities and this approach could be adopted in the following circumstances:

- if a client is not prepared to pay for the preparation of a bill of quantities;
- if there is not time to prepare a bill of quantities;
- for smaller value projects where a bill of quantities cannot be justified; or
- to use the cost plan as the basis for obtaining bids from contractors.

NRM2: Detailed measurement for building works

NRM2 is the direct replacement for SMM7 and was launched in April 2012 to become effective by January 2013. The general format and layout of NRM2 will be recognisable to quantity surveyors but there are one or two changes, for example, trades have been replaced with work sections and overall there are 41 work sections in NRM2 compared with SMM7 which had 22 trade sections. Many of these additional sections are a direct result of splitting existing SMM7 sections into smaller, more manageable, work sections, for example, SMM7 Section E: In-situ concrete/large precast concrete has been reorganised in NRM2 into three separate work sections:

- Section 11 In-situ concrete work;
- Section 12 Precast composite concrete;
- Section 13 Precast concrete.

Similarly, SMM7 Section D Ground works has been reorganised into the following separate work sections:

- Section 5 Excavating and filling;
- Section 6 Ground remediation and soil stabilisation;
- Section 7 Piling;
- Section 8 Underpinning;

- Section 9 Diaphragm walls and embedded retaining walls;
- Section 10 Crib walls, gabions and reinforced earth.

There is a net addition of seven new work sections. This new arrangement of work sections, it is said, reflects the need for flexibility for work package measurement and the widespread use of new construction techniques and modern methods of construction (MMC).

Some new sections have been introduced, for example, Section 2 Off-site manufactured materials, components or buildings, and, not unsurprisingly, typical work packages: Section 30 Suspended ceilings and Section 20 Proprietary linings and partitions have their own discrete sections.

One of the most obvious differences between NRM2 and SMM7 is that NRM2 is much bigger than SMM7 with one hundred more pages and is more prescriptive than its predecessor, for example, SMM7 had just five pages of general rules outlining how quantities are recorded and descriptions are framed whereas NRM2 has 40+ pages of general rules in Parts 1 and 2 covering such items as:

- the types and purpose of bills of quantities;
- the composition of bills of quantities;
- preliminaries;
- risk management within a bill of quantities;
- details of information to be provided prior to measurement;
- codification of bills of quantities;
- cost management/control;
- analysis of cost data.

NRM2 therefore can be considered a good practice guide for producing bills of quantities/work packages, almost like a text-book and certainly worth a look!

The structure of NRM2 is:

- *Part 1* places the measurement for works procurement in context with the RIBA Plan of Work and the OGC Gateway Process; and explains the symbols, abbreviations and definitions used in the rules;
- *Part 2* outlines the benefits of detailed measurement and describes the purpose and uses of RICS New Rules of Measurement: *Detailed Measurement for Building Works*; explains the function of bill of quantities, provides work breakdown structures for bill of quantities, defines the information required to enable preparation of bill of quantities, describes the key constituents of bill of quantities, explains how to prepare bill of quantities; sets out the rules of measurement for the preparation of bill of quantities; and provides the method for dealing with contractors' preliminaries, contractors' overheads and profit, contractors' design fees, other development/project costs, risks, inflation, and data gathering to support claims for tax incentives;
- *Part 3* comprises the tabulated rules for the measurement and description of building works for the purpose of works procurement;
- Supporting appendices.

Preliminaries

The preliminaries section is the largest in NRM2 and contains rules that apply to both bills of quantities and work packages. Again NRM2 adopts a much more comprehensive approach: NRM2 has 59 pages covering main and work packages compared with just 6 pages in SMM7.

Work sections

Many items that were thought to take too long to measure but added little to value have been deleted. In the work sections deemed to be included, works and materials are set out at the start of each section and replace the SMM7's coverage rules.

The following sections of NRM2 have alternative approaches to measurement and it is up to the quantity surveyor preparing the documentation to select the appropriate approach. These work sections are:

- Section 5 Excavation and filling;
- Section 8 Underpinning;
- Section 11 In-situ concrete work;
- Section 38 Mechanical services;
- Section 39 Electrical services.

For example, when measuring excavation and filling, NRM2 allows excavation to be described in two alternative ways:

- *Alternative 1*: The default approach, where all excavation is categorised as either bulk excavation or foundation excavation;
- *Alternative 2*: This alternative gives the quantity surveyor the opportunity to measure and describe the items of bulk excavation, i.e. excavating to reduce levels or to form basements, pools, ponds or the like, separately.

Although a degree of flexibility when measuring is desirable, perhaps it would have been better to make alternative 2 the default approach with alternative 1 as back-up. A consequence of adopting alternative 1 is that post-contract administration becomes more complicated as, for example, when carrying out a valuation for interim payment, the single item of bulk excavation may have to be broken down into its constituent parts.

Appendices

NRM2 contains a number of pro-formas in the Appendices at the rear of the document as follows:

- Appendix A Guidance on the preparation of bill of quantities;
- Appendix B Template for preliminaries (main contract) pricing schedule (condensed);

- Appendix C Template for preliminaries (main contract) pricing schedule (expanded);
- Appendix D Template for pricing summary for elemental bill of quantities (condensed);
- Appendix E Template for pricing summary for elemental bill of quantities (expanded);
- Appendix F Templates for provisional sums, risks and credits;
- Appendix G Example of a work package breakdown structure.

NRM3 *Order of Cost Estimating and Cost Planning for Building Maintenance Works*

The final part of the NRM suite, NRM3 had a 'soft launch' in 2013 and came into effect from 1 January 2015. Following extensive collaboration with BCIS, the Chartered Institution of Building Services Engineers (CIBSE) and the Building & Engineering Services Association (BESA) have agreed to adopt the NRM3 expanded cost structure. This means that the NRM3 elemental cost structure is now fully aligned with industry-standard planned preventative maintenance task schedules and the economic reference life expectancy data structure published by CIBSE Guide M and the BCIS.

NRM3 of the RICS New Rules of Measurement for building maintenance works provides a structured basis for the measurement of building maintenance works, encompassing the annualised maintenance and life-cycle major repairs and replacements of constructed assets and building components – which are carried out post-construction procurement and throughout the in-use phases of the constructed assets, or the built environment.

The prime functions of these rules of measurement is to provide consistent standards for the quantification and measurement of building maintenance work items – for the purposes of producing order of cost estimates, elemental cost plans and detailed asset-specific work programmes, throughout the entire building life-cycle.

The secondary functions of these rules of measurement for maintenance works include, among others, to provide information. This information is put to the following uses:

1 Input into life-cycle cost plans in a structured way, so that the same approach is adopted for all life-cycle cost plans cash flows and option appraisals. This in turn will facilitate meaningful comparison and more robust data analysis;
2 Advising clients on the likely cash flow requirements for the purpose of annual budgeting (and initiating sinking funds) and informing forward maintenance and life-cycle renewal plans;
3 Informing the implementation of maintenance strategy and procurement stages and the cost control of expenditure on maintenance works.

The process of economic evaluation of the whole life-cycle costing of all construction, operation and maintenance-related costs during ownership is what is

commonly referred to as *life-cycle costing*. It provides a method for quantity surveyors/cost managers to assist building owners and project teams in selecting the optimum solution for their circumstances and help inform the decision-making process at various stages during the feasibility, design development and procurement and the in-use phases of a building or facility.

NRM3 does not deal with operation or occupancy costs, or energy/carbon and environmental costs as these are too unpredictable.

According to the RICS, NRM3 can be used for:

- the initial order of cost estimates during preparation stages;
- cost plans during the design development and pre-construction stages;
- asset-specific cost plans during the pre-construction phases.

It also offers guidance on:

- the procurement and cost control of maintenance works;
- the measurement of other items associated with maintenance works that are not included in work items.

The rules for NRM3 follow the same framework and premise as NRM1 *Order of Cost Estimating and Cost Planning for Capital Building Works*.

The RICS New Rules of Measurement: *Order of Cost Estimating and Cost Planning for Building Maintenance Works* (NRM3), is divided into five parts with supporting appendices:

- *Part 1* places *Order of Cost Estimating and Cost Planning* in context with the RIBA Plan of Work and the OGC Gateway Process; defines the purpose, use and structure of the rules; clarifies how maintenance relates to other aspects of life-cycle costing; defines the cost categories and definitions that constitute the building maintenance works (renewal and maintain); provides preparation rules for defining the brief and project-particular requirements: gives guidance on the process of cost estimating and cost planning and levels of measurement undertaken depending on the stage in the building life-cycle; shows how to deal with projects comprising multiple buildings or facilities; and explains the symbols, abbreviations and definitions used in the rules;
- *Part 2* sets out the basis for the New Rules of Measurement for maintenance works by clarifying how maintenance costs relate to construction and life-cycle costing; defining the scope and parameters for renewal (R) and maintain (M) cost categories; explains the levels of measurement and process of cost estimating and cost planning, as well the importance of developing a clear and comprehensive employer's maintenance brief and measurement rules;
- *Part 3* describes the purpose and content of an order of cost estimate; defines its key constituents; explains how to prepare and report an order of cost estimate; and sets out the rules of measurement for the preparation of order of

cost estimates using the floor areas method, the functional unit method and the elemental method;

- *Part 4* describes the purpose and content of elemental cost planning used for building maintenance works; defines its key constituents; explains the rules for measurement for the preparation and reporting of formal maintenance cost plans for maintenance works;
- *Part 5* describes the measurement rules for annualised costing of maintenance works; explains the calculation methods used for renewal (R) cost plans generated from capital building cost plans and calculation methods for renewal (R) and maintain (M) works from asset registers and condition surveys and the use of remaining life predicted data;
- *Part 6* comprises the tabulated rules of measurement and quantification of costs of renewal (R) and maintain (M) works; provides a standardised cost structure for the renewal (R) and maintain (M) works integrating with the NRM1 construct (C) cost data structure; methods of codification of maintenance works cost plans; shows methods of codifying cost plans for works packages; shows methods of aligning NRM3 to COBie (Construction Operations Building Information Exchange) data structure and definitions for Building Information Models (BIM).

The following appendices are supplied:

- Appendix A Core definition of gross internal floor area (GIFA);
- Appendix B Core definitions of net internal area (NIA);
- Appendix C Commonly used functional types and functional units of measurement;
- Appendix D Special use of definitions for shops;
- Appendix E Logic and arrangements for integrating construct (C) to renewal (R) and maintain (M) works;
- Appendix F Maintenance cost categories and definitions and wider life-cycle costs;
- Appendix G Methods of economic evaluation and discounting equations (time value of money);
- Appendix H Information required for determining the maintenance brief and the project particulars;
- Appendix I Information required for formal maintenance cost plans;
- Appendix J Report template for elemental cost plan for renewal (R) and maintain (M) – level 1 codes;
- Appendix K Report template for elemental cost plan for renewal (R) and maintain (M) – level 2 codes;
- Appendix L Informative example of costing renewal (R) work tasks from capital building works cost plans;
- Appendix M Informative example of costing renewal (R) work tasks from asset registers/condition surveys;
- Appendix N Informative example of costing maintain (M) work tasks from asset registers/task schedules.

Note

1 The OGC developed the OGC Gateway™ Process as part of the Modernisation Agenda to support the delivery of improved public services, and examined programmes and projects at various key decision points throughout the life-cycle of delivery. The OGC was absorbed into the Cabinet Office in May 2010 as part of a cost-cutting exercise although the OGC guidance is still cited.

Bibliography

RICS (2007) *CONTRACTS IN USE, A Survey of Building Contracts in Use during 2007*. RICS.

RICS (2012a) *NRM1 Order of Cost Estimating and Cost Planning for Capital Building Works*, 2nd edn. RICS.

RICS (2012b) *NRM2: Detailed Measurement for Building Works*. RICS.

RICS (2014) *NRM 3 Order of Cost Estimating and Cost Planning for Building Maintenance Works*. RICS.

RICS (2015) *RICS Property Measurement*. RICS.

3 Procurement trends

Green and sustainable construction

The global green and sustainable building industry is forecast to grow at an annual rate of 23 per cent between 2017 and 2020 as a result of increasing carbon regulatory requirements and greater societal demand for greener products, according to research carried out by McGraw-Hill Construction in 2013: *World Green Building Trends: Business Benefits Driving New and Retrofit Market Opportunities in Over 60 Countries*. The UK Government's *Construction 2025* (Department for Business, Innovation and Skills, 2013) sets the industry a challenging target of a reduction in carbon emissions in the built environment of 50 per cent by 2025. The McGraw-Hill research goes on to suggest that an increasing percentage of architects, engineers and contractors will see the majority of their work as green in the coming years. *Construction 2025*, launched in 2013 by the then Business Minister Michael Fallon, set out ambitious targets in four key measurable areas which included a 50 per cent reduction in greenhouse gas emissions in the built environment. The strategy is part of the government's wide-ranging industrial policy identifying key growth sectors in the economy, which has seen it launch similar visions for the automotive and oil and gas sectors.

During the preparation of previous editions of this book, sustainability and green issues were discussed by few in the construction industry in the course of their day-to-day business. Sustainability, a little like stress, appears to have crept up on the UK construction industry, over the past 20 years or so. And yet, concerns about climate change and the environment can be traced back several centuries, although it was not until the late 1960s when organisations such as Greenpeace were formed that it came to public attention. There followed a number of reports and protocols, the most notable being:

- The Brundtland Report (World Commission on Environment and Development, 1987) also known as *Our Common Future*, which linked sustainability and development. It established triple bottom line sustainability: the environment, social and economic forces;
- The Rio Declaration (1992) which established the concept of the polluter pays;
- The Kyoto Protocol (1997) agreed under the United Nations Framework Convention on Climate Change.

Opinion about environmental impact gathered momentum in the decade after Kyoto with several severe warnings, including the Stern Report (2005), indicating that human activity was the primary cause of climate change and that urgent action was required to change behaviour. The Stern Report, together with high-profile media coverage of the former American Vice President Al Gore's endorsement of the film *An Inconvenient Truth*, convinced corporate and government opinion of the necessity to take green issues seriously. A report by the National Audit Office, *Improving Public Services Through Better Construction* (2005), concluded that £2.6 billion per annum is still wasted in the construction industry through a variety of reasons, including lack of consideration of whole life cost and sustainability or green issues.

One of the major obstacles to the introduction of more sustainable design and construction solutions is the perception that to do so will involve additional costs – typically 10 per cent on capital costs. However, a 2005 report by BRE Trust and Cyril Sweett entitled, *Putting a Price on Sustainability*, appears to demonstrate that this need not necessarily be the case. In fact, the report points out that significant improvements in the sustainability performance of buildings need not be expensive, although it is still true that in order to comply with the Code for Sustainable Homes or attain a high BREEAM rating (see below for definitions), there is the need to incur significant up-front investment. Nevertheless, the general uncertainty over the cost impact to an entire development's profitability could deter cost-adverse funders from backing a green project.

Various attempts have been made to define the term 'sustainable or green construction'. In reality, it would appear to mean different things to different people in different parts of the world, depending on local circumstances. Consequently, there may never be a consensus view on its exact meaning; however, one way of looking at sustainability is: 'The ways in which built assets are procured and erected, used and operated, maintained and repaired, modernized and rehabilitated and reused or demolished and recycled constitutes the complete life-cycle of sustainable construction activities.' In 2005, the RICS announced that it was establishing a new commission with a mission to 'Ensure that sustainability becomes and remains a priority issue throughout the profession and RICS.' In general, a sustainable building reduces the impact on the environmental and social systems that surround it, compared with conventional buildings. Green buildings use less water and energy, as well as fewer raw materials and other resources.

Why should sustainability concern the quantity surveyor? Here are some facts to think about.

Buildings are the single most important contributor to greenhouse gas emissions, with the construction sector responsible for one-sixth of the total freshwater withdrawals and, taking demolition into account, it generates 30 per cent of waste in OECD countries. In addition, around 40 per cent of total energy consumption and greenhouse gas emissions are directly attributable to constructing and operating buildings, according to Energy Action. Measured by

weight, construction and demolition activities produce Europe's largest waste stream, between 40 per cent and 50 per cent, most of which is recyclable.

Contractors, particularly those involved with public–private partnerships (PPP) are recognising the importance of sustainability issues and the early consideration of whole life costs.

Construction clients increasingly are realising the marketing potential of green issues, for example:

- increase in rental prices;
- increase in occupancy rates;
- reduction in running costs;
- improved productivity;
- 30 per cent of newly built or renovated buildings suffer from sick building syndrome.

Little wonder that the construction industry and its associated materials and manufacturing sectors have been singled out for action in the green debate when the statistics are laid out!

An estimated 25 million tonnes of construction waste ends up in landfill sites without any form of recovery or reuse. UK governments have set out to reduce construction waste to landfill, for economic and environmental reasons.

The process of getting the minimum whole life cost and environmental impact is so complex, being a three-dimensional problem, as shown in Figure 3.1. Each design option will have associated impacts and costs, and trade-offs have to be made between apparently unrelated entities, e.g. what if the budget demands a choice between recycled bricks or passive ventilation?

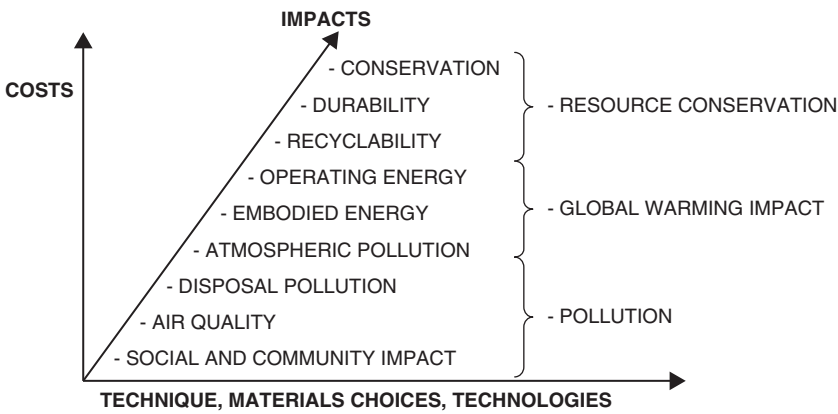


Figure 3.1 Techniques, material choices and technologies
Source: Adapted from Atkins Faithfull and Gould.

The London 2012 Olympics

One of the most recent high-profile sustainable projects was the London 2012 Olympic Games, for which all commercial partners were required to adhere to specific sustainability policies and criteria developed by the organising committee, generally relating to procurement, materials, waste management and ethical trading. The Olympics Delivery Authority (ODA) gave around 7,000 direct contracts worth £6 billion, which, together with its suppliers, formed supply chains of around 75,000 sub-contracts and accounted for more than two-thirds of the total spending on the games. The ODA's chief criteria were:

- Tenders were considered against sustainability requirements, such as minimising embodied energy, responsible sourcing and designing out waste separately from cost to form a 'balanced scorecard';
- The ODA had a specific procurement policy which identified that delivery on time and to agreed costs were critical to ODA's success. Sustainability was addressed by requiring that the whole life costs of a product/service (e.g. including disposal) were taken into account and by including environmental measures in procurement;
- Sustainability requirements were developed for each contract based on the ODA sustainability strategy, using the targets in each area (water, waste, energy, emissions and materials) to inform key performance indicators for each contract. Before tendering for the building of new venues, the ODA worked with designers to ensure that the design met requirements, which then went to the contractor as a package to deliver against.

By considering sustainability throughout the decision-making process the ODA found that in some cases it was able to make savings. For example, the preferred concrete provider was both the cheapest and the best environmentally because they used about 25 per cent recycled aggregate instead of more expensive conventional aggregate.

ISO 20400: the new standard for sustainable procurement

2017 is expected to see the publication of the long-awaited ISO 20400, the new international standard for sustainable procurement. This standard provides guidance for organisations of all sizes and nationalities wishing to implement a responsible resourcing strategy. The document will advise how best practice and value may be achieved, while respecting ethical standards, promoting diversity and equality, and minimising negative impacts and demands on resources. The guidance, which has been in preparation since 2013, will supersede BS 8903 and will cover:

- life-cycle considerations;
- due diligence;

- risk management;
- ethical and social responsibility;
- corporate social responsibility.

The arrangement of the new international standard is similar in format to BS 8903, providing systematic, step-by-step guidance from strategy through to implementation in the following areas:

- *Fundamentals* – the definitions, concepts, drivers and principles of sustainable procurement;
- *Policy and strategy* – key issues for organisations to consider when developing a sustainable procurement policy and strategy;
- *Organising procurement* – creating the organisational conditions necessary to procure sustainably and setting priorities;
- *Procurement process* – how to procure differently to best practice guidelines.

ISO 20400 is a guidance document only and so cannot be certified as with other ISO requirement standards. It provides a benchmark for firms to determine how sustainable their procurement practices are, which improvements are required, and how they may be implemented. Organisations are given guidance on how to make the right decisions, assign responsibility, achieve supply chain security and reduce supply chain risks.

There would appear, on the face of it, to be a strong business case for the sustainable construction agenda, based on:

- increasing profitability by using resources more efficiently;
- firms securing opportunities offered by sustainable products or ways of working;
- enhancing the company image and profile in the market place by addressing issues relating to corporate and social responsibility.

However, despite all the above, sustainability and green issues remain a nebulous topic for many within the construction industry. The popular perception is that there is a lack of customer demand for sustainability to be considered during design and procurement stages. However, consider the following reasons to be green:

- the Department for Environment, Food and Rural Affairs requires developers to complete a Sustainable Development Impact Test;
- public sector contractors must achieve BREEAM excellence for all new buildings;
- many high-profile private developers and landowners are seeking the same or higher standards of sustainability performance from their partners;
- investors are becoming increasingly interested in sustainability and are encouraging property industry partners to do the same.

Some of the benefits of having a BREEAM rating are claimed to be:

- demonstrating compliance with environmental requirements;
- marketing: as a selling point to tenants and customers;
- financial: to achieve higher and increased building efficiency.

Increasingly, clients as well as end users are requesting improved sustainability performance from their buildings, over and above the regulatory requirements arising from changes in the Building Regulations. Policies such as BREEAM and LEED (Leadership in Energy and Environmental Design) are often used as the vehicle for achieving these improvements. However, these tools are largely environmentally biased, and it is important that the wider social and economic dimension of sustainability is also considered. It is strongly recommended that these issues are considered holistically at an early stage in a project's management and inception and taken forward in an integrated manner. From a sustainability perspective, refurbishment projects are increasingly expected to achieve design standards expected of new-build projects including:

- improved quality and value for money;
- reduced environmental impact and improved sustainability;
- healthy, comfortable and safe internal and external environments that offer high occupant satisfaction and productivity;
- low costs in use;
- a flexible and future-proofed design.

The introduction of Energy Performance Certificates and Display Energy Certificates, as required by the European Union Directive; 2002/91/EC on the Energy Performance of Buildings Directive (EPBD), offers an opportunity to improve the energy performance of the existing building stock, and to set out on a refurbishment or refit without ensuring that an improvement of energy performance is specified would be ill advised, as there are significant benefits to be realised, both in cost reductions as well as reductions in carbon dioxide emissions.

The measures adopted to assess sustainability performance, which developers and design teams are encouraged to consider at the earliest possible opportunity, are:

- BREEAM (Building Research Establishment Environmental Assessment Method);
- BREEAM-In-Use, for existing buildings;
- Code for Sustainable Homes.

BREEAM has been developed to assess the environmental performance of both new and existing buildings. BREEAM assesses the performance of buildings in the following areas (see Figure 3.2):

- management: overall management policy, commissioning and procedural issues;
- energy use;

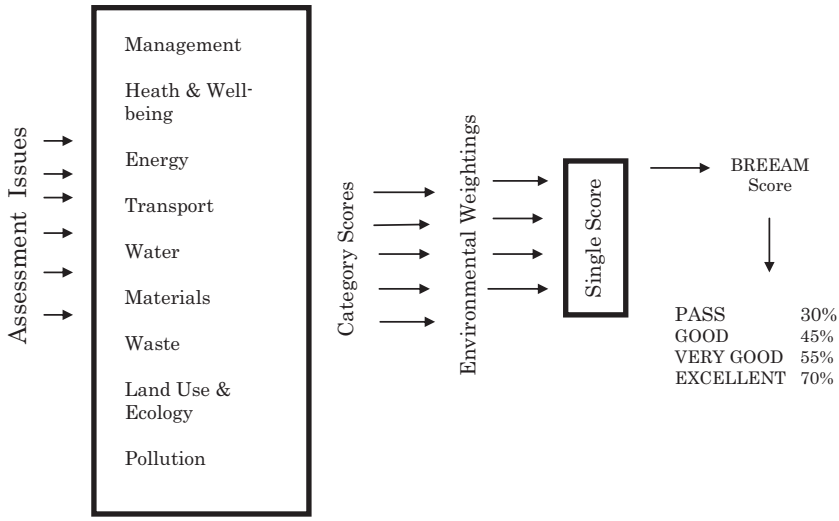


Figure 3.2 BREEAM scoring

- health and well-being;
- pollution;
- transport;
- land use;
- ecology;
- materials;
- water, consumption and efficiency.

In addition, unlike the Code for Sustainable Homes, BREEAM covers a range of building types, such as:

- offices;
- industrial units;
- retail units;
- schools;
- other building types, such as leisure centres can be assessed on an ad hoc basis.

In the case of an office development, the assessment would take place at the following stages:

- design and procurement;
- management and operation;
- post-construction reviews;
- building performance assessments.

A BREEAM rating assessment comes at a price and the fee scale for BREEAM assessors to carry out an assessment at each of the above stages could be between £5,000 and £10,000, an item that should be considered when completing Section 5 of the RICS New Rules of Measurement 1 *Order of Estimating and Cost Planning*.

Perhaps one of the most informative pieces of research into the cost of complying with BREEAM was carried out jointly between Cyril Sweett and the BRE. The research tried to dispel the widely held view that improving BREEAM ratings is necessarily an expensive exercise and demonstrated that an increase of between 1 and 3 BREEAM rating levels can be achieved at an additional up to 2 per cent of capital cost. The study includes four building types: (1) a house; (2) a naturally ventilated office; (3) an air-conditioned office; and (4) a PFI health centre. In order to establish a level playing field, some credits were not assessed as they relate to the location of the site. This was particularly the case with the PFI health centre. Interestingly, on a baseline cost comparison, only the PFI project, where the consortia will have to meet the running costs of the building over the concession period, typically 30 years, was there a high percentage of good BREEAM ratings in various locations, with minimal increases in expenditure needed to increase levels to very good or excellent.

A number of key issues were highlighted by Cyril Sweett's research, as follows:

- *Timing*: many BREEAM credits are affected by basic building form and servicing solutions. Cost-effective BREEAM compliance can only be achieved if careful and early consideration is given to BREEAM-related design and specification details. Clear communication between the client, the design team members and, in particular, the project cost consultants, is essential;
- *Location*: building location and site conditions have a major impact on the costs associated with achieving very good and excellent compliance;
- *Procurement route*: the PFI/PF2 and similar procurement strategies that promote long-term interest in building operations for the developer/contractor typically have an influence on the building's environmental performance and any costs associated with achieving higher BREEAM ratings.

The Building Regulations 2007 introduced a tougher energy and environmental section, and these new regulations were mandatory from October 2009. In addition, the Climate Change Bill will result in Scotland having the most ambitious climate change legislation anywhere in the world with a mandatory target of cutting emissions by 80 per cent by 2050. Consequently, new energy performance standards for buildings and large existing buildings are required and quantity surveyors must be able to provide cost advice on alternative solutions. So how

Table 3.1 BREEAM categories and their 2017 weightings

BREEAM categories	*Current weightings (2017) (%)*
Management	12
Energy	15
Water	7
Land use and ecology	10
Health and well-being	15
Transport	9
Materials	13.5
Waste	8.5
Pollution	10

does BREEAM work? BREEAM measures the environmental performance of buildings by awarding credits for achieving a range of environmental standards and levels of performance. Each credit is weighted according to its importance and the resulting points are added up to give a total BREEAM score and rating (Table 3.1).

BREEAM is assessed over several categories, see Figure 3.2. Each category contributors a percentage towards the overall rating.

The higher the BREEAM rating, the more mandatory requirements there are and progressively harder they become. In 2011, BS ISO 15686: 5 Service life planning – Buildings and constructed assets standards were updated.

Measurement and costing sustainability

As sustainability is a comparatively new topic for most quantity surveyors, measuring and costing green factors can present a challenge.

The elements with the highest maintenance to capital cost ratios are generally those that are included in major refurbishments, mainly the services elements and the fittings. Conversely, external works also have a high ratio because of the constant repletion of fairly small items of work, particularly grass and planted areas, which need constant maintenance at some times of the year. Table 3.2 shows the elements where maintenance costs as a percentage of capital costs are highest, based on a three-bedroom, five-person semi-detached house. These parameters will of course change with different building types and clients.

At the design stage the surveyor needs to be aware of the drivers for sustainability and the impact these have on capital and life-cycle costs, as well as the technical requirements of sustainable buildings, so that these are developed into realistic costs and are not arbitrary percentage additions. When the surveyor is required at this stage to liaise with the client and professional team to determine

the client's initial requirements and to develop the client's brief, consideration can be given to the client's overall business objectives, particularly any corporate responsibility targets likely to affect the project. In advising the client on demolition and enabling works, the surveyor is advised to consider carrying out a pre-demolition audit to maximise material reclamation and reuse and minimise waste to landfill.

The procurement of demolition and enabling works could include evaluation criteria that consider a company's sustainability credentials. Specialists would be required to contribute to meeting the client's objectives and the project targets in the key sustainability areas.

Where the activities relate to Construction Design and Management (CDM) Regulations, surveyors need to be aware of Site Waste Management Plans although not now mandatory. Where the client's objectives include achieving ratings/levels under BREEAM, LEED or the Code for Sustainable Homes, surveyors would be expected to familiarise themselves with the specialists who need to be appointed, both to carry out the assessment and to provide the necessary reports required by the schemes.

In advising on the cost of the project, the sustainability implications of alternative design and construction options need to be understood. It is recommended that cost estimates include cost/m^2 information for indicative low and zero carbon and renewable energy schemes and material selection. Costing of issues not generally associated with building design is extremely important, for example, those actions identified in an Environmental Impact Assessment or the implications of a green travel plan, and the quantity surveyor would be expected to understand or be able to undertake a life-cycle assessment for the whole development, not just the building. A site visit can identify issues likely to affect cost, time or method of application, including existing buildings on site (including cultural heritage), existing ecological features on site that may need protecting in order to achieve BREEAM credits, local road layouts that could create traffic congestion and noise, existing watercourses and the

Table 3.2 Elements with the highest maintenance to capital ratio

Element	*Maintenance* as % of capital*
Fittings	210
External works	148
Heating	133
Electrical installation	118
Wall finishes	92

Source: BCIS (2007).

Note: * Net present value (NPV) over 60 years at 3.5% discount rate.

implications for storm water control and attenuation, and areas of the site liable to flooding. Advising on the likely effect of market conditions can involve looking at the possible level of employment and skills in the area, and the levels of crime that might affect the site. The project costs at this stage can influence a financial appraisal and surveyors are advised to ensure they understand what is to be priced in order to provide a level of accuracy and avoid substantial cost increases at a later date. In addition to considering the effects of site usage, the shape of the building, the alternative forms of design, procurement and construction, etc., the surveyor would be expected to be able to proactively advise on the sustainability implications of various low and zero carbon technologies, renewable energy installations and material selection. The surveyor would also be expected to be able to advise on the cost implications of other sustainability issues, including possible construction waste, levels of local employment and skills, traffic and transport.

In advising on tendering and contractual procurement options, it is recommended that consideration is given in pre-qualification documentation to evaluation of the bidder's response to sustainability issues, particularly those affecting the project. It is important to ensure that the client's and the project's sustainability requirements that were incorporated into the project brief have been reflected in the tender documents, and to ensure that the documentation also includes a responsible approach to sustainability in the contractor's operations, preliminaries and temporary work.

Where bills of quantities are required, it is important that every effort is made to adequately measure all sustainability-related products and technologies, avoiding where possible provisional sums. It is important to ensure that the tender report identifies the sustainability issues/risks affecting the project and the bidder's response to them. Surveyors are advised to carry out an analysis of contractor's sustainability costs, to compare it with benchmarks and to report on this. It is important to ensure that variations with sustainability implications are valued and agreed.

It is commonly assumed that consideration of sustainable issues will rack up the costs of a building but this may not necessarily be the case. One of the principal barriers to the wider adoption of more sustainable design and construction solutions is the perception that these incur additional unwanted costs. Location and site conditions have a major impact on the assessment and of course these factors may be outside of the design team's influence.

Keys to achieving best whole life value are:

- understand value;
- assess value;
- put a cost to value propositions;
- identify the best value sustainable solution – *prior to commitment to invest*;
- optimise value over the whole asset life-cycle.

From a quantity surveyor's perspective, it must be possible to quantify and cost the impact of introducing sustainable practice into construction.

What items should be considered by a quantity surveyor in sustainable procurement?

To understand what sustainable procurement means, it is important to first understand what is meant by 'sustainable development' and 'procurement'. Sustainable development is a process which enables people to realise their potential and improve their quality of life, now and in the future, while protecting the environment. Sustainable development policy should include long-term planning, consideration of impacts beyond the local area (regional, national and international impacts) and the integration of social, economic and environmental issues. Procurement is the whole process of acquisition from third parties, covering goods, services and capital projects. The process spans the whole life-cycle from initial concept through to the end of the useful life of the asset (including disposal) or end of the services contract.

Sustainable procurement is a key method for delivering an organisation's sustainable development priorities. It is all about taking social and environmental factors into consideration alongside financial factors in making these decisions. It involves looking beyond the traditional economic parameters and making decisions based on the whole life-cycle cost, the associated risks, measures of success and implications for society and the environment. Making decisions in this way requires setting procurement into the broader strategic context, including value for money, performance management, and corporate and community priorities.

In general terms, the quantity surveyor should consider the implications of ethical procurement, which encompasses the following:

- whole life costs/life-cycle costs;
- costs of alternative (renewable) materials;
- renewable energy schemes;
- recycled contents schemes;
- the ethical sourcing of materials and labour.

Of course, the majority of building stock, approximately 98 per cent, is existing and therefore one of the biggest challenges for the construction industry is how to deal with this stock. For example, approximately one-third of total CO_2 emissions is from commercial buildings, of which commercial offices are a major contributor. The actions of both landlords and tenants contribute to building energy performance and in turn the CO_2 emissions produced. The landlord has sole control over the building fabric performance whereas the tenant is responsible for using the building and controls the hours of use, IT equipment

and the management of the setting of temperatures. In 2009, as part of the IPF Research Programme a group led by Cyril Sweett investigated the cost of making energy-efficient improvements to existing commercial buildings held in investment portfolios. Commercial buildings are of course not homogeneous, having very different characteristics that influence energy consumption and CO_2 emissions. For the IPF study, a range of existing office buildings were selected, in the main, constructed in the 1990s with a mixture of narrow and deep plans, with and without air conditioning. The research found in the case of a 1990-built deep plan, air-conditioned office building that for a baseline cost of £1000/m^2, reductions of 25 per cent could be achieved by modernising older-type buildings constructed in accordance with the 1990 Part L Building Regulations. However, by increasing the budget to £1050/m^2, the cumulative savings increased, see Table 3.3.

As illustrated in Table 3.3, it is estimated that emissions can be reduced by up to 54 per cent by increasing the budget to £1150/m^2 from the baseline allowance. It is also estimated that this expenditure would be sufficient to achieve an EPC rating of B for buildings that are starting from a baseline rating of D or E. Similar studies were conducted on two other categories of commercial buildings: supermarkets and industrial/warehouses (Table 3.4).

Table 3.3 Achieving reductions in emissions

Budget	*Cumulative saving (%)*
	1990 Deep plan air-conditioned office
Baseline improvement £1000/m^2	25
Budget £1025/m^2	37
Budget £1050/m^2	47
Budget £1075/m^2	49
Budget £1150/m^2	54

Source: Based on Investment Property Forum Research Programme (2009).

Table 3.4 Studies conducted on supermarkets and warehouses

	Cumulative saving (%)	
	Supermarket	*Industrial/Warehouse*
Baseline improvement	12	35
Baseline + £10/m^2	23	41
Baseline + £100/m^2	40	62
Baseline + £130/m^2	47	66

Source: Based on Investment Property Forum Research Programme (2009).

In all the building types considered, the key improvements considered included:

Variable speed heating pumps	pay-back period 12 months
Energy-efficient lighting	pay-back period 3–4 years
Air conditioning fan coil units	pay-back period 3–4 years
Condensing boilers	pay-back period 11 years

Items rejected due to the long pay-back period included wind turbines and high efficiency chiller units. Retrofit external wall components were also considered and although this approach improved the comfort and environment for the occupants, the costs were considerable and this could be accompanied with a potential loss of usable floor space.

Whole life costs/life-cycle costs

Definitions

See calculations for both new and refurbishment costs. The service life of an element, product or whole building may be viewed in one or more of the following ways:

- *technical life* – based on physical durability and reliability properties;
- *economic life* – based on physical durability and reliability properties;
- *obsolescence* – based on factors other than time or use patterns, e.g. fashion.

Common terms used to describe the consideration of all the costs associated with a built asset throughout its life span are:

- costs-in-use;
- life-cycle costs;
- whole life costs (WLC);
- through-life costs.

There have been various attempts to provide practising surveyors with information for WLC calculations. There are two major concerns to note:

- the parameters of the study;
- the accuracy of the cost data.

Definitions given in BS ISO 15685:5 are:

- Life-cycle costing is a methodology for the systematic economic evaluation of the life-cycle costs over the period of analysis, as defined in the agreed scope.

- Whole life costing is a methodology for the systematic economic consideration of all the whole life costs and benefits over the period of analysis, as defined in the agreed scope.

The International Organization for Standardization (ISO) defines life-cycle costs as 'the cost of an asset throughout its lifecycle while fulfilling the performance requirements'.

Life-cycle costing is basically a simple concept – it answers the question: 'If I build this building, what future costs will I be letting myself in for?' So it is only a projection of the costs that result from commissioning a building, and which will be the responsibility of the client/building owner. While life-cycle costs are not difficult to understand, it is complex because potentially there are a huge number of costs to consider. It is also complicated by the introduction of time into the equation and therefore the ways to treat the effects of inflation, and lost investment opportunities/income.

Part 5 of the ISO covers life-cycle costing (LCC) under the following topics:

- definitions, terminology and abbreviations;
- principles of LCC, i.e. purpose and scope; what costs to include/exclude; typical forms and level of LCC analysis at key stages; outputs;
- forms of LCC calculations and six methods of economic evaluation (with informative examples);
- setting the scope for LCC studies including how to deal with risks and uncertainty;
- how LCC forms part of the whole life costing business investment option appraisal process;
- reporting and analysis techniques.

The ISO allows organisations to build up life-cycle costs of construction projects on a common basis internationally. At present, there is no way to compare LCC estimates, and few organisations are able to estimate LCC. The ISO will eliminate confusion in the industry and is likely to become the established methodology going forward.

First introduced to the UK construction industry over four decades ago by Dr P.A. Stone as Costs-in-Use, it is only recently, with the widespread adoption of public–private partnerships (PPPs) in the early 2000s as the preferred method of procurement by the majority of public sector agencies, that the construction industry has started to see some merit in whole life costing. In addition, building owners with long-term interests in property are starting to demand evidence of the future costs of ownership. For example, PF2 prison projects are commonly awarded to a consortium on the basis of Design, Build, Finance and Operate (DBFO), and contain the provision that, at the end of the concession period, typically 25 years, the facility is handed back to HM Prisons in a well-maintained and serviceable condition. This is of course in addition to the operational and maintenance costs that will have been borne by the consortia over the contract period. Therefore, for PF2 consortia, given the obligations touched on

above, it is clearly in the consortium's interest to give rigorous attention to costs incurred during the proposed asset's life-cycle in order to minimise operational risk. Although Stone's work was well received in academic circles, where today extensive research still continues in this field, there has been and continues to be, a good deal of apathy in the UK construction industry towards the wider consideration of whole life costs.

It has been estimated by the Royal Academy of Engineering that the relationship between capital costs: running costs and business costs in owning a typical office block over a 30-year period is:

Construction (capital) cost	1
Maintenance and operating costs	5
Business operating costs	200

Although recently some doubt has been expressed about the accuracy of the Royal Academy ratio and that in reality it could be closer to 1:2:200, the fact remains that whole life costs are still a considerable factor in the cost of built asset ownership.

The business operating costs in the above equation (200) include the salaries paid to staff, etc. Clearly, in the long term, this aspect is worth close attention by design teams and cost advisors. One of the reasons for this lack of interest is, particularly in the private sector and the developer's market, that during the 1980s financial institutions became less enamoured with property as an investment and turned their attention to the stock market. This move led to the emergence of the developer/trader. Often it was an individual, rather than a company, who proposed debt finance rather than investment-financed development schemes. Whereas previously, development schemes had usually been pre-let and the investor might even have been the end user, the developer/trader had as many projects in the pipeline as they could obtain finance for. The result was an almost complete disregard for whole life costs as pressure was put on the designers to pare down capital costs at the expense of ultimate performance, as building performance is poorly reflected in rents and value. Fortunately, these sorts of deals have all but disappeared, with a return to the practice of pre-letting and a very different attitude to whole life costs. For, if a developer/trader was developing a building to sell on, they would have little concern with the running costs, etc. However, in order to pre-let a building, tenants must be certain that, particularly if they are entering a lease with a full repair and maintenance provision, there are no 'black holes', in the form of large repair bills, waiting to devour large sums of money at the end of the lease. In the present market, therefore, sustainability is as important to the developer as to the owner/occupier. A building will have a better chance of attracting better quality tenants, throughout its life, if it has been designed using performance requirements across all asset levels, from facility (building), through system (heating and cooling system), to component (air handling unit), and even sub-component (fans or pumps).

In and around major cities today, it is clear that buildings that attracted good tenants and high rents in the 1980s and early 1990s are now tending to only attract secondary or tertiary covenants, in multiple occupancies, leading to lower rents and valuations. This is an example of how long-term funders are seeing their 25–35-year investments substantially underperforming in mid-life, thus driving the need for better whole life procured buildings.

Whole life cost procurement includes the consideration of the following factors:

- initial or procurement costs, including design, construction or installation, purchase or leasing, fees and charges;
- future cost of operation, maintenance and repairs, including management costs such as cleaning, energy costs, etc.;
- future replacement costs, including loss of revenue due to non-availability;
- future alteration and adaptation costs;
- future demolition/recycling costs.

Whole life appraisers may include whatever they deem to be appropriate – provided they observe consistency in any cross-comparisons. The timing of the future costs associated with various alternatives must be decided, and then, using a number of techniques described below, their impact assessed. Classically, whole life cost procurement is used to determine whether the choice of, say, a component, with a higher initial cost than other like-for-like alternatives is justified by being offset by the reduction of the future costs as listed above. This situation may occur in new-build or refurbishment projects. In addition, whole life cost procurement can be used to analyse whether in the case of an existing building, a proposed change is cost-effective when compared with the 'do nothing' alternative.

There are three principal methods of evaluating whole life costs:

- simple aggregation;
- net present value;
- annual equivalent.

Simple aggregation

The basis of whole life costs is that components or forms of construction that have high initial costs will, over the expected life span, prove to be cheaper and hence better value than cheaper alternatives. This method of appraisal involves adding together the costs, without discounting, of initial capital costs, operation and maintenance costs. This approach has a place in the marketing brochure and it helps to illustrate the importance of considering all the costs associated with a particular element but has little value in cost forecasting. A similarly simplistic approach is to evaluate a component on the time required to pay back the investment in a better quality product. For example, a number of energy-saving devices are available for lift installations, a choice is made on the basis of which over the

life-cycle of the lift, say, five or ten years will pay back the investment the most quickly. This last approach does have some merit, particularly in situations where the life-cycle of the component is relatively short and the advances in technology and hence the introduction of a new and more efficient product are likely.

Net present value

The technique of discounting allows the current prices of materials to be adjusted to take account of the value of money of the life-cycle of the product. Discounting is required to adjust the value of costs, or indeed, benefits which occur in different time periods so that they can be assessed at a single point in time. This technique is widely used in the public and the private sectors as well as sectors other than construction. The choice of the discount rate is critical and can be problematic as it can alter the outcome of calculation substantially. However, when faced with this problem, the two golden rules that apply are that in the public sector follow the recommendations of the Green Book or *Appraisal and Evaluation in Central Government*, currently recommending a rate of 3.5 per cent. In the private sector, the rule is to select a rate that reflects the real return currently being achieved on investments held by the client. To help in understanding the discount rate, it can be considered almost as the rate of return required by the investor which includes costs, risks and lost opportunities.

The mathematical expressions used to calculate discounted present values are:

$$\text{Present value (PV)} = \frac{1}{(1+i)^n}$$

Where:

(i) = rate of interest expected or discount rate

(n) = the number of years

This present value multiplier/factor is used to evaluate the present value of sums, such as replacement costs that are anticipated or planned at, say, 10–15-year intervals.

For example, consider the value of a payment of £150 that is promised to be made in five years time. Assuming a discount rate of 3.5 per cent, £150 in five years time would have a present worth or value of £126.30.

$$£150 \times \frac{1}{(1.035)^n} = £150 \times 0.8420 = £126.30$$

or in other words, if £126.30 were to be invested today @ 3.5 per cent, this sum would be worth £150.00 in five years time, ignoring the effects of taxation.

Calculating the present value of the differences between streams of costs and benefits provides the net present value (NPV) of an option and this is used as the basis of comparison.

Annual equivalent

This approach is closely aligned to the theory of opportunity costs, i.e. the amount of interest lost by choosing option A or B, as opposed to investing the sum at a given rate percentage, and is used as a basis for comparison between alternatives. This approach can also include the provision of a sinking fund in the calculation in order that the costs of replacement are taken into account.

In using the annual equivalent approach the following equation applies;

Present value of £1 per annum (sometimes referred to by actuaries as the Annuity that £1 will purchase)

This multiplier/factor is used to evaluate the present value of sums, such as running and maintenance costs that are paid on a regular annual basis:

$$\text{Present value of £1 per annum} = \frac{(1+i)^n - 1}{i(1+i)^n}$$

Where:

(i) = rate of interest expected or discount rate

(n) = the number of years

Previously calculated figures for both multipliers are readily available for use from publications such as Parry's Valuation Tables, etc.

Sinking funds should also be considered; a fund created for the future cost of dilapidations and renewals. Given that systems are going to wear out and/or need partial replacement, it is thought prudent to 'save for the rainy day' by investing capital in a sinking fund to meet the cost of repairs, etc. The sinking fund allowance therefore becomes a further cost to be taken into account during the evaluation process. Whether this approach is adopted will depend on a number of features, including corporate policy, interest rates, etc.

Whole life costing is not an exact science, as, in addition to the difficulties inherent in future cost planning, there are larger issues at stake. It is not just a case of asking 'how much will this building cost me for the next 50 years?', rather it is more difficult to know whether a particular building will be required in 50 years time at all – especially as the current business horizon for many organisations is much closer to three years. Also, whole life costing requires a different way of thinking about cash, assets and cash flow. The traditional capital cost focus has to be altered, and costs should be thought of in terms of capital and revenue costs coming from the same 'pot'. Many organisations are simply not geared up for this adjustment. The common misconception that a whole life

costed project will always be a project with higher capital costs does not help this state of affairs. As building services carry a high proportion of the capital cost of most construction projects, this is of particular importance. Just as capital and revenue costs are intrinsically linked, so are all the variables in the financial assessment process. Concentrate on one to the detriment of the others and you are likely to fail.

Perhaps, the most crucial reason is the difficulty in obtaining the appropriate level of information and data. Clift and Bourke (1999) found that despite substantial amounts of research into the development of database structures to take account of performance and WLC, there remains a significant lack of standardisation across the construction industry in terms of scope and data available. Ashworth (1989) also points out that the forecasting of building life expectancies is a fundamental prerequisite for whole life cost calculations, an operation that is fraught with problems. While, to some extent, building life relies on the individual building components, this may be less critical than at first imagined, since the major structural elements, such as the substructure and the frame, usually have a life far beyond those of the replaceable elements. Clients and users will have theoretical norms of total life spans but these have often proved to be widely inaccurate in the past. The Building Maintenance Information (BMI) of the Royal Institution of Chartered Surveyors was established in the 1970s. The BMI has developed a Standard Form of Property Occupancy Cost Analysis, which, it is claimed, allows comparisons between the cost of achieving various defined functions or maintaining defined elements. The BMI defines an element for occupancy cost as: expenditure on an item which fulfils a specific function irrespective of the use of the form of the building. The system is dependent on practitioners submitting relevant data for the benefit of others. The increased complexity of construction means that it is far more difficult to predict the whole life cost of built assets. Moreover, if the malfunction of components results in decreased yield or underperformance of the building, then this is of concern to the end user/owner. There is no comprehensive risk analysis of building components available for practitioners, only a wide range of predictions of estimated life spans and notes on preventive maintenance – this is too simplistic, there is a need for costs to be tied to risk, including the consequences of component failure. After all, the performance of a material or component can be affected by such diverse factors as:

- quality of initial workmanship when installed on site and subsequent maintenance;
- maintenance regime/wear and tear. Buildings that are allowed to fall into disrepair prior to any routine maintenance being carried out will have a different life-cycle profile to buildings that are regularly maintained from the outset;
- intelligence of the design and the suitability of the material/component for its usage. There is no guarantee that the selection of so-called high quality materials will result in low life-cycle costs.

Other commonly voiced criticisms of whole life costing are:

- expenditure on running costs is 100 per cent allowable revenue expense against liability for tax and, as such, is very valuable. There is also a lack of taxation incentive, in the form of tax breaks, etc., for owners to install energy-efficient systems;
- in the short term and taking into account the effects of discounting, the impact on future expenditure is much less significant in the development appraisal;
- another difficulty is the need to be able to forecast, a long way ahead in time, many factors such as life-cycles, future operating and maintenance costs, and discount and inflation rates. WLC, by definition, deals with the future and the future is unknown. Increasingly obsolescence is being taken into account during procurement; a factor that it is impossible to control since it is influenced by such things as fashion, technological advances and innovation. An increasing challenge is to procure built assets with the flexibility to cope with changes. Thus, the treatment of uncertainty in information and data is crucial as uncertainty is endemic to WLC (Flanagan *et al.*, 1989; Bull, 1993). Another major difficulty is that the WLC technique is expensive in terms of the time required. This difficulty becomes even clearer when it is required to undertake a WLC exercise within an integrated real-time environment at the design stage of projects.

In addition to the above changes in the nature of development, other factors have emerged to convince the industry that whole life costs are important.

Whole life cost procurement – critical success factors are:

- effective risk assessment – what if this alternative form of construction is used?
- timing – begin to assess WLC as early as possible in the procurement process;
- disposal strategy – is the asset to be owner occupied, sold or let?
- opportunity cost – downtime;
- maintenance strategy/frequency – does one exist?
- suitability – matching a client's corporate or individual strategy to procurement.

Sources of cost data for whole life cost calculations

In 2001, the Whole Life Cost Forum was launched as a source of reference on whole life cost data and can be accessed at www.wlcf.org.uk, although the WLCF no longer trades.

There are a number of definitions for whole life costing, but one currently adopted is: 'the systematic consideration of all relevant costs and revenues associated with the acquisition and ownership of an asset.'

Although whole life costing can be carried out at any stage of the project and not just during the procurement process, the potential of its greatest effectiveness is during procurement because:

- almost all options are open to consideration at this time;
- the ability to influence cost decreases continually as the project progresses, from 100 per cent at project sanction to 20 per cent or less by the time construction starts;
- the decision to own a building normally commits the user to most of the total cost of ownership and consequently there is a very slim chance of changing the total cost of ownership once the building is delivered.

Typically, about 75–95 per cent of the cost of running, maintaining and repairing a building is determined during the procurement stage.

There now follows a simple example, based on the selection of material types, illustrating the net present value and the annual equivalent approaches to whole life cost procurement (Table 3.5).

This problem is a classic one, which material, with widely different initial and maintenance costs will deliver the best value for money over the life-cycle of the building? In this example, with a discount rate of 6 per cent, it is assumed that the materials are to be considered for installation in a PF2 project, with an anticipated life of 25 years.

Table 3.6 indicates a whole life cost calculation for material B presented in two ways: as a net present value and also as an annual equivalent cost. The calculation is repeated for each material or component under consideration and then a comparison can be made.

A replacement expenditure profile, excluding cyclical maintenance and energy over a range of elements over a 35-year contract period is shown in Table 3.7.

Clearly, the choice of the correct type material or component would appear of critical importance to a client as future replacement and maintenance costs will have to be met out of future income. However, in reality, theory and practice are often very different. For example, for many public authorities, finding budgets for construction works is usually more difficult than meeting recurring running and maintenance costs that are usually included in annual budgets as a matter of course.

In addition to the net present value and annual equivalent approaches described previously, Williams (2006) identified that simple aggregation could sometimes be used effectively when evaluating whole life costs.

Table 3.5 Material costs

Material	*Initial cost*	*Installation cost*	*Maintenance cost per day*	*Other maintenance Costs*	*Life expectancy*
A	£275	£150	£3	£100 every 3 years for preservative treatment	12 Years
B	£340	£150	£3	None	15 Years

Table 3.6 Results for Material B

Total Discounted Costs

Year	*Present Value of £1 per annum (PV of £1 pa)*	*Present Value (PV £1)*	*Initial costs £*	*Other costs £*	*Annual costs £3 x 365*	*NPV Total discounted costs of replacement + other + annual cost + initial costs £*	*Total NPV £*	*AEC £*
1	0.943	0.943	490.00		1095.00	1523.02	1523.02	1614.4
2	1.834	0.890			1095.00	974.55	2497.57	1362.25
3	2.673	0.840			1095.00	919.38	3416.95	1278.31
4	3.465	0.792			1095.00	897.34	4284.29	1236.41
5	4.212	0.747			1095.00	818.25	5102.54	1211.32
6	4.917	0.705			1095.00	771.93	5874.47	1194.65
7	5.582	0.665			1095.00	728.24	6602.71	1182.76
8	6.210	0.627			1095.00	687.02	7289.72	1173.91
9	6.802	0.592			1095.00	648.13	7937.85	1167.04
10	7.360	0.558			1095.00	611.44	8549.30	1161.58
11	7.887	0.527			1095.00	576.83	9126.13	1157.13
12	8.384	0.497			1095.00	544.18	9670.31	1153.47
13	8.853	0.469			1095.00	513.38	10183.69	1150.35
14	9.295	0.442			1095.00	484.32	10668.00	1147.72
15	9.712	0.417		490.00	1095.00	661.37	11329.38	1166.50
16	10.106	0.394			1095.00	431.04	11760.42	1163.72
17	10.477	0.371			1095.00	406.64	12167.06	1161.28
18	10.828	0.350			1095.00	383.63	12550.69	1159.14
19	11.158	0.331			1095.00	361.91	12912.60	1157.24
20	11.470	0.312			1095.00	341.43	13254.02	1155.55
21	11.764	0.294			1095.00	322.10	13576.12	1154.03
22	12.042	0.278			1095.00	303.87	13879.99	1152.67
23	12.303	0.262			1095.00	286.67	14166.66	1151.45
24	12.550	0.247			1095.00	270.44	14237.10	1150.33
25	12.783	0.233			1095.00	255.13	14692.24	1149.36

Notes:

AEC = Annual equivalent cost.
Other cost = replacement costs every 15 years.

Table 3.7 Replacement expenditure profile over thirty-five years

Element	*Replacement expenditure (%)*
Windows/doors	22.95
Kitchens	15.79
Heating	11.82
Structural	10.63
Roofs	8.72
Bathrooms	7.79
Wiring	6.50
External areas	3.87
Internal decorations	2.48
Communal decorations	1.69
Over cladding	1.61
Rainwater goods	1.51
External walls	0.99
Off-road parking	0.82
DPC	0.73
Security/CCTV	0.60
Door entry systems	0.51
Fire precautionary works	0.50
Porches/canopies	0.44
Plastering	0.07

Source: Whole Life Costs Forum.

Costs of renewable materials

Renewable construction materials are made from plant-derived substances that can be produced repeatedly. In contrast, most other construction materials are derived from raw materials which we cannot replace: oil, minerals, metals, etc. Renewable construction materials range from very 'natural' unprocessed materials such as straw bales used for walling, to more refined products such as floor coverings manufactured using renewable polymers. Renewable materials are beginning to be introduced into mainstream construction, e.g. hemp and lime walling material, and it is claimed may soon become commonplace in UK buildings.

Renewable construction materials require less embodied energy to manufacture, process and transport to their point of use. Embodied energy includes energy used in obtaining the raw materials (e.g. sand and gravel or plant materials), energy used in the processing of those materials (e.g. grinding, blending, firing), and energy used in the manufacture of finished products. Embodied energy can be regarded as an energy 'debt' incurred by materials, therefore using materials with low embodied energy reduces the carbon footprint of a building and reduces its impact on the environment.

The use of renewable construction materials is not a requirement in building regulations and is not required for ratings to be awarded in the Code for Sustainable Homes. This may be partially due to the fact that renewable construction materials are still in development in the UK and are not yet widely available for most applications. For these reasons information on costs associated with renewable materials is not widely available.

Renewable energy schemes

Renewable energy is defined as energy flows which are replenished at the same rate as they are used. Renewable energy may be direct, for example, solar water heating, or indirect, for example, biomass, wind and hydro. Renewable energy schemes are not without their critics, the most common criticism being the sheer scale of, say, wind farm schemes that will be required to replace conventional power generation. Another point of contention is that with the extra cost of installation, for example, the cost of a large wood-chip burning biomass boiler, the pay-back period can be considerable, perhaps as long as 100 years plus; in addition, the extra space required for fuel storage could be considerable. For example, the fuel demand of 20,000 kWh boiler over a heating season equates to $2m^3$ of kerosene as against $25m^3$ of woodchips. There is the necessity to source fuel from within a 25-mile radius of the boiler in order to maintain a satisfactory carbon footprint. Against this, the running cost of woodchip is substantially below the cost of conventional fuels, perhaps half in terms of cost per kWh. At the time of writing, information on the cost of biomass installation available to the quantity surveyor is limited.

Perhaps the most widely used applications of renewable energy sources are solar and photovoltaic panels. Used most often for domestic scale schemes, the main limiting factor is the area of panels required to produce energy. For example, in the case of solar panels $1m^2$ of panel is required to deliver 45 litres of hot water at a cost of approximately £200–£300 per m^2 to install. The pay-back period for solar panels and photovoltaic panels is again considerable and could conceivably be longer than the design life of the project. Planning consideration may also be an issue. For many people the most obvious signs of renewable energy schemes are wind turbines and wind farms. The costs of installation are considerable, but are capable of being offset if the electricity produced is suitable for connection to the national grid, for example, £40,000 for an entry-level turbine capable of producing 15 kWh. Other considerations are tax allowances and of course the suitability of the site for locating a wind turbine.

Ska ratings

Formally launched on 6 November 2009, the Ska rating is an environmental assessment method designed to rate and compare the environmental performance of fit-out projects, initially for office buildings in the UK. Ska ratings are similar to BREEAM credits but solely focus on assessing a fit-out. In the case of a

BREEAM Offices fit-out assessment, the tool filters out the land use and ecology credits and also some of the credits relating to the built construction, therefore tailoring it for a fit-out assessment. However, some of the BREEAM Offices fit-out assessment credits do relate to the building, which can be outside the control of the project, e.g. whether the building has a pulsed water meter is assessed in BREEAM but the Ska rating only considers a water meter if the provision or modification of water services is within the scope of the fit-out. In addition, the BREEAM fit-out assessment has credits relating to the proximity of the building to public transport nodes (Ska rating does not assess this).

The Ska assessment process is broken down into three stages:

- *design/planning*. At this stage we identify the measures and issues in scope. Once the measures in scope are identified, the client has the opportunity to prioritise which measures they want to achieve and make a decision on design, cost, programme and benefit, and add them into the scope of works for the project. This will also set the environmental performance standards for how the project is delivered, in terms of waste and energy in use, etc. Then if the specification demonstrates that these measures are likely to be achieved, they will be reflected in an indicative rating;
- *delivery/construction*. This involves the gathering of evidence from O&M manuals and other sources to prove that what has been specified has actually been delivered and that the performance and waste benchmarks have been achieved;
- *post-occupancy assessment*. Finally, there is the option to review how well a fit-out has performed in use against its original brief from a year after completion.

The RICS is currently operating an accreditation scheme for Ska assessment.

Recycled contents schemes

Recycled content is defined in ISO 14021 as:

> Recycled content is the proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content, consistent with the following usage of the terms:
>
> - pre-consumer material: Material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it;
> - post-consumer material: Material generated by households or by commercial, industrial and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

The use of recycled materials is already a requirement for a number of construction clients as follows:

- the Scottish Government has asked all public bodies in Scotland to set 10 per cent recycled content as a minimum standard in major public sector projects in Scotland. Councils including Aberdeen, Glasgow, Midlothian, South Ayrshire and the Shetland Islands have already taken action, as has Scottish Water;
- the Central Procurement Directorate in Northern Ireland issued recycled content guidance in February 2006;
- the Welsh Assembly Government has set a 10 per cent recycled content target in major regeneration projects and Welsh Health Estates applies a KPI and target in health sector procurement;
- the Olympic Delivery Authority adopted minimum standards of at least 20 per cent (by value) of materials used in the permanent venues, to be from recycled content for London 2012;
- property developers and retailers including British Land, Hammerson, John Lewis Partnership, Marks and Spencer and Stanhope have also set recycled content targets;
- councils including Bristol, Greenwich, Islington, Lancashire, Leeds, Newcastle, Nottingham, Sandwell and Sheffield have set recycled content tender requirements in schools, as have Leeds Metropolitan and Worcester Universities;
- minimum recycled content standards have been adopted for regeneration by South West England and Yorkshire Forward Regional Development Agencies, Leeds Holbeck and Raploch Urban Regeneration Company.

According to the Waste and Resources Action Programme (WRAP), the following are examples of higher recycled content products available at no extra cost (Table 3.8).

It is thought that material types that offer higher levels of recycled content include those shown in Table 3.9.

Table 3.8 Examples of higher recycled content products

Component	*Typical product*	*Products with higher recycled content*
Dense blocks	Brand A – 0% recycled content (£5.50 / m^2)	Brand B – 50–80% recycled content (£5.50 / m^2)
Concrete roof tiles	Brand C – 0% recycled content (£550 / 1000)	Brand D – 25% recycled content (£550 / 1000)
Glass / mineral wool insulation	Brand E – 10% recycled content (£3.50 / m^2)	Brand F – 80% recycled content (£3.00 / m^2)

Source: WRAP – Material change for a better environment.

Table 3.9 Material types offering higher levels of recycled content

Bulk aggregates	Ready mix concrete
Asphalt	Drainage products
Pre-cast concrete products	Concrete tiles
Clay facing bricks	Lightweight blocks
Dense blocks	Plasterboard
Ceiling tiles	Chipboard
Insulation	Floor coverings

The ethical sourcing of materials and labour

According to the, International Council for Local Environmental Initiatives (ICLEI), key elements of ethical sourcing include:

- equal partnership and respect between producers and consumers;
- a fair price for socially just and environmentally sound work;
- healthy working conditions;
- fair market access for poverty alleviation and sustainable development;
- stable, transparent and long-term partnership;
- guaranteed minimum wages and prompt payment;
- financial assistance, when needed (pre-production financing);
- premiums on products used to develop community projects;
- encouraging better environmental practices.

Advice is needed by all types of owners, occupiers, lenders, investors, and public and private bodies as to:

- their environmental duties and liabilities;
- how to determine and quantify liability;
- the implications for asset management arising from any actual or potential liabilities;
- who to look to for advice and how advisors should be appointed;
- the steps to take to minimise or eliminate liability; and
- the likelihood of ongoing, new or potential liability.

Value from green development

There now seems to be a greater awareness that energy-efficient offices command higher rental prices, have lower vacancy rates and higher market values, relative to otherwise comparable conventional office buildings. This, along with revenue savings of reduced energy and water as well as expert opinion that suggests higher levels of productivity can be achieved, begins to create a compelling argument for building and refurbishing to higher green standards.

However, despite this, energy-efficient buildings are still in the minority of total building stock.

Comparatively few green buildings have been completed and of those a high percentage have been in the public sector. However, proponents of green development maintain that sustainable buildings can do the following:

- significantly reduce whole life costs and ensure more rapid pay-back compared with conventional buildings from lower operation and maintenance costs, thereby generating a higher return on investment;
- secure tenants more quickly;
- command higher rents or prices;
- enjoy lower tenant turnover;
- attract grants, subsidies, tax breaks and other inducements;
- improve business productivity for occupants;
- improve user satisfaction. Some 85 per cent of a building's real costs are related to staff/productivity costs, so user satisfaction is therefore key;
- reduce initial construction costs to <10 per cent of a building's lifetime costs;
- make energy cost typically 30 per cent of a building's operating costs;
- increase productivity especially through daylighting;
- enhance health and well-being;
- produce higher academic achievement;
- produce higher morale;
- reduce absenteeism;
- improve image-branding and symbolise values.

However, the barriers to green development are at present substantial and include:

- lack of clear project goals, i.e. targets;
- lack of experience;
- lack of commitment;
- a complicated rating process.

A raft of new legislation is now ensuring that the consideration of sustainability for new projects is not merely an option. In January 2006, the European Commission's Energy Performance Directive came into effect and shortly after that in April 2006 the Office of the Deputy Prime Minister planned to launch a Code for Sustainable Buildings. If this were not enough, the long-awaited revision to Part L of the Building Regulations also came into force in April 2006. The Building Regulations are considered to be one of the most far-reaching pieces of legislation ever to hit the construction industry and will force cuts in the carbon emissions from buildings by one million tonnes a year. Design teams will have to obtain energy ratings before and after construction, and assessment will be based on the government's Standard Assessment Procedure for Energy Rating 2012 (SAP 2012).

Other considerations

Off-site construction

The benefits of off-site factory production in the construction industry are well documented and include the potential to considerably reduce waste, especially when factory-manufactured elements and components are used extensively. Its application also has the potential to significantly change operations on site, reducing the amount of trades and site activities and changing the construction process into one of a rapid assembly of parts that can provide many environmental, commercial and social benefits, including:

- reduced construction-related transport movements;
- improved health and safety on site through avoidance of accidents;
- improved workmanship quality and reducing on-site errors and rework, which themselves cause considerable on-site waste, delay and disruption;
- reduced construction timescales and improved programmes.

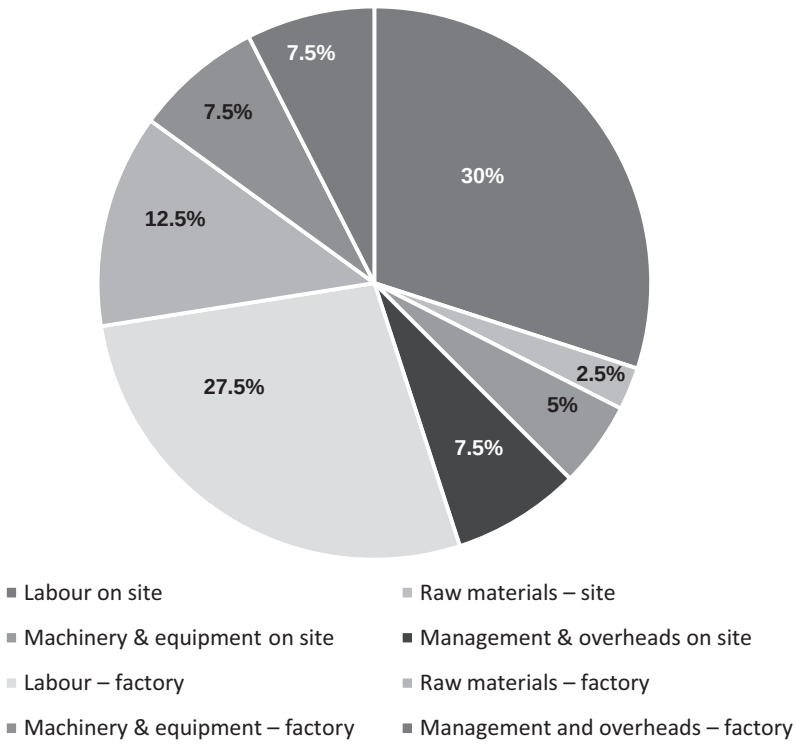


Figure 3.3 Analysis of typical resource consumption by project cost – industrialised process

Source: Bernard Williams Associates.

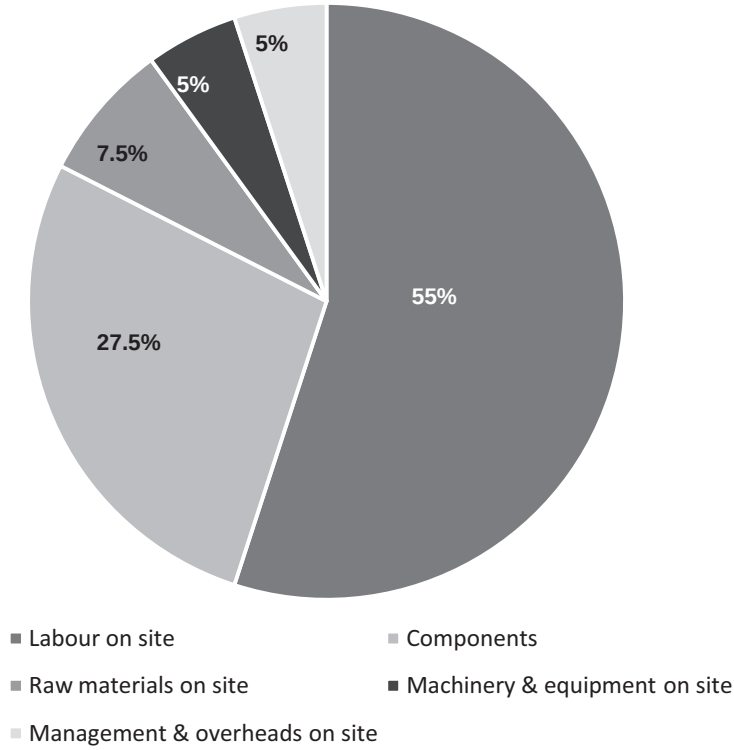


Figure 3.4 Analysis of typical resource consumption by project cost – traditional process
Source: Bernard Williams Associates.

Off-site construction is one of a group of approaches to more efficient construction sometimes called modern methods of construction (MMC) that also include prefabrication, improved supply chain management and other approaches. Technologies used for off-site manufacture and prefabrication range from modern timber and light gauge steel framing systems, tunnel form concrete casting through to modular and volumetric forms of construction, and offer great potential for improvements to the efficiency and effectiveness of UK construction.

Figures 3.3 and 3.4 illustrate the differences in resource consumption between traditional site construction and an industrialised process.

Key questions to consider during the procurement stages

- Has research been carried out by the design team and/or use of the WRAP Net Waste Tool to identify where on-site waste arises?
- Can construction methods that reduce waste be devised through liaison with the contractor and specialist sub-contractors.

- Have specialist contractors been consulted on how to reduce waste in the supply chain?
- Have the project specifications been reviewed to select elements/components/materials and construction processes that reduce waste?
- Is the design adaptable for a variety of purposes during its life span?
- Can building elements and components be maintained, upgraded or replaced without creating waste?
- Does the design incorporate reusable/recyclable components and materials?
- Are the building elements/components/materials easily disassembled?
- Can a Building Information Modelling (BIM) system or building handbook be used to record which and how elements/components/materials have been designed for disassembly?

Public–private partnerships (PPPs)

Background and definition

In its widest sense a public–private partnership (PPP) can be defined as 'a long-term relationship between the public and private sectors that has the purpose of producing public services or infrastructure' (Zitron, 2004). One of the most popular PPP models, see Figure 3.5, was the Private Finance Initiative (PFI), a term used to describe the procurement processes by which public sector clients contract for capital-intensive services from the private sector. Private sector involvement in the delivery of public services in the UK has developed into a very emotive topic, with an unfortunate tendency to generate more heat

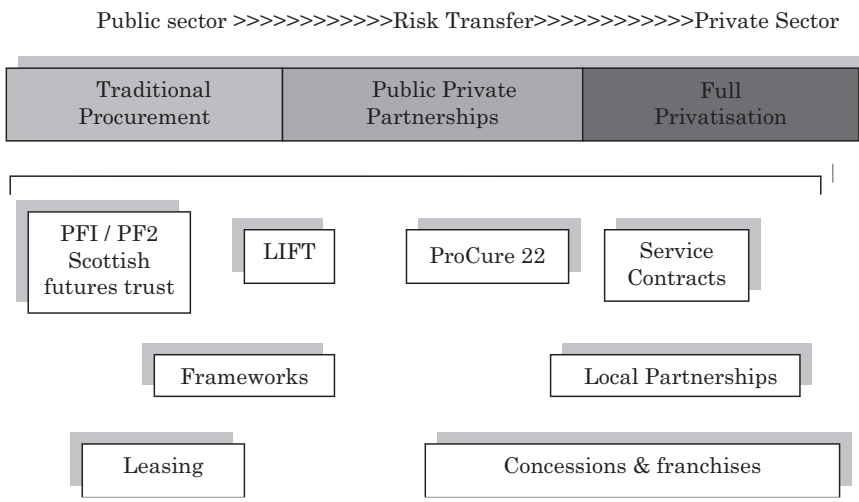


Figure 3.5 PPP procurement models

than light. The PFI was launched in the early 1990s and then several years later the term PPP emerged and appeared to subsume the PFI. Public–private partnerships bring public and private sectors together in long-term contracts. PPPs encompass voluntary agreements and understandings, service-level agreements, and outsourcing.

For many years PFI was the only game in town for public sector authorities seeking approval for new projects. Figure 3.6 illustrates PFI spend during the period 1990–2015 with a clear spike between 1998 and 2008, dates which correspond to the election of a Labour government in 1997 and the world financial crash in 2007.

Public–private partnerships in the UK have developed and continue to be developed in many forms to suit the needs of particular sectors, e.g. education, health, etc., and in some cases sub-sectors, e.g. primary healthcare.

In most cases, however, in PPP arrangements, private sector contractors become the long-term providers of services rather than simply up-front asset builders, combining some or all of the responsibilities for the following features of a public service facility:

- design;
- construction;
- finance (which may be a mixture of public and private sources);
- facilities management;
- service delivery.

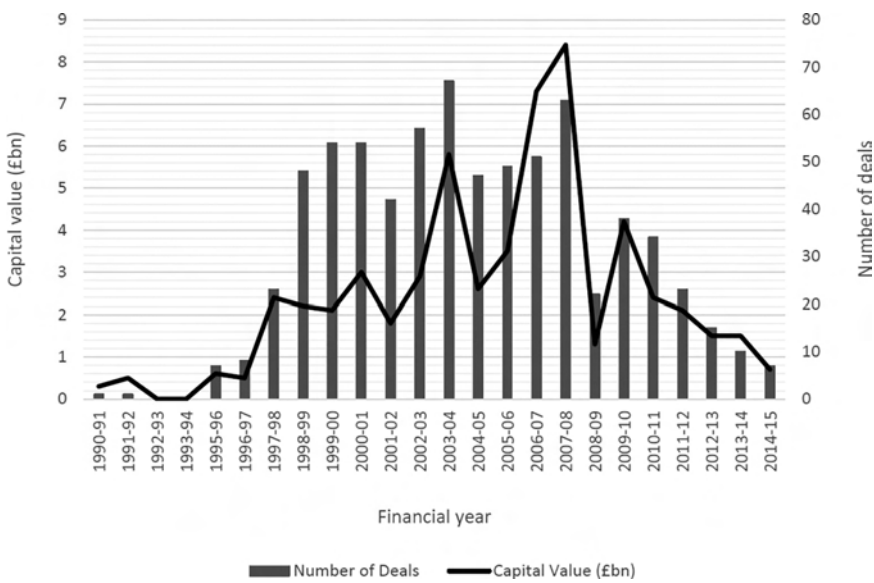


Figure 3.6 Number of projects reaching financial close, 1990–2015

The development of PPPs

The origins of the UK Private Finance Initiative lie in the introduction, in 1981, of the Ryrie Rules, named after Sir William Ryrie, a former Second Permanent Secretary of the Treasury. The Ryrie Rules were partially phased out in 1989 and finally abandoned in 1992 with the launch of the PFI.

The Private Finance Initiative was the name given to the policies announced by the Chancellor of the Exchequer, Norman Lamont, in the Autumn Statement of 1992. The autumn statements of 1993 and 1994 by Chancellor Kenneth Clarke were used to reshape the design and nature of the initiative. The intention was to bring the private sector into the provision of services and infrastructure, which formerly had been regarded as primarily a public sector concern. For many political spectators, PFI was a natural progression for the Thatcher Government that had so vigorously pursued a policy of privatisation during the 1980s. Not surprisingly, therefore, the PFI has been seen by some as a means of back door privatisation of public services, and trade unions, in particular UNISON, voiced their concerns over the adoption of the PFI. However, as far as government was concerned, there was a clear distinction between the sale of existing public assets, which they see as privatisation, and the PFI, which they do not.

It was against this backdrop, therefore, that in 1992 the PFI was launched and almost immediately hit the rocks. The trouble came from two sides: first, the way by which civil servants had traditionally procured construction works and services left them without the experience, flexibility or negotiation skills to 'do deals', a factor that was to prove such an important ingredient for advancement of the PFI. In addition, there was still a large divide and inherent suspicion between the public and private sectors and very little guidance from government as to how this divide could be crossed.

The second major problem in trying to get the PFI off the ground related to the way in which a whole range of projects in the early days of the initiative were earmarked by over-zealous civil servants as potential PFI projects, when they were quite obviously not. The outcome of this was that consortia could spend many months or even years locked into discussions over schemes with little chance of success, because the package under negotiation failed to produce sufficient guaranteed income to pay off the consortia's debt due to onerous contract conditions and inequitable risk transfer stipulations by the public sector. This practice earned PFI the reputation of incurring huge procurement costs for consortia and contractors before it became apparent that the business case for the project would not hold water. The procurement costs were non-recoverable by the parties concerned and before long PFI earned the reputation of being procurement of the last resort, at least by the private sector.

The 1997 Labour Government was elected to power on a pledge to put partnership at the heart of modernising public services. Within a week of winning the election in May 1997, a Labour Government appointed Malcolm Bates to conduct a wide-ranging review of the PFI. The first Bates Report made 29 recommendations, of which the dissolving of the Private Finance Panel in favour

of a Private Finance Taskforce was key. Following the publication of the second Bates Report in 1999 and its recommendation that deal-making skills could be strengthened and that all public sector staff engaged in PFI projects should undergo annual training, PricewaterhouseCoopers were tasked with producing a PFI Competence Framework.

In 1999, Sir Peter Gershon was invited to review civil procurement in central government. The subsequent report highlighted a number of weaknesses in government procurement systems as follows:

- organisation;
- process;
- people and skills;
- measurement; and
- contribution of the central government.

Gershon's aims were to modernise procurement throughout government, to provide a greater sense of direction in procurement and to promote best practice in the public sector. Gershon's proposals for dealing with these deficiencies led to the creation of a central organisation entitled the Cabinet Office.

But government was also anxious to spread the use of private investment into local authorities and in April 1996 the Local Authorities Associations established the Public Private Partnership Programme or 4Ps, now known as Local Partnerships (LPs), in England and Wales. The LPs is a consultancy set up to help local authorities develop and deliver forms of public private partnership. The local authority services covered by the LPs are housing, transport, waste, sport and leisure, education, etc.

During the second and third terms of the Labour Government in the UK, a number of specialist PPP procurement routes have been devised in order to meet the needs of particular public sector agencies, for example, LIFT.

NHS Local Improvement Finance Trusts (LIFTs)

Local Improvement Finance Trusts (LIFTs) involve Partnerships UK plc (PUK) and the Department of Health forming a joint venture, Partnerships for Health, to encourage investment in primary care and community-based facilities and services. LIFT has been developed to meet a very specific need in the provision of primary and social healthcare facilities in inner city areas, that is to say, GP surgeries, by means of a long-term partnering agreement. In order to participate in the programme, projects must be within areas designated as LIFT by the Department of Health. Although LIFT is at present confined to the health sector, other sectors are looking closely at the model for possible adaptation to other public service provision.

LIFT is based on an incremental strategic partnership and is fundamentally about engaging a partner to deliver a stream of accommodation and related services through a supply chain, established following a competitive EU-compliant

procurement exercise. Rather like the approach adopted by framework agreements, there should be no need to go through a procurement process again for a bidder to undertake these additional projects. Therefore, just as in the case of ProCure 22, discussed below, there should be considerable savings in terms of cost and time over the duration of the partnership arrangement.

Frameworks

Framework agreements are being increasingly used to procure goods and services in both the private and public sectors. Frameworks have been used for some years on supplies contracts; however, in respect of works and services contracts, the key problem, particularly in the public sector, has been a lack of understanding as to how to use frameworks, while still complying with legislation, particularly the EU Directives and the need to include an 'economic test' as part of the process for selection and appointment to the framework. In the private sector, BAA were the first big player to make use of framework agreements and covered everything from quantity surveyors to architects and small works contractors. The EU public procurement directives define a framework as

> An agreement between one or more contracting authorities and one or more economic operators, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quality envisaged.

ProCure 22

NHS ProCure 22 has been constructed and developed from previous programmes (ProCure21 and ProCure21+) by NHS Estates around four strands to promote better capital procurement by:

- establishing a partnering programme for the NHS by developing long-term framework agreements with the private sector that will deliver better value for money and a better service for patients;
- enabling the NHS to be recognised as a 'Best Client';
- promoting high quality design;
- ensuring that performance is monitored and improved through benchmarking and performance management.

In common with most large public sector providers, the NHS has suffered from the usual problems of schemes being delivered late, over budget and with varied levels of quality, combined with little consideration to whole life costs. One of the main challenges to NHS capital procurement is the fragmentation of the NHS client base for specific healthcare schemes, as it is comprised of several hundreds of health trusts who all have responsibility for the delivery of schemes and each has differing levels of expertise and experience in capital procurement.

The solution to these problems was to develop an approach to procurement known as NHS ProCure 22 as a radical departure from traditional NHS procurement methods and as a cornerstone of the massive capital investment programme in the NHS. The principle underpinning the ProCure 22 programme is that of partnering with the private sector construction industry.

The Private Finance Initiative (PFI)

Information compiled by government between March 2016 and March 2017 indicates that there are currently 728 PFI contracts either in operation or in construction in the UK with a capital value of £58 billion, ranging from the provision of street lighting in Rochdale to a £133 million project to build and maintain schools in Bristol (Figure 3.7).

The primary focus for PFI to date has been on services sold to the public sector. There are three types of PFI transactions currently in operation. In return for designing, funding and operating a PFI facility, the provider sector consortia receive a unitary charge (Figure 3.8). For example, in the case of the £40 million Birmingham Group School programme, the private sector consortium receives a unitary charge of between £2.4 million and £11 million per annum.

During the period 1997–2008, PFI was the only game in town for the procurement of large public sector projects with three main models:

- *Joint ventures* in which both the public and private sectors contribute, but where the private sector has overall control. The government's contribution can take a number of forms, such as concessionary loans, equity transfer of existing assets, ancillary or associated works, or some combination of these. If there is a government equity stake, it will not be a controlling one. The government may also contribute in terms of initial planning regulations or straight grants or subsidies.

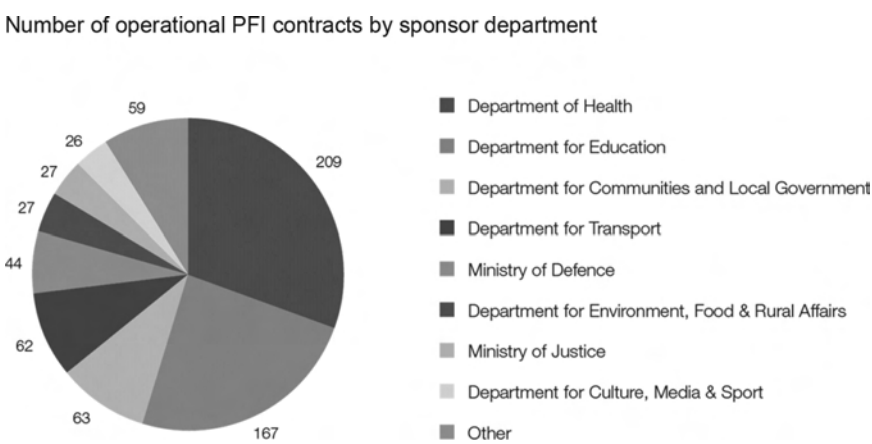


Figure 3.7 Number of operational PFI contracts by sponsor department

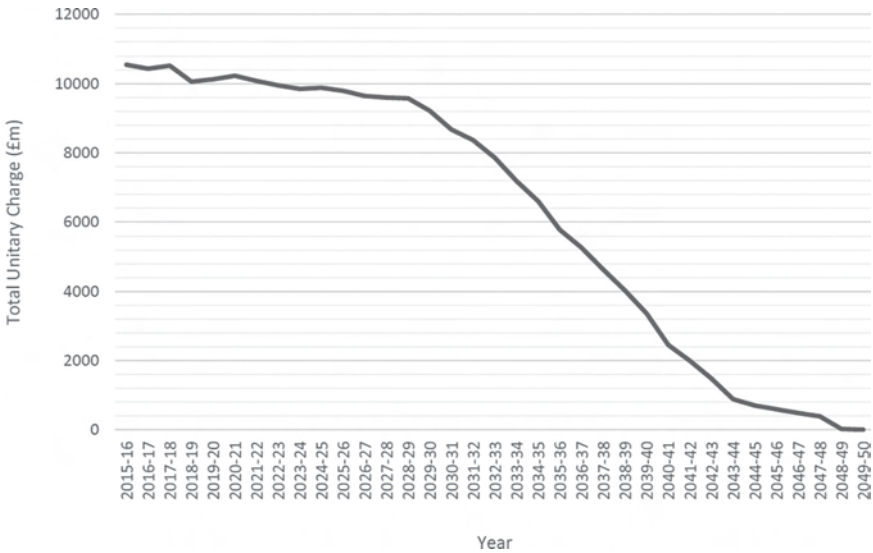


Figure 3.8 Estimated unitary payments to PFI projects

- *Financially free standing projects* where the private sector undertakes a project on the basis that costs will be recovered entirely through a charge for the services to the final user, for example, the Queen Elizabeth II Bridge in Kent/Essex, where the toll charges go directly to the company that constructed and is running the bridge. At the end of the concession period, the ownership of the asset may be handed over to the public sector.
- *Classic PFI* is the widest used, most controversial, and best-known form of PPP, accounting at its height for approximately 80 per cent of all expenditure on PPPs in the UK construction sector and is characterised by private sector consortia submitting tenders to:
    - raise the finance;
    - prepare the design;
    - build the project;
    - operate and maintain the complete facility for a period of thirty years plus.

As stated above, classic PFI involved the consortia raising the finance for a project which was at a considerbly higher cost than government rates, see Table 3.10.

During the currency of the contract, the consortia will receive an annual payment, known as a unitary charge, providing that agreed performance standards are met. At the end of the contract, the facility is handed back to the public sector in a good state of repair.

Table 3.10 Estimated finance costs

	2013/14
Government borrowing: implied interest rate	3.1 %–3.4%
Private finance (including finance leases): implied interest rate	7.2 %–7.4%

Source: Calculated from HM Treasury, *Whole of Government Accounts*, 2013/14, March 2015.

Classic PFI: Contractual Relationships (DBFO)

Design, Build, Finance and Operate (DBFO) is the classic and perhaps most widely used PFI model, with a contract structure usually similar to the one illustrated in Figure 3.9. In order to obtain approval, early PFI projects were required to demonstrate two principal advantages over conventional public procurement strategies:

- value for money compared with traditional service provision;
- risk transfer; the second important hurdle for PFI project to clear is a demonstration that significant risk has been transferred from the public to the private sector operator (i.e. without a guarantee by the taxpayer against loss).

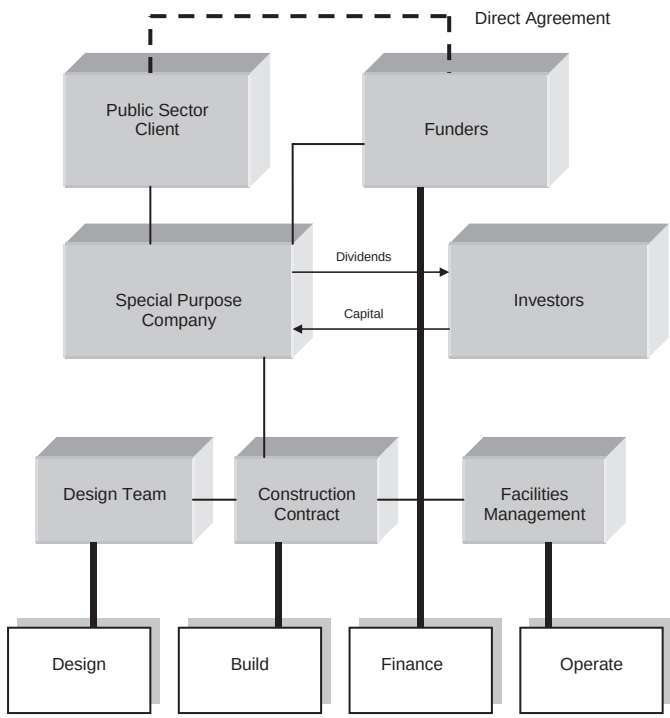


Figure 3.9 PFI contractual arrangements

In addition to value for money and risk transfer, other characteristics of PFI deals such as DBFO are:

- selection based on competition on the net present values of the unitary payment;
- an output-based specification rather than the traditional prescriptive model;
- a long-term contract, usually thirty years minimum;
- performance-related payments;
- task integration;
- operation of completed facility.

Why PFI?

The uniqueness of PPPs lies in the partnership of two sectors (public and private) which have during the last sixty years or so, in the UK at least, followed very different paths, with very different objectives. In broad terms, the benefit for the private sector includes the predictability of guaranteed long-term income streams, and for the public sector, cost and time certainty in the delivery of a new or refurbished built asset that enables it to deliver a public policy outcome. In addition, given the unenviable track record of the UK construction industry, the public sector client does not need to start paying for the facility or service until it is ready for use.

The difficulties with the traditional fragmented approach to public procurement have been threefold:

- projects can only proceed once the public funding is in place and this can be problematic. Agencies have to bid annually, recently changed to three yearly, for funds from the Treasury and inevitably many projects fail to secure funding and do not go ahead. If funding is secured, design and procurement are usually on the basis of cheapest bottom line price rather than value for money, with little or no consideration given to long-term running, maintenance or decommissioning costs;
- once funding is approved, the project delivery is often unreliable both in terms of cost and time certainty, as previously discussed in Chapter 1.
- the maintenance of built assets is also dependent on central government funding, which, like the funding of capital projects, is unpredictable. Often funds for capital building programmes have to be diverted to carry out essential maintenance or repair work.

In addition, traditional procurement models leave the public sector client vulnerable to high levels of risk which, it has been proved, it is ill equipped to manage. PFI procurement results in a large proportion of risk being transferred to the contractor or private sector.

Compared with the traditional and often fragmented approaches to construction procurement, PPPs, depending in the model used, offer the advantages of

synergies between traditionally diverse processes in the delivery and operation of built assets, for example:

- synergy between the design and construction. This is not a new concept and buildability can also be achieved through other forms of procurement, such as design and build. Most PFI projects are able to deliver this well with designers working alongside the contractor;
- synergy between the construction phase and the operational phase. This is mainly to do with the suitability and reliability of the construction, taking into account whole life costs over the expected life of the project.

Not unnaturally, there is growing evidence that companies that can combine design, construction and hard facilities management in-house are increasingly successful in the PPP market, for example, the UK arm of the French giant Bouygues.

The current state of PPP/PFI

The near collapse of the world's financial markets in 2009 had a major impact on the UK PFI market as sources of private funding dried up. Consequently deals slumped in 2009 making it the worst year since 1995 for the public–private partnerships industry. In 2009 only 35 PPP deals in total were signed across all sectors amounting to £4.24 billion, this compared with £6.5 billion in 2008 and £7.3 billion in 2007. Elsewhere in Europe, though, the PPP market developed steadily with around €5.0 billion worth of deals being signed. However, with turbulent political and economic times ahead in the UK, it is uncertain what the level of activity will be during the coming years.

In Scotland, the Scottish National Party announced on their election in 2007, that PFI was no longer to be an option as a public sector procurement route in Scotland. Instead it was to be replaced with The Scottish Future's Trust in 2008 which began to initiate procurement programmes in 2010/11. With current PFI projects coming to a close, it is thought by some that this will result in a loss of PFI expertise north of the border.

In June 2010, a Conservative/Liberal Coalition Government was elected to Westminster. Within weeks, in an attempt to cut costs, the Building Schools for the Future programme with a budget of £9 billion over three years was axed. The future of other PPP programmes is, at the time of writing uncertain.

So, what is the current state of health of the PFI and why is it used? When it was first launched in 1992 the principal rationale was:

- to provide value for money and efficiency savings;
- to transfer risk from the public to the private sector.

These motives still remain pretty much the driving force as the procurement policy matures.

The PF2 procurement process: 'Getting a good deal'

The question as to whether PFI contracts provide value for money has been examined and re-examined on numerous occasions by a wide variety of public and private sectors bodies. There is still a heated debate at all levels as to whether PPPs and, in particular, the PFI deliver value for money over 30 years after this procurement route was introduced in its present model. In 2009, a House of Lords Select Committee concluded that the PFI was just about delivering value in terms of the provision of new public facilities, but there are others, for example, Professor Allyson Pollock, who gave evidence to the House of Lords, who will never be convinced. In December 2012, in light of the much criticism, HM Treasury published *A New Approach to Public Private Partnerships*. This publication made a number of observations, including in Chapter 6 that 'some risks have been transferred to the private sector that did deliver value for money'.

The reasons that were cited for the need for a new approach to PPP/PFI were:

- the PFI was not providing value for money;
- past experience demonstrated significant aspects of the PFI model were unsatisfactory, such as lack of financial transparency;
- the PFI process has often been slow and expensive for both the public and the private sector, that resulted in increased costs and reduced value for money for the taxpayer;
- PFI contracts have been insufficiently flexible during the operational period, thereby making alterations to reflect the public sector's service requirements difficult;
- there has been insufficient transparency on the future liabilities created by PFI projects to the taxpayer and on returns made by investors;
- inappropriate risks have been transferred to the private sector, resulting in a higher risk premium being charged to the public sector.

So what of PFI remains in PF2?

- integrated design, build and maintenance to deliver whole life solutions;
- establishing best value solutions to meet output-based requirements on a no-service, no-fee basis, based on a detailed payment mechanism (unitary charge);
- obtaining the majority of finance from the taxpayer;
- sharing of risk.

Major areas of change between PFI and PF2 are:

- Equity finance:
    - the public sector to take an equity stake in all projects of between 30 and 49 per cent;
    - part of the equity to be subject to funding competition.

- Procurement:
  - a centralised procurement unit to be established;
  - an 18-month cut-off for the procurement process.
- Service provision:
  - soft services, for example, cleaning, catering, etc., to be removed from the main contract;
  - minor maintenance to be transferred to frameworks.
- Risk allocation:
  - certain risks to be taken back into the public sector;
  - risks will be allocated so as to optimise value for money rather than maximise risk transfer.
- Specific changes have been made to some features of risk:
  - change of law risk;
  - utilities risk;
  - risk of site contamination by an external source.
- Debt finance:
  - pension funds and institutional investors will be encouraged to invest in PF2 schemes.
- Value for money:
  - periodic reviews for continuous improvement.

One of the most attractive aspects of PFI to politicians was the ability to account for PFI debt 'off balance sheet' resulting in millions of pounds worth of liabilities not being accounted for as debt, thereby presenting a much brighter picture of the government's balance sheet than would otherwise be the case. In the case of UK PFI projects, this off balance sheet treatment amounts to £145 billion (see www.thisismoney.co.uk/money/news/article-2180334/Revealed-The-612bn-debts-Government-hidden.html).

Following criticism and the collapse of ENRON in 2009/10, the UK Government adopted the International Financial Reporting Standards (IFRS) and in particular, IFRIC12 and IPSAS32, bringing back accounting on balance sheet for PFI projects, thereby adding to the financial transparency for the projects.

Figure 3.10 details a typical PF2 procurement process, for Hull City Council.

The role of the quantity surveyor in PPP/PF2

Quantity surveyors are just one of a range of professional advisors involved in PPP/PF2 projects. As previously noted, the Royal Institution of Chartered Surveyors

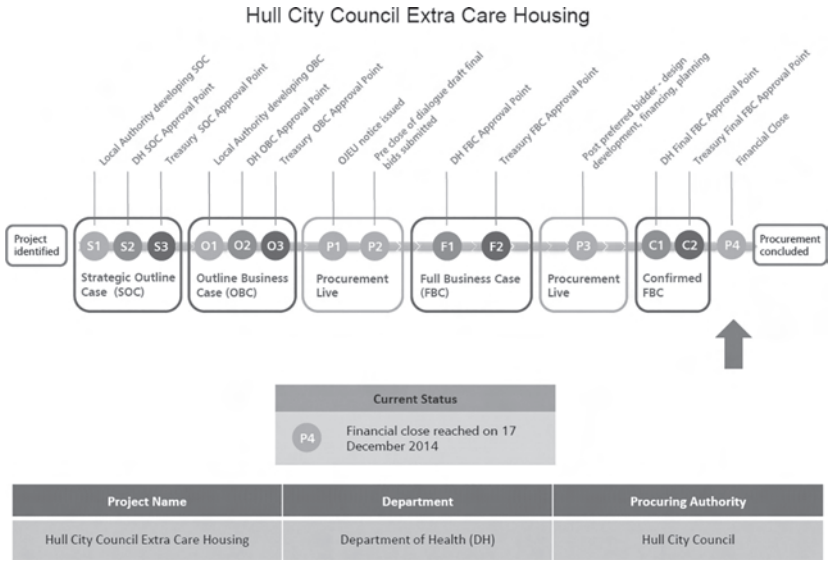


Figure 3.10 PF2 procurement timeline

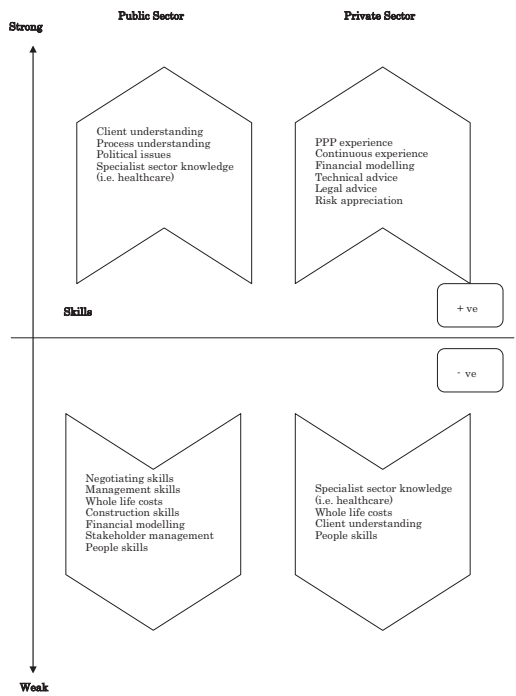


Figure 3.11 PPP skills balance

are in no doubt as to the importance of PPP/PF2 to the future of the profession, and many quantity surveying practices are involved in PPP/PF2 deals in a variety of roles for both the public and private sectors. Figure 3.11 illustrates the public/private skills balance as identified by the RICS Project Management Faculty.

For the private sector, special purpose companies (SPCs)

In the private sector working for the operator, the quantity surveyor's role could involve the following responsibilities.

Advice on procurement

For many private sector consortia the approach to submitting a bid for a PF2 project is unknown territory. Added to which is the fact that, by their nature, PF2 projects tend to be highly complex, requiring decisions to be taken during the development of the bid at Stages P1 and P2, that not only involve capital costs, but also long-term costs. Increasingly, as explained in Chapter 5, the impact of EU Procurement Directives must be considered. Some contracting authorities use the *Official Journal* of the EU (OJEU) to 'test the water' for a proposed PPP project; the quantity surveyor can supply preliminary cost information at this time. In addition, the quantity surveyor with experience in PPP can provide expert input into the pre-qualification stage. The stage at which the bidders are selected in the private sector consortia is based upon, among other things, their knowledge of a specialised sector of public services and their ability to manage risk.

General cost advice

The traditional quantity surveying role of advising on capital costs, including also the preparation of preliminary estimates, bills of quantities, obtaining specialist quotes, etc. In addition, value management and value engineering techniques as described earlier in this chapter are increasingly being called on to produce cost-effective design solutions.

- *reviewing bids prior to submission*. Due diligence;
- *advice on whole life costs*. It has already been stated that to many the key to running a successful PPP contract is control of whole life costs. Recognising this, many surveying practices now have in-house advice available in this field;
- *specialist advice*. Obviously, highly complex projects, for example, the construction and management of a major hospital, require a great deal of expert input from specialists, for example, medical planners able to advise on medical equipment, etc. from the outset. Surveying practices committed to developing their role in PPP already have at their disposal such expertise, which in some cases is in-house.

For funders

Due diligence

The financial and funding aspects of major projects are becoming increasingly susceptible to both technical as well as commercial risks. Investors and funding institutions are looking more and more for independent scrutiny of all aspects of development, from design integrity to contractual robustness of the contract and beyond to the expenditure levels and progress against programme. The skills of the quantity surveyor provide an excellent platform for the investigative and analytical processes necessary to satisfy these requirements.

For the public sector purchaser

Procurement advice

For the public sector, this method of procurement is, for many, just as unfamiliar as for the private sector. The surveyor can advise the contracting authority on how to satisfy the requirement of this method of procurement. It is widely agreed that the appointment of a project manager at an early stage is vital to PPP project success. In addition, pressure has being exerted to speed up the procurement process, a factor that makes the role of the project manager even more crucial.

- *the outline business case*. The preparation and development of the outline business case involves the preparation of a risk register, the identification and quantification of risk; all of which are services that can be supplied by the quantity surveyor;
- *advice on facilities management*. Technical advice on this topic during the drawing up of the service specification.

Common and joint services to SPCs/public sector purchasers

Joint public/private monitor certifier

This role is similar to the role played by a *bureau de contrôle* in France and involves monitoring the construction works to ensure that it complies with contract. In addition to the built asset, the surveyor employed in this role can monitor facilities management operation. The concerns with this practice centre around the 'belt and braces' way in which the certification is being carried out and the fact that firms are signing off multi-million pound schemes, for very little fee and are effectively acting as unpaid insurance agents. Any claim is covered by professional indemnity insurance.

Services to consortium building contractors

The role recognised by many surveyors as their main involvement in PPP, it includes: preliminary cost advice, preparation and pricing of bills of quantities, and supply chain management.

Conclusion

So, has what has the reaction of the PFI market been to PF2? The stark truth is not very much. According to Pinsent Masons, 'no one associated with PPP/PFI really seems to want it' and there is a distinct lack of buzz due mainly to complex financial structures. In addition, in 2016, the Scottish Futures Trust ran foul of EU borrowing rules with arguments as to whether schemes are publicly or privately owned. Also, in a reverse of the previous decision to adopt FRS5, the UK Government is considering reverting to off balance sheet accounting. The reason being that under PF2, the government takes an equity stake in projects, and on balance accounting is hindering their chance of doing this.

New models of procurement

The Cabinet Office redefines its approach to construction procurement at regular intervals. In July 2014, the Cabinet Office recommended three models of procurement in the aptly named New Models of Procurement. They are:

- cost-led procurement;
- integrated project insurance;
- two-stage open book.

The common principles of these models are a requirement for clients to do the following:

- clearly define the desired functional outcome including specific requirements, e.g. carbon reduction, use of apprentices, etc.;
- identify typical costs and deliver the outcomes based on available data, benchmarking and cost-planning work. This will enable the client to set a realistic yet challenging cost ceiling, that would be achieved or bettered, and costs would be further reduced over a series of projects or programmes of work;
- engage with the supply chain that embraces the principles of early contractor involvement and a high level of supply chain integration; and ensure that on completion of the capital phase, the specified output performance is achieved;

- apply a robust review process to ensure appropriate scheme definition, create commercial tension, monitor scheme development and address any unnecessary scope, risks and potentially missed opportunities;
- take steps to ensure that those appointed to carry out the processes of the models, whether internal or external to the client organisation, have the skills to do so effectively.

The hope is that these models will change the way in which government buys construction. They attempt to change the procurement process so that the supply chain responds to an outline declared budget and client requirements. This is different from the usual process where the price is built up against a specification without the tendering organisations knowing what budget the client has available. It is claimed that pilot projects delivered savings of £447 million in 2012/13 and £840 million in 2013/14.

Cost-led procurement

The client, who may have existing framework agreements, invites one or more integrated teams or supply chains to deliver a project using collaborative behaviour, tools and techniques under the declared budget on the initial project. Then they are required to achieve cost savings on future projects for the same quality standard. In competition with other similar integrated supply chain organisations from the framework, two to three organisations are involved early in the procurement process to encourage the use of innovative design and working practice to develop bids that identify cost reductions. To be successful, the bidding organisations must achieve a price below the budget and are scored on a mix of commercial and physical benefits. If there are no prices below the budget, then others from outside of the framework are permitted to bid. If the budget cannot be met or improved upon, then the client will have to consider increasing the budget or reducing the specification.

Integrated project insurance (IPI)

The origins of IPI go back over a decade, as it was being discussed in the early 2000s – by the team that developed the Strategic Forum for Construction's 'Integration Tool Kit' for developing integrated project teams and supply chains. In Europe, decennial liability insurance has been in the marketplace for many years.

To implement IPI, the client holds a competitive appointment process to select an integrated project team (IPT) who will be responsible for project delivery. Criteria for selecting the IPT will include the common requirements for capability – such as proven track record – plus a demonstration of maturity behaviour, lean thinking, removal of wasteful processes, and a reasonable fee. The successful team then creates a preferred solution that will provide the outcome required by the client, including the generation of savings measured against historical cost

benchmarks. The differentiator between this and other forms of procurement is the insurance policy which covers all the usual construction insurances for the client and all supply chain members involved in the project.

The insurance also absorbs some of the commercial risk of cost escalation beyond the budget. However, before that facility is available, there is a pain-share threshold, divided up on an open basis between the client and the other supply chain members.

This IPI model includes independent facilitation and a gateway process which ensures value for money and helps balance commercial risk to a level at which an insurer is prepared to provide the insurance. This third party intervention and review process is seen as a considerable benefit to the successful outcome of the project. The insurance provides for cost overruns only up to a financial cap, thus limiting the insurer's potential exposure and will not meet all of an over-spend, but helps remove some of the blame culture prevalent within the industry.

Payment under the policy will be on the basis of proven loss. However, to obtain the insurance cover at the outset, the proposed scheme will be subject to independent validation to ensure that the project is deliverable and that it is commercially competitive or, as the guidance refers to it, as the maintenance of 'commercial tension'.

The first UK construction contract to use integrated project insurance was awarded in 2015 for the £12 million Centre for Advanced Building Technologies at Dudley College in the West Midlands which was due for completion by spring 2017. All the project team firms signed up to a new alliancing contract, which also features a project bank account under which the firms are jointly liable for the project.

Two-stage open book

This is a two-stage tender process where a contractor is selected after the first phase rather than at the end of a two-stage tendering process. The first stage involves contractors and their consultant team being selected on the basis of 'capacity, capability, stability, experience, strength of their supply chain and fee (profit plus company overhead)'. The second stage consists of the successful team being asked to produce a proposal on an open book basis against the client's brief and cost benchmarks. The intention is that this will allow early engagement of the supply chain leading to an agreed price and risk profile prior to the client committing to construction. An interesting feature of this approach is that it is intended that the client will be able to 're-engineer' the supply chain as part of a joint review, with the potential of Tier 1 contractors sharing their supply chain members with the client and other Tier 1 contractors.

Two of the models described above are really further developments of existing procurement methods. But the cost-led procurement method is a departure from previous practice in that the client is now going to declare the budget openly and up-front. If the bidding contractors cannot meet the budget, then the project does not go ahead unless more finance is found or the specification level is reduced.

The two-stage open book method is really about the client getting access to the supply chain early in the procurement process and ring-fencing the overhead and profit fee at stage 1. In reality, what does a main contractor (Tier 1 contractor) do other than take risk, provide management resource and expertise, and broker the contractual relationship between client, itself, the sub-contractors and suppliers?

But what about construction management? Could the public sector 'go direct' and manage its own supply chains? It would appear not, although surely it is food for thought given that the client teams will need to have competent project and cost management capability to procure these models. The real game changer and innovation, as far as the UK construction industry is concerned, is the integrated project insurance. It has been a long time coming but it is about to surface both within the public sector and also private sector. The issue will be how much it will cost in terms of premium and whether it is affordable in terms of the cost of the premium when weighed up against the project risks.

Bibliography

Ashworth, A. (1989) Life cycle costing: a practice tool. *Cost Engineering*, 31(3): 8–11.

BCIS (2007) *Guide to the Housing Corporation's Life Cycle Cost Measure for Social Housing*. BCIS.

BRE Trust and Cyril Sweett (2005) *Putting a Price on Sustainability*. Building Research Establishment.

Bull, J. W. (ed.) (1993) *Life Cycle Costing for Construction*. Routledge.

Clift, M. and Bourke, K. (1999) *Study of Whole Life Costing*. Building Research Establishment.

Department for Business, Enterprise and Regulatory Reform (2008) *Strategy for Sustainable Construction*. HMSO.

Department for Business, Innovation and Skills (2013) *Construction 2025: Industrial Strategy for Construction – Government and Industry in Partnership*. Available at: www.gov.uk/government/publications/construction-20

Flanagan, B. *et al*. (1989) *Performance Improvement in Construction Management*. Routledge.

HM Treasury (2012) *A New Approach to Public-Private Partnerships*. HMSO.

McGraw-Hill Construction (2013) *World Green Building Trends: Business Benefits Driving New and Retrofit Market Opportunities in Over 60 Countries*. McGraw-Hill.

RICS (2009) *Sustainability and the RICS Property Life Cycle*. RICS.

Williams, B. (2006) *Benchmarking of Construction Costs in the Member States*. BWA.

World Commission on Environment and Development (1987) *Our Common Future* (The Brundtland Report). Oxford University Press.

WRAP and Cyril Sweett (2009) *Delivering Higher Recycled Content in Construction Projects*. Waste Resources Action Programme.

Zitron, J. (2004) *PFI and PPP: Client and Practitioner Perspectives. Proceedings of 21st Annual Conference of the Major Projects Association*.

4 IT update

The first edition of *New Aspects of Quantity Surveying Practice* was drafted in, what was for the IT and e-commerce sectors, the heady days of the late 1990s/early 2000s. There were exaggerated predictions from practically every quarter, including government departments, on the ways by which e-commerce and e-construction were going to become all-pervading and revolutionise everything from tendering to project management. To paraphrase Harold Wilson's famous 1960s speech in which he referred to the 'white heat of technology' , the late 1990s and early part of this new decade were a period when the 'white heat of information technology' resulted in the massive expansion of e-commerce portals and associated IT systems. Perhaps the big news since the third edition of this book is the introduction of e-projects and BIM into the UK construction industry, while the uptake of digital procurement remains at disappointingly low levels.

e-projects

Collaboration platforms

These provide a set of tools and information environment for collaboration between organisations, something that we have not been particularly good at in the construction industry. This can focus on specific functions, such as collaborative design and engineering or providing project support with a virtual team of consultants. Business opportunities are in managing the platforms and selling the specialist tools.

The value chain (Figure 4.1) has been defined as a model that describes a sequence of value-adding activities of a single organisation, connecting an organisation's supply side with its demand side, and includes supporting activities. Information technology is applicable at all points of the value chain.

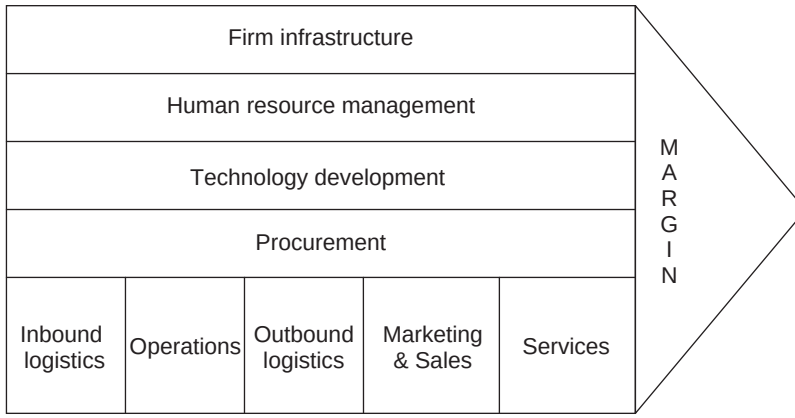


Figure 4.1 The value chain

Primary activities

- inbound logistics; just-in-time activities;
- operations; process control;
- outbound logistics; online link to customers;
- marketing and sales;
- service; technical support.

Support activities

- firm infrastructure; e-mail;
- human resource management; online personnel base;
- technological development; CAD/BIM;
- procurement; online access to suppliers' inventory.

Value chain integration can use internet technology to improve communication and collaboration between all parties within a supply chain.

Value chain service provider

These organisations specialise in a particular and specific function of the value chain, for example, electronic payment or logistics. A fee or percentage-based scheme is the basis for revenue generation.

Value chain integrators

These focus on integrating multiple steps in the value chain, with the potential to exploit the information flow between these steps as further added value.

Virtual communities

Perhaps the most famous of virtual communities is the ubiquitous Amazon.com. Figure 4.2 illustrates the traditional lines of communication between the various supply chain members. Without the presence of a hub to link and coordinate the various parties, decisions can be, and frequently are, taken in isolation, without regard to the knock-on effects of cost, delays to the programme, impact on other suppliers, etc.

Contrast the introduction of a collaborative hub (Figure 4.3), for example, as illustrated by Constructing Excellence at http://constructingexcellence.org.uk/collaborative-working-champions/, which permits decision-making to be taken in the full light of knowledge about the possible implications of proposed changes. In addition it also permits specialist sub-contractors or suppliers to contribute their expertise to the design and management process, this is the basis of BIM.

In a recent case study, the quantity surveying practice Gleeds calculated the drawing production cost savings arising from the use of an electronic data management collaboration system used on a £5 million, 30-week retail construction project as follows:

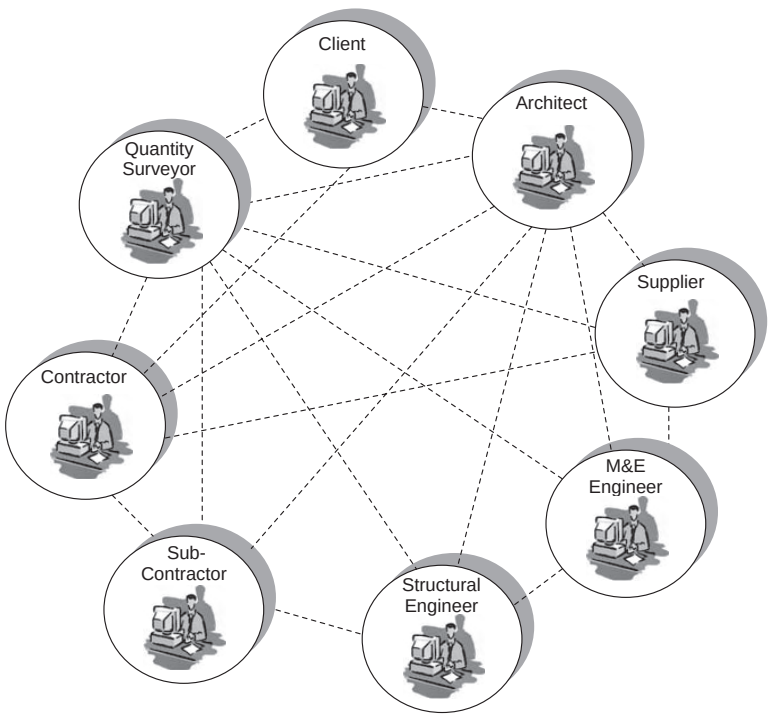


Figure 4.2 Traditional communication network

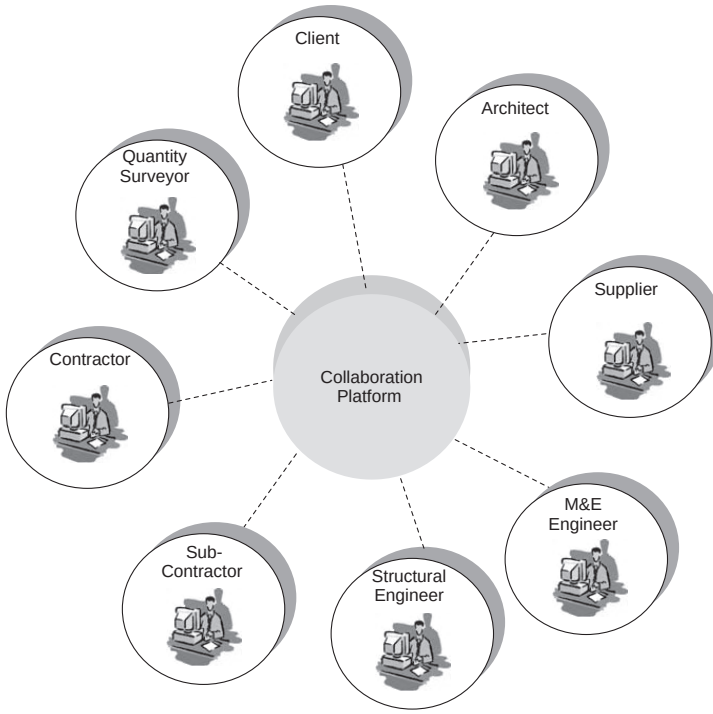


Figure 4.3 Collaboration platform communication

Printing cost for project drawings	£46,112
Postage for drawings	£1,584
Copying costs for project specification	£10,215
Postage costs for specification	£219
Total	£58,130

Source: CITE.

Building Information Modelling (BIM)

According to *Construction 2025* (Department for Business, Innovation and Skills, 2013), the main threats to UK construction are:

- lack of collaboration and limited knowledge sharing: learning points from projects are often team-based and lost when the team breaks up and the project ends;
- low technology transfer;

- sectorial integration: vertical integration in the supply chain is low and there is high reliance on sub-contracting. Lack of integration often leads to a fracture between design and construction management and a fracture between the management of construction and its execution, leading to lost opportunities to innovate.

It was estimated by the UK Government's *Construction Strategy 2011* that the ways in which the UK construction industry generates and exchanges information, together with current procurement practice, add 20 per cent on to overall turn-out costs.

The UK (England, Wales and Northern Ireland) Government remains unconvinced that it is receiving value for money from construction procurement and therefore as part of the UK Government *Construction Strategy 2011* (Cabinet Office, 2011), it was announced that from April 2016 all central government-funded projects must be BIM-enabled to Level 2. In the tradition of UK Government-led construction industry initiatives, the introduction of BIM was poorly handled, to the extent that on the deadline day, the target had to be revised to apply only to public-sponsored projects exceeding £10 million. Scotland follows in 2017 for public sector projects over £4.32 million. Interestingly, the phase 'central government-funded projects' has come under scrutiny as there is uncertainty as to what projects actually fall into this category. For example, High Speed 2 (HS2) is centrally funded, but is not obliged to apply the BIM mandate because it is a non-departmental government agency and therefore subject to a different compliance regime. BIM certainly does not appear to be the catch-all model envisaged at the time when it was first announced in 2011.

The concept of Building Information Modelling (BIM) is not new, having been around since at least the 1980s, when some architects and engineers began to switch from drawing boards to computer-aided design (CAD). While this change dramatically increased drawing office productivity, the outputs were still largely paper-based 2D drawings – plans, elevations, sections, isometric views, exploded diagrams, etc., and still tended to be shared with fellow team members as paper-based documentation.

What, therefore, are the differences between CAD and BIM?

CAD is a successful and powerful drafting tool with the following characteristics:

- it is a drafting tool to produce working drawings;
- it is a fragmented process containing multiple files;
- it is a means of creating construction documentation;
- it is a system that requires manual co-ordination.

Whereas BIM can be said to be:

- a database of information, including details of design, validation, construction and life-cycle issues;
- a representation of virtual construction;
- analytical and quantifiable.

As discussed in Chapter 1, construction has often lagged behind other sectors in the field and in other markets, such as the automotive and aerospace industries, where designers had also been switching from manual drafting to CAD. They began to explore 3D visualisation and to relate the outputs of their design processes to manufacturing, designing components that could be accurately produced on computer-controlled machines. In the construction industry, however, things were moving at a different pace, mainly due to the highly fragmented nature of the sector. In the worldwide aerospace industry, there are only a handful of aircraft manufacturers, and they have developed close, long-term commercial relationships with their suppliers. With a history of innovation and a culture of continued investment in research and development, there are high barriers to entry for any company wanting to compete in the aerospace industry.

The global construction industry, in contrast, currently comprises millions of contractors, and many more sub-contractors, consultants, materials suppliers and product manufacturers. It is a highly competitive industry in which many businesses work on small margins, with little or no investment in research and development. As a result, there is little differentiation between firms; many compete almost purely on price, and only in recent years have we begun to see a small number of major clients looking to develop longer-term partnering or alliance-type framework agreements with key suppliers. The differences between construction and aerospace or automotive are also exacerbated when one considers the products. Aircraft and cars are produced in a handful of factory environments in large volumes to standard core designs with a relatively limited number of configurations. The construction industry's outputs, on the other hand, are often unique, one-off solutions to a client's needs, produced specifically for particular locations, and their design and construction can involve an infinite number of variations, often due to the availability of appropriate skills, knowledge, materials, labour, space, etc.

It is hardly surprising therefore, that BIM has developed more slowly in construction than the adoption of modelling technology in other sectors. But, since the 1980s, some construction businesses have expanded well beyond CAD. Reasons include; the lower cost and increased processing power of computer hardware, higher bandwidth telecoms links (again at lower cost), wider availability and use of BIM software outside niche disciplines, and the emergence of industry data exchange standards. Let us look at how the adoption has occurred in the UK. The main catalyst for change in the UK came after the late 2000s global financial crisis when the UK Government began to demand better value for money and better carbon performance from its public sector projects. Paul Morrell, the government's chief construction advisor (2009–2012), had already announced his interest in BIM.

What is BIM?

BIM is different things to different people and has been described as:

- a risk management tool;
- a way to increase understanding of a project;
- an aid to the design team;
- an aid to the construction team;
- a communication tool.

BIM is the process of bringing together and sharing information in a digital format among all those involved in a construction project, including architects, engineers, surveyors and builders. By making information far more accessible and available to the client and end user to support through-life asset management, BIM is claimed to be a path to greater productivity, risk management, improved margins and sustainability. BIM envisages virtual construction of a facility prior to its actual physical construction, in order to reduce uncertainty, improve safety, work out problems, and simulate and analyse potential impacts. Sub-contractors from every trade can input critical information into the model before beginning construction, with opportunities to pre-fabricate or pre-assemble some systems off site. Waste can be minimised on site and components delivered on a just-in-time basis rather than being stockpiled on site.

A BIM digital representation of a building is structured as follows:

- the building;
- spaces within the building;
- systems within the spaces;
- products that make up the spaces;
- the relationship/constraints between the spaces.

The use of digital fly-through models is commonplace today. However, with BIM, it is the structured information behind the models that is so important and enables the project to be built digitally before being built on site. On site, it can be used for the purchase of materials and checking the compliance of systems and specifications.

Therefore, to put it simply; BIM is a process, facilitated by software, which, at the higher levels is accessible by all the players in a construction project, and is used to enter and store information on a project. The information need apply not only to the construction phase but also to the operation and maintenance of the completed project. In addition, the software can produce virtual models of the completed/proposed project prior to start on site which facilitates:

- avoidance of design clashes;
- generation of quantities;
- the application of alternative solutions, including cost estimates;
- sharing of information in real time;
- important information on running and maintenance regimes for the client;
- environmental assessments;
- quicker and easier design revisions;
- consistency of standards;
- more accurate scheduling of information;
- more accurate tendering processes;
- project planning and resource allocation;
- more efficient construction phasing;
- links to facilities management systems.

Facilities such as the NBS National BIM Library are now freely available at www.nationalbimlibrary.com/ and this contains thousands of generic and manufacturer's BIM objects in 3D format, created to comply with global standards that can be dragged and dropped directly into models.

Why adopt BIM?

According to the University of Northumbria (2007):

- 30 per cent of projects do not meet original programme or budget;
- 92 per cent of clients said that designers' drawings are typically not sufficient for construction;
- 37 per cent of materials used in construction become waste;
- 10 per cent of the cost of a project are typically due to change orders;
- 38 per cent of carbon emissions are from buildings not cars.

According to the (2015) RICS report 'How can BIM support NRM1?', the benefits of adopting BIM are:

- *feasibility*. Allows the best opportunity in early decision-making and greater certainty that project outcomes will be successfully delivered. Collaboration early in the design process reduces the necessity for costly and time-consuming changes and reworks later in the process;
- *at the design stage*. Produces simulation models and accurate analysis of design solutions and reduces the potential for clashes resulting in significant de-risk for the client;
- *on site*. Reduces construction time as errors are minimised;
- *occupancy*. Supports facilities management and operation.

As far as BIM adoption in the EU Single Market is concerned, the use of electronic communications with regard to procurement procedures is now mandatory (unless an exemption applies) and all EU Member States have the opportunity to recommend or require the use of BIM on public projects. The EU Public Procurement Directive (EUPPD) states: 'For public works contracts and design contests, Member States may require the use of specific electronic tools, such as of building information electronic modelling tools or similar.' Clearly, the use of BIM will not be mandatory, but the EUPPD does go some way in encouraging or pushing Member States to recommend or specify the use of BIM. However, the tools and devices must not restrict access to public procurement. If the tools and devices proposed are not generally available, the contracting authorities must offer an alternative means of access. Furthermore, public contracts must comply with the principles of the Treaty of Rome on the Functioning of the European Union: equal treatment, non-discrimination, proportionality and transparency.

In order to facilitate the introduction of BIM into the UK construction industry, the process has been broken down into levels ranging from 0 to 3.

BIM Level 0

Level 0 effectively means no collaboration or sharing of information with 2D CAD drafting being used, mainly for the production of information with output and distribution being via paper or electronic prints, or a mixture of both. According to the NBS *National BIM Report* (2016), the majority of the industry is already well ahead of this.

BIM Level 1

Working at this level is common within the UK construction industry and generally involves the use of a common data environment, such as a collaboration platform, described earlier in this chapter, with which sharing information can be facilitated and managed. Typically, this level comprises a mixture of 3D CAD and 2D for drafting production information with models not being shared between the project team.

BIM Level 2

This was the level chosen by the UK Government as the minimum target for all work on public sector work, by 2016. The big difference between Level 1 and Level 2 is that Level 2 involves collaborative working, with all parties working and contributing to a shared single model. All parties can access and add to a single BIM model and therefore it is essential that all the parties use a common file format such as COBie (Construction Operations Building Information Exchange). A new BIM Level 2 website was launched in November 2016: http://bim-level2.org/en/

COBie (Construction Operations Building Information Exchange)

Construction Operations Building Information Exchange (COBie) is a non-proprietary data format for the publication of a subset of Building Information Models (BIM) focused on delivering asset data rather than geometric information. It is formally defined as a subset of the Industry Foundation Classes (IFC, the international standard for sharing and exchanging BIM data across different software applications), but can also be conveyed using worksheets or relational databases. It can be used by facilities managers in the operations stage of a project and helps to capture project data such as:

- equipment lists;
- product data sheets;
- warranties;
- spare parts lists;
- preventive maintenance schedules.

To make COBie as useful as possible, the data is available in several formats and is claimed to be easy to access and manage, regardless of size or IT capability.

BIM Level 3

Currently regarded as the Holy Grail, this represents full collaboration between all disciplines by using a single, shared project model which is held in a centralised repository. All parties can access a single model and share details and information. The UK Government reasserted its commitment to Level 3 BIM in the 2016 budget – see later discussion on legal aspects.

Early BIM adoption

As the NBS BIM report (2016) illustrates, the construction industry's appetite for BIM appears to be less than enthusiastic. A survey of over a thousand organisations, taken immediately before the introduction of BIM into public sector procurement, indicated that just 54 per cent of those approached were 'aware or had used BIM', with 42 per cent not using BIM and 4 per cent claiming not to be aware of BIM at all!

In addition, early feedback from post-implementation surveys carried out by CIOB/BIM+ over 82 organisations in 2016 appears to indicate that:

- 60 per cent of respondents reported no increase in margins/fees/profit from using BIM;
- 24 per cent of respondents reported that BIM saved time during the construction phase;
- 40 per cent or respondents reported that they have no intention to make BIM a requirement on their projects.

The problem, as always, is how to get a message across such a fragmented industry – not just the top fifty companies but the remaining 200,000.

Challenges for BIM

Two major challenges have emerged for early BIM adopters:

- legal issues; and
- culture change.

Legal issues

These issues centre around:

- where the design liability lies (if something goes wrong, whose fault is it?);
- ownership – who owns the model and the data in it?
- copyright and intellectual property rights.

There are differing opinions as to who does own and who should own the intellectual property rights in BIM models. Some consultants accept that these rights are owned by the client while others refuse to hand them over and share BIM data. The main concern is the loss of intellectual property rights. According to the King's College Centre of Construction Law and Dispute Resolution (2016), this may be primarily a commercial issue rather than a new legal problem as intellectual property rights should not need additional legal protections by virtue of attaching to BIM models. For example, existing statutory copyright protection already covers graphic and non-graphic design work plus 'computer program' and 'preparatory design material for a computer program'. Therefore, intellectual property rights and copyright issues would not seem to present a major problem, provided there is a clear understanding regarding:

- each team member's ownership or permission in respect of all contributions to models;
- the granting of limited, non-exclusive licences to reproduce, distribute, display or otherwise use those contributions;
- equivalent clarity in respect of contractor and sub-contractor contributions;
- the use of models for facilities management during the operation and maintenance phase.

There is, however, a distinction between intellectual property rights at BIM Level 2, where contributions to BIM models can be traced to their authors, and the position at BIM Level 3, where contributions may become indistinguishable. Concerns have been raised as to the intellectual property implications of BIM Level 3, where contributions cannot be separated and if a contributor cannot

prevent or even see amendments made to their work by another contributor. The difference is more a question of insurable liability than intellectual property as it is possible to protect joint authorship if that is how a BIM Level 3 model is to be jointly owned. This situation also raises the question of who pays if information or details in the BIM model turn out to be incorrect.

Who pays for the model?

As previously discussed, the use of BIM is claimed to improve the design and co-ordination, and reveals construction problems and therefore helps the design team optimise both product and process and, in turn, the resultant savings pay for its cost. However, should one party pay for BIM as the savings benefit multiple sources, namely, the design team, main contractors, sub-contractors, suppliers, manufacturers and, of course, the client? The cost of building an integrated model exceeds the normal cost of producing typical construction documentation.

For example, CIOB/BIM+'s recent research (Cousins, 2016) found that a large number of public and private sector clients are being asked to pay a premium, by consultants or contractors, for delivering project information in BIM.

Culture change

At a cultural level, communication, sharing of information and trust have never been the strong point of the UK construction process. For many, this factor is the major obstacle to the adoption of BIM by UK Construction plc where, to a great extent, knowledge is still regarded as power.

What impact will BIM have on quantity surveying practice?

So is BIM the final curtain for the quantity surveyor? Not for the first time the quantity surveyor has been threatened with obsolescence, this time by BIM, and it has even been suggested that quantity surveyors are deliberately dragging their heels in adopting BIM in an act of self-preservation. To some extent, the jury is still out regarding this question, but one thing is certain, BIM will not herald the death of the quantity surveyor. According to the RICS, Building Information Modelling will 'enhance rather than damage' the quantity surveying profession. Others within the profession warn that BIM won't kill the quantity surveying profession, but firms that do not embrace the changes will lose relevance. The ability of BIM models to automatically generate quantities and cost estimates does not lessen the need for an expert to interpret the vast amounts of data produced, or to distil it into a form that clients, contractors and sub-contractors can use to make informed decisions, just as in the past they have been used to interpret drawings. Equally, the quality of the data from a BIM model depends on what data you put into it, and quantity surveyors are uniquely qualified to input and analyse that output of data. Professional insight and judgement will be needed to produce quantities from models and will be required for the foreseeable future.

Table 4.1 Quantity surveyor's interface with BIM

Project stage	*QS function/interface with BIM*
Feasibility	Definition of the employer's information requirements (EIR), i.e. the information that will ultimately be required from a project information model
Cost planning	Commissioning a CDE to manage both CAPEX and, importantly, OPEX information
Detailed design	Early involvement of facilities managers and end users in project design provision of model viewing, clash detection and project planning software to all relevant team members
Procurement	Defining how information models will be used, viewed and kept up to date by facilities managers
On site	Data interpretation Implementing workflows Co-ordination Management of CAPEX
Operation	Defining how information models will be used, viewed and kept up to date by facilities managers Augmenting the Building Information Model by capturing building performance data

There is no doubt that BIM is able to produce generic quantities faster than traditional techniques although other systems such as digitisers are capable of producing quantities quickly and efficiently. However, quantity surveyors are needed to interpret the BIM models, just as in the past they have been used to interpret drawings. BIM models can generate quantities quickly, but what they cannot do yet is present the quantities in a format that is of wider use by the industry. Therefore, quantity surveyors will have to interpret digital data produced from a variety of sources, including BIM. Table 4.1 presents the interface and function of the quantity surveyor and BIM.

Digital Built Britain: BIM Level 3

Altough the UK Government is pushing ahead with BIM Level 3, there has been criticism that it is too soon, as Level 2 has still to properly bed in. BIM Level 3 promises to supply:

- data-enabled collaborative working in the design, construction and operation of assets enabling best use of capability in the supply chain to deliver value to customers;
- use of data recording asset operation to understand asset performance, define better project briefs and to form the basis of new performance contracting models;
- application of remote monitoring, telemetry and control systems to the real-time operation of assets and networks utilising the internet of things;

- integration of infrastructure with control systems, such as in cars or trains, to maintain positions in lane and distances between vehicles, thereby reducing the risk of collisions and increasing the capacity of networks;
- use of 3D printing and other local fabrication techniques to provide components for infrastructure projects as well as Smart factory automation and Design for Manufacture and Assembly (DfMA);
- enabling the Internet of Services (and Construction) as well as associated value chains, to allow cross-sector collaboration;
- use of embedded sensors and other features of the Internet of Things to monitor the condition of infrastructure and predict the need for maintenance interventions, creating a feedback loop back to the asset brief, enabling the opportunity to invoke performance contracts and reporting;
- the availability of performance data at sources such as data.gov to enable a vibrant and growing digital analytics and services sector. An example is the Transport for London Oyster Card system and the services developed by Transport for London (TfL) and KPMG and the deployment of technology on motorways to provide Smart capabilities by the Highways Agency.

In June 2017, NEC4 introduced a new X Option to support BIM. As the requirements of BIM on the public sector become better understood, and are due to increase, this standard wording in contracts is a welcome change, and a steadying force.

Client requirements with BIM

The CIOB BIM+ 2017 survey found that the requirement to use BIM does not currently appear to be client-driven. In response to the question: 'As a client, what are your requirements on BIM?', the results were that almost half of the clients interviewed (49 per cent) said they did not make BIM a requirement on projects, though teams were free to use it, whereas 20 per cent of clients said they currently asked for BIM Level 2 on all projects.

Broken down into client type, the survey offers some interesting results:

- some 38 per cent of those from central government departments said that they make BIM Level 2 mandatory on all projects, while 23 per cent said it was not a requirement;
- only 17 per cent of other publicly funded clients asked for it on 100 per cent of projects – and 62 per cent said not at all;
- in the private sector, 11 per cent said they demanded Level 2 BIM on 100 per cent of projects, with 50 per cent said not at all.

Digital building

Having transformed retailing, publishing, travel and financial services, digital technology is changing the way we plan, build, maintain and use our social and

economic infrastructure. The vision of the Digital Built Britain strategy (Digital Built Britain: Level 3 Building Information Modelling: Strategic Plan) creates the opportunity to disrupt the current approach to designing and procuring infrastructure projects by doing the following:

- providing a platform through which a wide range of suppliers (including small and medium-sized enterprises) and other stakeholders can be engaged in finding the best informed life-cycle solutions to infrastructure problems and be in a position to bid to supply solutions;
- improving technical solutions and reducing costs by challenging the existing roles of consultants, contractors and suppliers;
- developing new business models for infrastructure and asset design, delivery, operation and adaptation, based on wider use of service performance data;
- protecting national security, to ensure that in increasing the availability of data, we put in place or build into design of any BIM project and its ongoing management, security measures and protocols so that threats may be deterred, detected, or the consequences of a cyber-attack minimised.

The internet in particular has provided a platform for changing relationships between clients, surveyors, contractors and suppliers; open exchange of information is critical in order to harness the best from this virtual marketplace, and one of the biggest challenges is creating a culture that encourages and rewards the sharing of information. Too many people are still starting from the viewpoint that knowledge is power and commercial advantage and the belief that the more that they keep the knowledge to themselves, the more they will be protecting their power and position. Despite the somewhat slower uptake by the construction industry compared with other sectors, Figure 4.4 illustrates the wide range of e-markets available for construction and quantity surveying applications from basic e-shop websites to complex value chain integrators and collaboration platforms.

The key advantages for the adoption of e-technologies are considered to be:

- cost reductions;
- faster transactions;
- fewer errors;
- less paperwork.

In a survey of e-commerce adoption carried out by Statistical Indicators Benchmarking the Information Society (SIBIS) across seven EU states, it was found that the leading e-commerce all-rounders were in distribution and financial network sectors, whereas off-line and basic online organisations were most likely in construction and manufacturing.

As shown in Figure 4.5, internet technologies can be exploited in marketing and sales by introducing web marketing and eventually e-sales, this is referred to as the front office development path of e-commerce, since it involves dealing

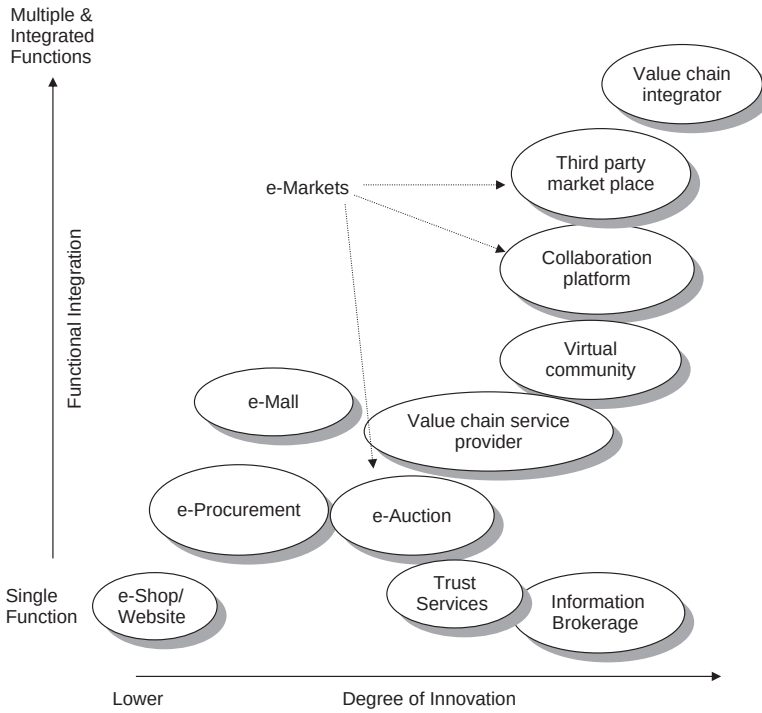


Figure 4.4 Classification of electronic commerce business models
Source: Timmers (1999).

online with final customers. Integration of closed business networks, involving suppliers and distribution networks is defined as the back office development path. The next step is integration of applications and exploiting processes synergies – the all-round e-commerce model.

The transparency of the internet should be a driving force for changing business strategies and attitudes and yet it will take a quantum leap in construction business culture to disclose sensitive information to the supply chain. It has been suggested by a leading construction industry dot com, that the European construction industry could save up to € 175 billion per annum on building costs and reduce completion time by up to 15 per cent through the widespread adoption of e-construction technologies.

When the lean thinking initiative was introduced into construction, the car industry provided the role model, now that some sections of the construction industry are seriously talking about e-commerce, it can once again look to the motor industry for a lead. In America, the three major domestic motor manufacturing firms have been dealing with suppliers via a single e-commerce site for a number of years – an initiative that has resulted in reported savings of over

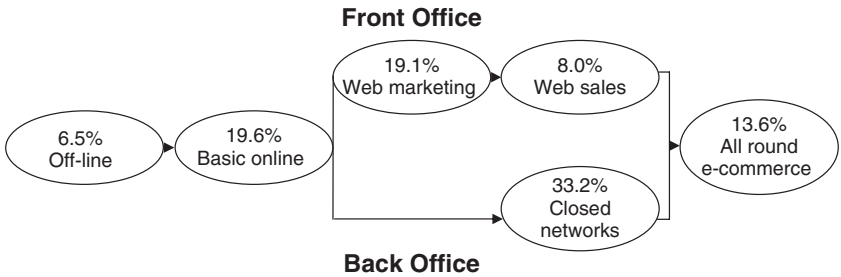


Figure 4.5 e-commerce development stages and degree of engagement, expressed as a percentage, in e-commerce in the EU

Source: empirica/SIBIS.

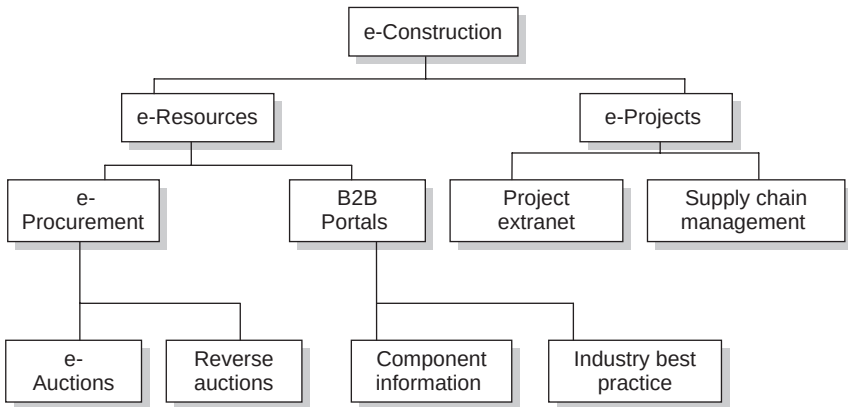


Figure 4.6 The shape of e-construction

£600 million a year. Similar initiatives are also to be found in the retail and agriculture sectors, but perhaps in the rush to establish the first truly successful construction-based e-portal the UK players have ignored some basic business rules.

The shape of e-construction

Several years after the advent of e-construction, the current shape can be considered as shown in Figure 4.6.

e-Resources: B2B Portals

Business to Business (B2B) portals combine a number of easily accessible e-markets and include the following resources:

- industry-best practice, for example, www.constructingexcellence.org.uk;
- materials and component information.

e-portals can be broken down into categories, based on who is trading with whom. Latterly sectors such as construction, finance, etc., have coined their own terms, e.g. e-construction, e-finance, to stake their own unique claim in the electronic marketplace. Although some sources claim that there can be up to nine classifications of e-commerce, most people agree that there are only three and, of these, only two, Business to Business (B2B) and Business to Consumer (B2C), have seen strong growth, the other sectors being Consumer to Consumer (C2C) or Person to Person (P2P).

Business-to-Business (B2B) or Business to Administration (B2A)

The extent to which B2B has been adopted by business depends on the sector and the size of the organisation. This category of e-business uses the internet and extranets and it is forecast that spending in B2B is expected to dominate internet growth. There are basically two different types of B2B companies: horizontal and vertical. Vertical B2B companies work within an industry and typically make money from advertising on specialised sector-specific sites or from transaction fees from the e-commerce that they may host (Figure 4.7). Horizontal B2B companies are a completely different breed and operate at different levels across numerous different verticals. Whether it is enabling companies to electronically procure goods, helping to make manufacturing processes run more efficiently, or empowering sales forces with critical information, most horizontal companies make their money by selling software and related services, for example, www.tendersdirect.co.uk.

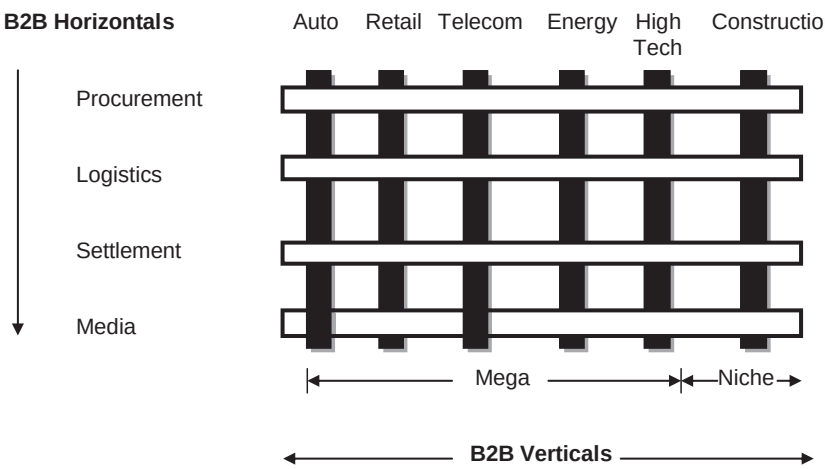


Figure 4.7 The structure of B2B commerce
Source: Adapted from PricewaterhouseCoopers

The development of B2B commerce has been rapid compared with other technological innovations, in a few years, B2B has developed from a high-cost, rigid system with low transparency to a low-cost, highly flexible and fully transparent system.

The development of e-commerce towards e-business, the more comprehensive definition which is now preferred, reveals the move from the enterprise-centric vision to the multi-enterprise network, or virtual enterprise and the move towards the exploitation of the ICT and the potential of the internet from cost reduction-oriented electric commerce to the collaborative-commerce vision, a move that requires a major step change in business culture. The challenge for construction and the surveying professions is undoubtedly greater. Dell, for example, has the considerable advantage of being already in the internet-related product field, where clients and suppliers are already technologically sophisticated, but nevertheless, real value added benefits are available for the quantity surveyor. The key point which is now currently acknowledged is that with the usage of ICTs and the internet in business, not only costs can be reduced, but also value can be created. Value is created from brokering transactions and matching orders between companies, but also from the provision of additional services, such as professional services for integrating and managing companies, including legal and financial services, logistics, project and contract management as well as background services like market intelligence. For example, Dell has created virtual integration with both their upstream partners and their downstream clients so that the entire supply chain acts like a single integrated company, Dell builds computers to order; typically someone who works for a large company like Boeing, goes to a private web page available only to Boeing employees and can order and configure a computer online. Dell suppliers maintain a two-week supply of components near to Dell factories: this inventory belongs to the suppliers not Dell. Dell shares information with suppliers on inventory levels, sales and forecasts and work with suppliers as a virtual enterprise**.**

e-resources and e-tendering

Electronic tendering enables the traditional process not only to be made more efficient but also to add significant value. It can provide a transparent and paperless process allowing offers to be more easily compared according to specific criteria. More importantly, by using the internet, tendering opportunities become available to a global market.

e-procurement is the use of electronic tools and systems to increase efficiency and reduce costs during each stage of the procurement process. Of all the resources referred to in Figure 4.6, e-procurement is the one that intersects the most with other typologies, often in a complex way. For some years there have been significant developments of e-procurement; legislative changes have encouraged greater use throughout the EU; new techniques such as electronic reverse auctions have been introduced, not, it has to be said, without controversy. In addition, the UK Government has launched a drive for greater

public sector efficiency following HM Treasury's publication of the *Gershon Efficiency Review: Releasing Resources to the Frontline*, in July 2004, now in the government's web archive, and e-procurement is seen to be at the heart of this initiative.

The stated prime objective of electronic tendering systems is to provide central government, as well as the private sector, with a service that replaces the traditional paper tendering exercise with a web-enabled system that delivers additional functionality and increased benefits to all parties involved in the tendering exercise. The perceived benefits of electronic procurement are:

- efficient and effective electronic interfaces between suppliers and civil central governments, departments and agencies, leading to cost reductions and time saving on both sides;
- quick and accurate pre-qualification and evaluation, which enables automatic rejection of tenders that fail to meet stipulated 'must have criteria';
- a reduced paper trail on tendering exercises, saving costs on both sides and improving audit;
- increased compliance with EU Procurement Directives, and best practice procurement with the introduction of a less-fragmented procurement process;
- a clear audit trail, demonstrating integrity;
- the provision of quality assurance information, e.g. the number of tenders issued, response rates and times;
- the opportunity to gain advantage from any future changes to the EU Procurement Directives;
- quick and accurate evaluation of tenders;
- the opportunity to respond to any questions or points of clarification during the tendering period;
- reduction in the receipt, recording and distribution of tender submissions;
- 24-hour access.

Figure 4.8 illustrates the possible applications of e-procurement to projects that are covered by the EU public procurement directives.

The benefits of electronic tendering and procurement of goods and services are said to be a wider choice of suppliers leading to lower cost, better quality, improved delivery, reduced cost of procurement (e.g. tendering specifications are downloaded by suppliers rather than by snail mail). Electronic negotiation and contracting and possibly collaborative work in specification can further enhance time- and cost-savings and convenience (Table 4.2). For suppliers, the benefits are more tendering opportunities, possibly on a global scale, lower cost of submitting a tender, and possibly tendering in parts, which may be better suited for smaller enterprises or collaborative tendering. Lower costs can be achieved through increased greater efficiency and in some sectors the time may not be too far distant when the majority of procurement is done this way. However, for many, online security still is a major concern and uptake has been poor.

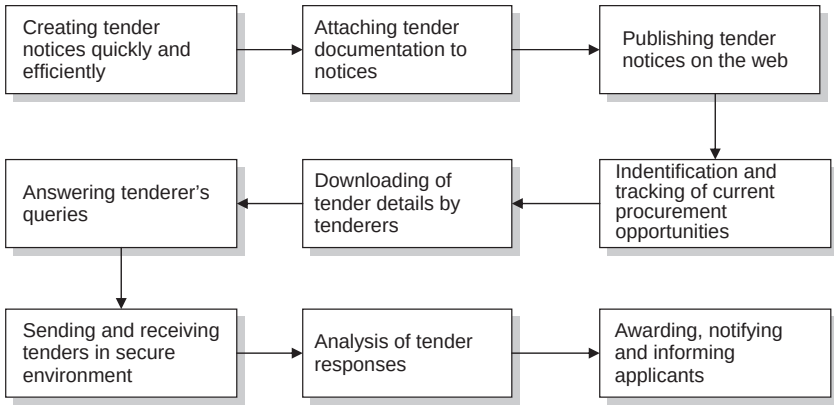


Figure 4.8 Possible applications of e-procurement

Table 4.2 Advantages of e-procurement

Governance	• allow to set rules for specific workflows; • guaranteed traceability and transparency for the market and clients; • provides visibility on purchase activities.
Knowledge sharing	• access to information managed by e-tendering solutions; • identify best practice and interact with colleagues on specific topics; • search supplier information.
Efficiency	• faster access; • time reduction; • cost savings.
Competitiveness	• reach more sub-contractors and suppliers; • improve commercial margins; • create databases of prices and suppliers.

In autumn 2010, the RICS produced a guidance note on e-tendering in response to the growth in the preparation of tender documents in electronic format. Figure 4.9 sets out their recommended approach to the e-procurement process while Figure 4.10 maps the way in which contract documentation can be organised for the e-tendering process.

The RICS e-tendering system can, according to BCIS research, do the following:

- reduce tendering costs by over 30 per cent (based on the production of nine tender bundles – one client, one in-house, average five contractors and two design teams for a traditional procurement);

- reduce tendering processing time by around 29 per cent (from preparation of tender bundles to publishing, opening, evaluation and client reporting).

Typical costs include £600 for a single tender and £7,500 for a one-year subscription for up to 20 electronic tenders (£450 each). However, the industry remains unconvinced with e-tendering usage being confined to major programmes such as the London 2012 Olympics and Crossrail. And why is it that the huge strides we have all made in the use of electronic systems in our personal lives are not replicated in our working practices? It may be partly the risk-averse nature of the profession and reluctance to change; but a factor will also be that the cost of using paper will be hidden in overheads. Either way, using e-tendering appears to fall into the 'too difficult' box for lots of practices. However, some headline projects such as Crossrail have adopted e-procurement, see https://crossrail.bravosolution.co.uk/web/login.shtml.

It is worrying that there is still little evidence of the use of electronic tendering. It may well be that we are going through a period of paper-based tendering with the documents being issued in electronic format as well, leading to under-reporting. Extranet-based tendering is the logical next step in the market, using such examples as the RICS e-tendering service.

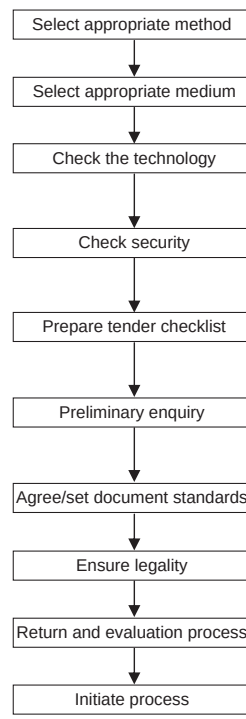


Figure 4.9 The RICS's recommended approach to the e-procurement process

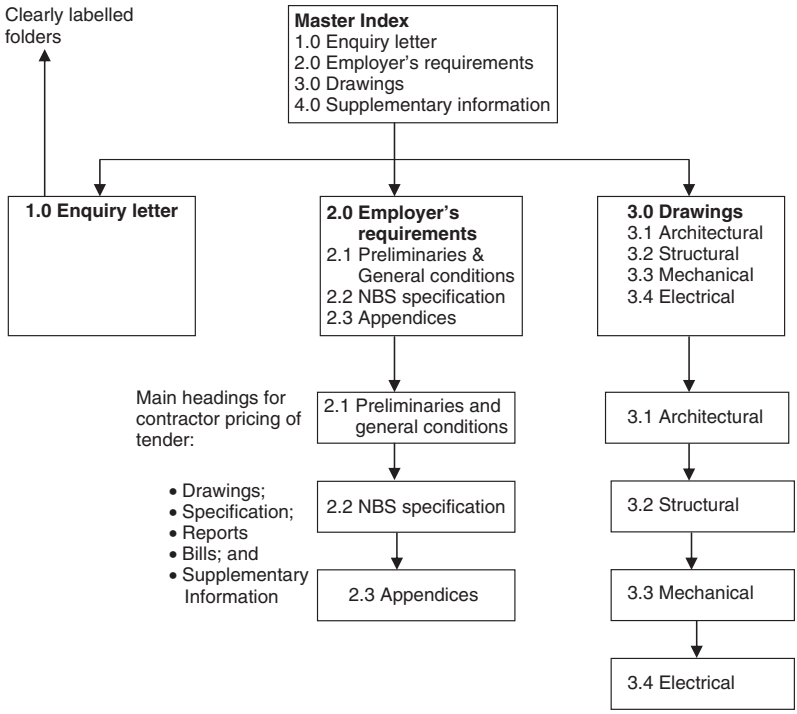


Figure 4.10 Organisation of contract information for e-procurement
Source: RICS.

Good communication is vital to the procurement and construction process and electronic communication is revolutionising the means of communication available. However, previous research by the RICS Construction Faculty has shown that the take-up of electronic communication as part of the procurement process in the UK Construction Industry has been, at best, patchy. The RICS Construction Faculty's (2003) report *Measurement Based Procurement of Buildings* showed that while all Bills of Quantities were prepared in digital form, fewer than 30 per cent were made available to the contractor as an electronic document and fewer than 10 per cent of priced bills were submitted electronically. Furthermore, only 3 per cent of consultants and 4 per cent of contractors had had any experience of e-commerce systems.

As far as construction is concerned, another study carried out by Eadie *et al.* published in 2010 continued to show that the update of e-procurement is still at very low levels in the construction industry. The study indicated that less than 25 per cent of construction organisations use e-procurement in the UK, which is substantially below other sectors. Can it be that despite the perceived advantages of e-procurement, the industry is so conservative and unwilling to change and embrace new approaches and techniques?

The research went on to try to define the drivers and barriers to the introduction of e-procurement in construction to try and understand why this is so. One excuse often cited is the uniqueness of the construction industry, say, compared with manufacturing, and perhaps there is some element of truth in this, but it cannot completely account for the different levels of uptake. A review of current practice in 2010 identified that the perceived drivers and barriers to the use of e-procurement can be categorised as shown in Table 4.3.

Of 483 surveyed organisations, only 83 were using e-procurement, although this figure covers a wide disparity between the public and private sectors, with some 74 per cent of organisations within the public sector engaging with e-procurement, while in the private sector less than 25 per cent of organisations were using e-procurement. That rank order of the drivers and barriers vary between the public and private sector although cost savings in administration and transactions and security in the process were ranked number one by both sectors.

Table 4.3 e-procurement drivers

e-procurement drivers	*Category*
Cost	Cost savings in administration and transactions
	Increased profit margins
	Strategic cost savings
Time	Shortened procurement times
	Shortened communication times
	Shortened times through greater transparency
	Reduction in evaluation times
	Shortened contract completion time
Quality	Increased quality through benchmarking
	Increased quality through the supply chain
	Increased efficiency
	Increased quality through improved communications
	Increased accuracy
General	Gain competitive advantage
	Convenience of archiving completed work
	Develops technical skills and expertise of procurement staff

Table 4.4 e-procurement barriers

e-procurement barriers	*Category*
Cultural	Lack of management support/leadership
	Resistance to change
	Lack of widely accepted e-procurement software solution
	Magnitude of change
	Lack of national IT policy relating to e-procurement issues
	Bureaucratic dysfunctionalities
	Lack of technical expertise
	Staff turnover

Infrastructure	Access to internet Insufficient assessment of systems prior to installation
Security	Security in the process Confidentially of information – unauthorised access Data transmission reassembly – incorrect reassembly of transmitted data Incomplete documents supplied.
Legal	Lack of pertinent case law Different national approaches to e-procurement Proof of intent – electronic signatures Clarity of sender and tenderer information Enforceability of electronic contracts
Assessment costs	Information technology investment costs
Compatibility	Internal and external interoperability of e-procurement software Investment in compatible systems Reluctance to 'buy into' one-off systems
General	Perception of no business benefits realised Lack of awareness of best practice solutions Lack of forum to exchange ideas

Overcoming the most important barriers (Table 4.4) and incorporating the most important drivers within e-procurement systems will achieve a higher level of maturity.

e-auctions

An online auction is an internet-based activity, which is used to negotiate prices for buying or selling direct materials, capital or services (Figure 4.11). Online auctions can be used to sell: these are called Forward (or seller) auctions and closely resemble the activity on websites such as eBay; the highest bidder wins. Now some companies are starting to use reverse auctions where purchasers seek market pricing, inviting suppliers to compete for business on an online event. Auctions can either be private/closed where there are typically few bidders who cannot see each other's bids, or open, where a greater number of participants are invited. In this case participants can see either their rank or the bidding itself. When used, the technique can replace the conventional methods of calling for sealed paper tenders or face-to-face negotiations.

Online auctions are said to offer an electronic implementation of the bidding mechanism used by traditional auctions and systems may incorporate integration of the bidding process together with contracting and payment. The sources of income for the auction provider are from selling the technology platform, transaction fees and advertising. Benefits for suppliers and buyers are increased efficiency and time saving, no need for physical transport until the deal has been established, as well as global sourcing.

There have been some strong objections to e-auctions and in particular to reverse e-auctions, from many sections of the construction industry. In the public sector,

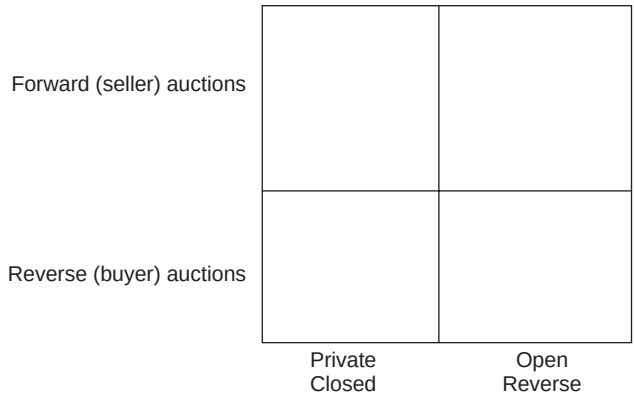


Figure 4.11 An online auction

the OGC received representations from trade associations and other bodies (OGC, 2005). Sections of the industry have seen e-auctions as a return to lowest price purchasing, threatening already low margins. The industry also perceives e-auctions as challenging the principles of many government-led initiatives, such as best practice portals, or an integrated supply chain approach to construction procurement based on optimum whole life value. Among quantity surveyors the perception of e-auctions are very negative with 90 per cent feeling that they reduce quality and adversely affect partnering relationships.

Reverse e-auctions

The reverse e-auction event is conducted online with pre-qualified suppliers being invited to compete on predetermined and published award criteria. A reverse e-auction can be on any combination of criteria, normally converted to a 'price equivalent'. Bidders are able to introduce new or improved values to their bids in a visible and competitive environment. The procedure and duration of the event will be defined before the reverse e-auction commences. There will be a starting value that suppliers will bid against until the competition closes.

Three characteristics that need to be present to have a successful reverse e-auction are:

- the purchase must be clearly defined;
- the market must be well contested;
- the existing supply base must be well known.

These three factors are interdependent and together form the basis for an auction that delivers final prices as close as possible to the true current market price. For the buyer and the supplier, a clearly defined scope of work is essential, without this, it becomes very difficult accurately to bid for the work. Contestation,

that is three or more suppliers within the market willing to bid for the work, is another prerequisite. Without this, there is no incentive for suppliers to reconsider their proposals. Finally, the client's knowledge of the supply base ensures that the most suitable suppliers participate in the events. In order to move away from a system where cost is the only selection criterion, it is possible to organise bidders to submit, before the commencement of the reverse e-auction, their proposals on other matters, such as safety or technical ability. These proposals can then be evaluated beforehand and the resulting scores built into the auction tool. Therefore, when a supplier enters their price, the application already has the information needed to complete the evaluation process, the process is known as a transformation reverse auction or TRA and is thought to more accurately reflect the prevailing market dynamics.

Figure 4.12 compares e-tendering and traditional tendering.

Knowledge management

> A learning organization is an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights.
>
> (Garvin, 1998)

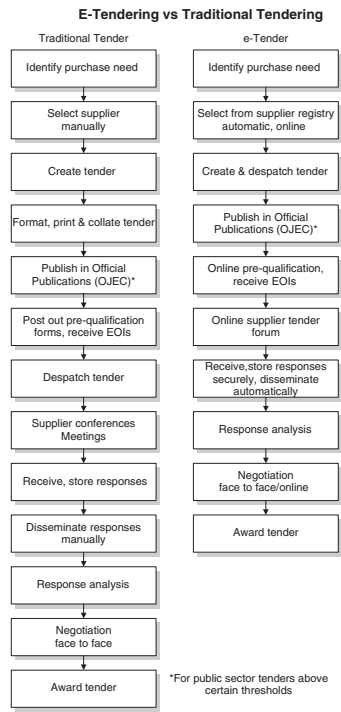


Figure 4.12 e-tendering versus traditional tendering

Knowledge management is a comparatively new concept, being established in the early 1990s, and can be defined as a means by which to capture and monitor the ever-increasing bodies of intellectual knowledge and facilitate the efficient creation and exchange of knowledge on an organisation-wide level. Knowledge management should not be confused with information management. Information management consists of predetermined responses to anticipated stimuli. Knowledge management, however, consists of innovated responses to new opportunities and challenges. Knowledge management typically focuses on organisational objectives such as improved performance, competitive advantage, innovation, the sharing of lessons learned, integration and continuous improvement. Knowledge management can help individuals and organisations share practices and approaches in order to reduce redundant work and avoid reinventing the wheel. It can also reduce training time for new employees, retain expertise when employees leave an organisation, and adapt to changing environments and markets.

Sources of knowledge

During the course of a day, a quantity surveyor will draw on many sources of knowledge when, for example, providing cost and contractual advice for clients or preparing procurement documentation. The bigger the organisation, the greater the potential store of knowledge and the more important it is that the knowledge available is effectively managed in order to add value to the organisation as well as the service that clients receive. These knowledge sources can be categorised as follows:

- *explicit*: knowledge that is easily codified and conveyed to others. It is articulated knowledge, expressed and recorded as words, numbers, codes, mathematical and scientific formulae. Explicit knowledge is easy to communicate, store and distribute, and is the knowledge found in books, on the web, and other visual and oral means, and in standard forms of contract and methods of measurement. It is the opposite of tacit knowledge. Occasionally referred to a hard knowledge;
- *tacit*: the concept of tacit knowledge was introduced by the Hungarian philosopher-chemist Michael Polanyi in his 1966 book, *The Tacit Dimension*. And compared with explicit knowledge, tacit knowledge is difficult to formalise and convey to others. Tacit knowledge is often based on experience, instinct and personal insights. For example, recognising the tell-tale signs of financial difficulties in a contractor's or sub-contractor's organisation that may develop into bankruptcy of insolvency. This is occasionally referred to as soft knowledge;
- *implicit*: this form of knowledge falls between explicit and tacit and is knowledge that was once explicit but over time is capable of being codified and quantifiable. It may mean taking a second look at tacit knowledge to determine whether it can be codified.

According to Davis *et al.* (2007), the quantity surveying profession is characterised by a wealth of experiential knowledge, which is tacit and cannot be written down easily. It is crucial that quantity surveying firms realise their true potential assets, which can be determined by the introduction of a knowledge management system as it enables the company to 'know what it knows'. Quantity surveyors are professionals who help clients with the legal and financial problems through their expertise. The more projects quantity surveyors complete, the more experience they gain. However, most QS firms face a problem in that they are losing knowledge due to the retirement or resignation of key personnel. With the help of a knowledge management system, knowledge is shared and stored, and thus the risk of losing the knowledge can be minimised. Currently around 22 per cent of the workforce are in their 50s or 60s.

How can knowledge management be introduced into a quantity surveying practice?

A prerequisite on introducing a knowledge management system into an organisation is to develop a culture where employees are willing to share their knowledge and not be victims of a blame culture. Like many new approaches to management, there will be an unwillingness within an organisation to change current operating practices and evaluate the perceived benefits.

Knowledge management processes and the potential for IT

The ways in which knowledge management can be introduced will depend on the size and the type of an organisation. BSI PD7503 Introduction to Knowledge Management in Construction identifies seven critical aspects:

- decide what is required from the knowledge management programme;
- draw up a strategy for implementation;
- understand the organisation's current knowledge resources;
- enable a sharing culture;
- manage the knowledge content;
- use enabling technology;
- measure and evaluate the results.

Table 4.5 indicates a number of knowledge management processes and the potential for IT. The knowledge management processes can be said to be:

- knowledge creation;
- knowledge storage/retrieval;
- knowledge transfer;
- knowledge application.

In a survey of quantity surveyors in 2007 Davis *et al.* approached fifty quantity surveyors in practice to discover their perception of knowledge management.

Table 4.5 Knowledge management processes and the potential for IT

Knowledge management processes	*Knowledge creation*	*Knowledge storage / retrieval*	*Knowledge transfer*	*Knowledge application*
Supporting information	Data mining Learning tools	Electronic bulletin boards Knowledge repositories	Electronic bulletin boards Discussion forums	Expert systems Workflow systems
Technologies		Databases	Knowledge directories	
IT Enables	Combining new sources of knowledge Just-in-time learning	Support of individual and organisational memory. Inter-group knowledge access	More extensive internal network More communication channels available Faster access to knowledge sources	Knowledge can be applied in many locations More rapid application of new knowledge through workflow automation
Platform technologies	Intranets / groupware and communication technologies			

The majority of quantity surveyors questioned agreed that knowledge management would bring numerous benefits to the company and themselves and were very positive. However, they were unconvinced that an increase in innovation would occur. This can be explained by the lack of emphasis on creating knowledge. Furthermore, quantity surveyors expected that knowledge management would bring personal benefits more than benefits to the company. This is shown by the current knowledge-sharing practices they frequently used. The findings illustrate that in the knowledge-sharing process, knowledge and experience are mainly personal experiences and not company tactical experiences or company-level problem-solving techniques.

The majority of the respondents believed that the most critical factors to knowledge management success are management support, employee active participation, application of an IT system and creating a knowledge-sharing space.

Again, the findings indicated that the main barriers to a quantity surveying firm developing a knowledge management system are lack of time and understanding of the processes involved and the difficulty in locating, capturing, generalising and storing knowledge. The resistance to change the current practice and employ a new management approach from the top management also contributes to the opposition to develop knowledge management in firms. As previously stated, enterprises enter supply chains to improve profitability through product development that is responsive to consumer demands. Increasing market share and maintaining a competitive product depend on the ability of each unit in the chain to apply knowledge innovatively. The key to innovation is the application of explicit and implicit knowledge of the people within the organisations throughout the chain. With improving technology and a supportive learning environment, enterprises in the supply chain can add value by using the collective wisdom of the people in the organisation.

The quantity surveyor and digital construction

Levels of digital business

Entering the world of e-commerce should be a considered business decision, not a knee-jerk reaction to the sudden availability of new technology. An existing bricks and mortar company's goals are different from those of an idea company. Likely to be already profitable, a bricks and mortar company will most often turn to the internet to expand its markets, meet customers' needs and improve operating efficiencies in ways that are usually incidental to an existing business – not to reinvent its business. The first step is to identify the business goals that can be served by using the internet. Answering this question depends in part, upon the nature of the business, For example: How large is the company? What sort of distribution chain does it use? Is its customer base static or could it be expanded? Some examples of potential e-commerce applications to surveying practices follow.

Considerable market advantage can be gained through the use of e-mail and interactive websites, as is the common practice now in modern society and business.

The choice of partner can be crucial in maximising opportunities. For example, by working with existing operators, it is possible to start benefiting immediately.

A constant theme throughout this book has been client criticisms of the UK construction industry and its fragmented structure. Clients, professionals as well as the entire downstream supply chain try to cope with the challenge of operating in a highly fragmented industry, where the top five contractors own less than 10 per cent of the marketplace. The fragmentation has in return over the years contributed to poor profitability and cash flow even for the major players, which has in turn prevented investment in new technologies, as noted by Latham and Egan all those years ago. Add to this the constant demand by clients for added value and the case for adopting e-commerce solutions and practices seems irresistible. The biggest benefits of e-commerce are likely to come from the integrated supply chain, where information is freely available between clients, contractors and suppliers.

Electronic document management systems (EDMS)

Of the many systems that emerged from the early 2000s, some failed to capture the imagination and they fell by the wayside, others were clearly ill conceived, while others still survive and try to convince the profession of their usefulness.

On the face of it, electronic data management would appear to be the ideal solution for the quantity surveyor, who, on a daily basis, has to deal with a large volume of information in a variety of formats. While quantity surveyors can never be regarded as Luddites when it comes to embracing IT solutions and integating them into traditional situations, there appear to be limits as to how far IT can penetrate quantity surveyors' working practices.

EDMS vary in complexity and functionality. The nature of the construction industry presents a number of problems relating to the electronic management of documents, these, according to the RICS, can be said to be:

- because information is primarily centred around individual projects, rather than in set business structures, this increases the management and control required;
- there are large information flows, both in and out of organisations to many different external organisations, and these flows vary from project to project;
- drawings and models pose particular problems due to the size of files involved;
- documents that have been executed under seal may need to be retained for twelve years;
- numerous legal requirements on organisations that hold and control information and in particular; the Data Protection Act 1998 and the Freedom of Information Act 2000, although this legislation is not exclusive to data stored and managed electronically.

The typical order for the process illustrated in Figure 4.13 is:

- create;
- capture;
- share;
- collaborate;
- control;
- index;
- manage/store;
- access;
- retrieve;
- distribute;
- repurpose;
- achieve;
- delete.

It would seem to be that the key to implementing an efficient EDMS is rigorous evaluation according to the level of sophistication and functionality.

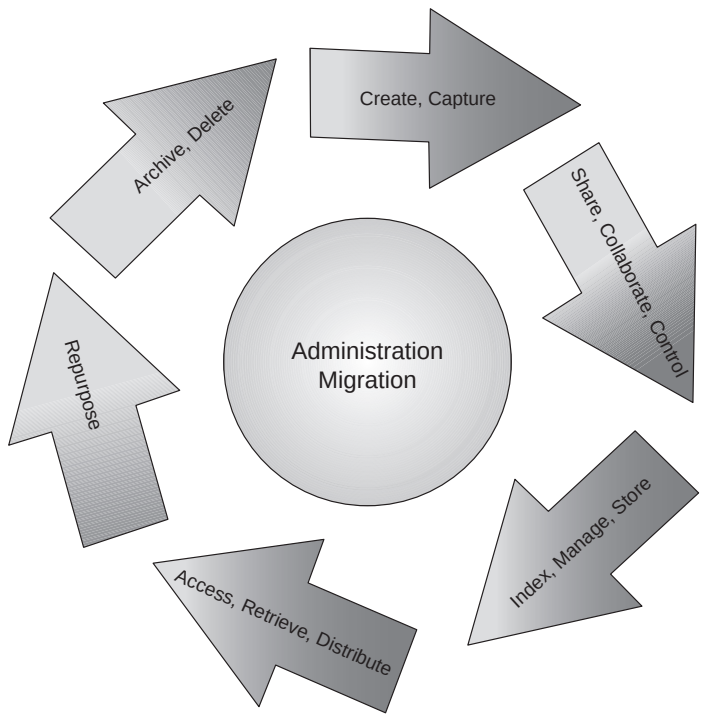


Figure 4.13 Document life-cycle

Source: RICS Practice Note Electronic Document Management.

Conclusion

There can be no doubt that the future for both business in general and for the quantity surveyor in particular, will be part of the digital economy. In the late 1990s, revolutionary new business models were set to destroy old economic values but only two years later the talk of the collapse of the new economy was just as overstated. However, to equate the downturn in the e-economy with the demise of the internet is like the pundits who proclaim the death of the quantity surveyor – very exaggerated! The market is maturing, and as has been demonstrated in this chapter, and the shift towards the digital building is unstoppable and there are real benefits that can be brought to a fragmented industry by e-commerce.

Bibliography

BSI (British Standard Institute) (2003) *PD7503 – Introduction to Knowledge Management in Construction*. British Standard Institute.

Cabinet Office (2011) *Government Construction Strategy 2011*. HMSO.

Chevin, D. (2017) CIOB BIM+ It's time to plug the BIM knowledge gap. CIOB.

Cousins, S. (2016) Is BIM worth paying a premium for? CIOB/BIM+.

Davis, P. *et al.* (2007) *Knowledge Management for the Quantity Surveying Profession*. Strategic Integration of Surveying Services.

Eadie, R. *et al.* (2010) *A Cross Discipline Comparison of Rankings for e-Procurement Drivers and Barriers Within UK Construction Organisations*. ITcon.

Garvin, D. A. (1998) Building a Learning Organization. *Harvard Business Review on Knowledge Management*, July–August. HBS Press.

HM Government (n.d.) Digital Built Britain: Level 3 Building Information Modelling: Strategic Plan. Available at: www.gov.uk

HM Treasury (2004) *The Gershon Review: Releasing Resources for the Frontline: Independent Review of Public Sector Efficiency*. HMSO

King's College Centre of Construction Law and Dispute Resolution (2016) *Enabling BIM Through Procurement and Contracts*.

NBS (2016) *National BIM Report 2016*. NBS.

OGC (2005) *e-Procurement in Action – A Guide to e-Procurement in the Public Sector*. Office of Government Commerce.

Polanyi, M. (1966) *The Tacit Dimension*. University of Chicago Press.

RICS Construction Faculty (2003) *Measurement Based Procurement of Buildings*. RICS.

RICS (2015) How can BIM support NRM1? RICS.

RICS (n.d.) Document lifecycle: RICS Practice Note Electronic Document Management.

SIBIS (2003) *Matching up to Information Society*. Statistical Indicators Benchmarking the Information Society.

Timmers, P. (1999) *Electronic Commerce – Strategies and Models for Business to Business Trading*. John Wiley & Sons Ltd.

University of Northumbria (2007) *CMAA Industry Report*. Available at: www.cmaa.org

5 Ethical practice at home and abroad

Ethics

> Ethics is an important topic and particularly so for surveyors who operate in a sector that is generally perceived to have low ethical standards.
>
> (RICS *Futures*/Transparency International, 2015)

In Table 5.1, attitudes to bribery, in the Bribe Payers Index are illustrated on a scale of 0–10, where 0 indicates the view that companies always bribe and 10 indicates the view that they never do. It can be seen that the built environment sector has a poor public image internationally. In the Bribe Payers Index, real estate, utilities and construction languished at the bottom of the league table. This is a theme that has been raised many times throughout the RICS *Futures* document.

In 2010, *Building* magazine published the results of a survey conducted by Europe Economics for the Office of Fair Trading (OFT) where 13 per cent of respondents thought that cover pricing was 'common' or 'appears in most bids' which was the same proportion as in 2008 although the National Federation of Builders dismissed the findings. The same survey found a more tolerant attitude by clients to contractors who refused to submit bids by not placing them on a blacklist, an approach recommended by OFT guidelines issued in September 2009.

Interestingly, in a survey carried out by the Chartered Institute of Building in 2006, nearly 40 per cent of those questioned regarded the practice of cover pricing either as 'not very corrupt' or 'not corrupt at all' regarding it as the way that the industry operates. In addition, 41 per cent of respondents admitted offering bribes on one or more occasions. One of the major issues from the CIOB survey was a clear lack of definition of corruption and corrupt practices. The industry is one that depends on personal relationships and yet a particular nebulous area was non-cash gifts that range from pens to free holidays.

Table 5.1 Attitudes to bribery in the Bribe Payers Index

Rank	*Sector*	*Score*
1	Agriculture	7.1
1	Light manufacturing	7.1
3	Civilian aerospace	7.0
3	Information technology	7.0
5	Banking and finance	6.9
5	Forestry	6.9
7	Consumer services	6.8
8	Telecommunications	6.7
8	Transportation and storage	6.7
10	Arms, defence and military	6.6
10	Fisheries	6.6
12	Heavy manufacturing	6.5
13	Pharmaceutical and healthcare	6.4
13	Power generation and transmission	6.4
15	Mining	6.3
16	Oil and gas	6.2
17	Real estate, property, legal and business services	6.1
17	Utilities	6.1
19	Public works contracts and construction	5.3
	AVERAGE	**6.6**

Source: RICS *Futures*/Transparency International (2015).

The value of global construction output is expected to increase by £6.2 trillion and to reach £13.5 trillion per annum by 2030. It is difficult to determine precisely the value of losses through corruption, but estimates tend to range between 10 and 30 per cent. The research by the Construction Sector Transparency Initiative (CoST) suggests that a similar amount could be lost through mismanagement and inefficiency. This means that by 2030, unless measures are introduced that effectively improve this situation, close to £4.5 trillion could be lost annually through corruption, mismanagement and inefficiency. So what is it that makes the construction industry so corrupt? The Global Infrastructure Anti-Corruption Centre has identified 13 features that make construction particularly prone to corruption, amongst which are:

1 *uniqueness*: No two construction projects are the same, making comparisons difficult and providing opportunities to inflate costs and conceal bribes;
2 *complex transaction chains*: The delivery of infrastructure involves many professional disciplines and tradespeople and numerous contractual relationships that make control measures difficult to implement;
3 *work is concealed or covered up*, therefore materials and workmanship are often hidden, e.g. steel reinforcing is cast in concrete, masonry is covered with plaster and cables and pipes enclosed in service ducts;

4 *official bureaucracy*: Numerous approvals are required from government in the form of licences and permits at various stages of the delivery cycle, each one providing an opportunity for bribery;
5 *the scale of infrastructure investments*: Investments in economic infrastructure such as dams, airports and railways can cost tens of billions of dollars, making it easier to conceal bribes and inflate claims.

The Chartered Institute of Loss Adjusters produced a report in 2011 stating that fraud in construction in the UK was rife, estimating it at 10 per cent of the £6.5 billion of revenues, or £40,000 per company. The National Fraud Office's Annual Fraud Indicator (AFI) reported losses to private construction companies resulting from fraud in 2012 at £3 billion, with £1 billion taken on by larger businesses, and £2 billion absorbed by SMEs.

The Office of Fair Trading and the Office for National Statistics, in one of their largest ever Competition Act investigations, found widespread evidence of bid rigging on procurement projects in the UK (Table 5.2). The investigation uncovered issues such as so-called 'breakfast-clubs' (a form of illegal cartel where contractors meet up to decide who will win the latest contract). In a 2012 survey of procurement professionals for the AFI, 40 per cent of respondents said that spend on construction is at greatest risk from procurement fraud.

In some instances, procurement procedures can also inadvertently encourage corrupt behaviour. An investigation by the Office of Fair Trading in 2008 uncovered widespread collusion among contractors bidding for government contracts and for this reason, particularly in the public sector, there has been a trend to move away from competitive tendering.

In February 2016, the Sweett Group plc was sentenced and ordered to pay £2.25 million as a result of a conviction arising from a Serious Fraud Office investigation into its activities in the United Arab Emirates. The company pleaded guilty in December 2015 to a charge of failing to prevent an act of bribery intended to secure and retain a contract with Al Ain Ahlia Insurance Company (AAAI), contrary to Section 7(1)(b) of the Bribery Act 2010, between

Table 5.2 Prevalence of different types of fraud in the UK

Type	*Prevalance*
Billing fraud	Med
Bid/contract rigging – market collusion	High
Bribery/corruption	Low
Fictitious vendors – falsifying payment applications	Med
Change order manipulation	High
Theft or substitution of materials	Med
False representation	High
Money laundering	Low

December 2012 and December 2015. His Honour Judge Beddoe described the offence as a system failure and said that the offending was patently committed over a period of time. This was the first successful conviction under section 7 of the UK Bribery Act 2010.

There is a wide spectrum of research and models on medical ethics-related matters, but comparatively little on business ethics and even less on ethics and construction and surveying practice. Never before has there been such a need for individuals and organisations to be seen to be conducting themselves according to ethical principles.

Ethics and the law

George McKillop in his (2009) article, 'Fraud in construction – follow the money', states 'I wonder, however, how many people fully understand the true diversity of fraud in construction – not only how endemic it is, but it can affect just about any business.' In a highly critical article, he goes on to outline trends in construction fraud giving the following examples:

- the theft and diversion of materials by internal staff;
- quantity surveyors signing off over-payments in return for kickbacks;
- construction companies setting up a shell company to invoice a co-operative sub-contractor for non-existent services, which in turn is ultimately billed on to his employer's company for signing off.

The legislative framework defining fraud has been confused. The principal statutes currently dealing with corruption are the Public Bodies Corrupt Practices Act 1889, the Prevention of Corruption Act 1906 and the Prevention of Corruption Act 1916. This legislation makes bribery a criminal offence, whatever the nationality of those involved, if the offer, acceptance or agreement to accept a bribe takes place within the UK's jurisdiction. The Anti-terrorism, Crime and Security Act 2001 has extended UK jurisdiction to corruption offences committed abroad by UK nationals and incorporated bodies. Commercial bribery is currently covered by the Prevention of Corruption Act 1906 insofar is it relates to bribes accepted by agents. The Bribery and Corruption Act 2010 aimed to 'transform the criminal law on bribery, modernising and simplifying existing legislation to allow prosecutors and the courts to deal with bribery more effectively'. In addition, it was hoped that it would also promote and support ethical practice by encouraging businesses to put in place anti-bribery safeguards that ensure all employees are aware of the risks surrounding bribery and that adequate systems exist to manage these. Bribery may include the corruption of a public official as well as commercial bribery, which refers to the corruption of a private individual to gain a commercial or business advantage.

The essential elements of official bribery are: giving or receiving a thing of value to influence an official act. The thing of value is not limited to cash or money. Such things as lavish gifts and entertainment, payment of travel and

lodging expenses, payment of credit card bills, 'loans', promises of future employment, interests in businesses, can be bribes if they were given or received with the intent to influence or be influenced. The Act makes it a criminal offence to give, promise or offer a bribe and to request, agree to receive or accept a bribe either at home or abroad. The measures cover bribery of a foreign public official.

The four principal categories of offences are:

1. Offence of bribing another person
2. Offences relating to being bribed
3. Bribery of a foreign public official
4. The new corporate offence: failure to prevent bribery, whereby a commercial organisation (a corporate or a partnership) could be guilty when:
    - a bribe has been made by a person performing services for or on behalf of the commercial organisation;
    - with the intention to obtain or retain business or other business advantage for the commercial organisation.

It is a defence for the organisation to show that there were adequate procedures in place designed to prevent employees or agents committing bribery. The penalties on conviction are the same as for fraud, including, in the most serious cases, a sentence of up to ten years' imprisonment following conviction on indictment.

Why is ethics important for surveyors?

Professions can only survive if the public retains confidence in them. Conducting professional activities in an ethical manner is at the heart of professionalism and the trust that the general public has in professions such as the chartered quantity surveyor. One of the principal missions for construction-related institutions like the RICS is to ensure that their members operate to high ethical standards, indeed ethical standards was a top priority on the RICS *Agenda for Change* (1998). And yet there still appears to be a number of professionals who just don't get it when it comes to ethics, as witnessed by the regular stream of cases that appear before the RICS Disciplinary Panel. In fact, the reported cases are just the tip of the iceberg as many less serious cases brought to the attention of the RICS Professional Conduct Panel are dealt with prior to this stage. For quantity surveyors, transparency and ethical behaviour are particularly important as they deal on a daily basis with procurement, contractual arrangements and payments and valuations.

Recently the RICS has published a number of guides/documents to help surveyors find their way through the ethical maze:

- Professional Ethics Guidance Note (2000)
- Professional Ethics Guidance Note (2003) Part 2 Case Studies
- RICS *Core Values* (2006)

- RICS Rules of Conduct for Members (2007b)
- RICS Rules of Conduct for Firms (2007a)
- Fraud in Construction – Follow the Money (McKillop, 2009)
- Fraud in Construction – RICS Guidance (2010)

In addition to the above, the RICS has also published a Help Sheet on maintaining professional and ethical standards (RICS, 2007c) where the behaviour of a chartered surveyor in their professional life is characterised as follows:

1 Act honourably – never put your own gain above the welfare of your clients or others to whom you have a professional responsibility.
2 Act with integrity – be trustworthy in all that you do, never deliberately mislead, whether by withholding or distorting information.
3 Be open and transparent in your dealings.
4 Be accountable for all your actions and don't blame others if things go wrong.
5 Know and act within your limitations and competencies.
6 Be objective at all times – never let sentiments or your own interests cloud your judgement.
7 Always treat others with respect – never discriminate.
8 Set a good example in both public and private behaviour.
9 Have the courage to make a stand.
10 Comply with relevant laws and regulations.
11 Avoid conflicts of interest – declare any potential conflicts of personal or professional interest.
12 Respect the confidentiality of client's affairs.

Although the list above appears to be straightforward, things are never quite that simple in practice when matters such as economic survival and competition are added into the mix. The position is even more complicated when operating in countries outside the UK where ideas of ethics may be very different to those expected by the RICS. Ethical behaviour is that which is socially responsible, for example, obeying the law, telling the truth, showing respect for others and protecting the environment.

In December 2016, the International Ethics Standards Coalition (IESC), on which the RICS is represented, entered the debate with the publication of '*An Ethical Framework for the Global Property Market*, which contained the following list of ethical principles:

- *Accountability*: Practitioners shall take full responsibility for the services they provide, shall recognise and respect client, third party and stakeholder rights and interests and shall give due attention to social and environmental considerations throughout.
- *Confidentiality*: Practitioners shall not disclose any confidential or proprietary information without prior permission, unless such disclosure is required by applicable laws or regulations.

- *Conflict of interest*: Practitioners shall make any and all appropriate disclosures in a timely manner before and during the performance of a service. If, after disclosure, a conflict cannot be removed or mitigated, the practitioner shall withdraw from the matter unless the parties affected mutually agree that the practitioner should properly continue. See also *RICS Professional Standards and Guidance: Global Conflicts of Interest*, March 2017, later in this chapter.
- *Financial responsibility*: Practitioners shall be truthful, transparent and trustworthy in all their financial dealings.
- *Integrity*: Practitioners shall act with honesty and fairness and shall base their professional advice on relevant, valid and objective evidence.
- *Lawfulness*: Practitioners shall observe the legal requirements applicable to their discipline for the jurisdictions in which they practise, together with any applicable international laws.
- *Reflection*: Practitioners shall regularly reflect on the standards for their discipline and shall continually evaluate the services they provide to ensure that their practice is consistent with evolving ethical principles and professional standards.
- *Standard of service*: Practitioners shall only provide services for which they are competent and qualified; shall ensure that any employees or associates assisting in the provision of services have the necessary competence to do so and shall provide reliable professional leadership for their colleagues or teams.
- *Transparency*: Practitioners shall be open and accessible; shall not mislead or attempt to mislead; shall not misinform or withhold information as regards products or terms of service; and shall present relevant documentation or other material in plain and intelligible language.
- *Trust*: Practitioners shall uphold their responsibility to promote the reputation of their profession and shall recognise that their practice and conduct bears upon the maintenance of public trust and confidence in the IECS professional organisation and the professions they represent.

Concepts of ethics

Ethical behaviour is developed by people through their physical, emotional and cognitive abilities. People learn ethical behaviour from families, friends, experiences, religious beliefs, educational institutions and the media. Business ethics is shaped by societal ethics. Ethics is a branch of philosophy that covers a whole range of things that have real importance in everyday personal and professional life. Ethics is about:

- right and wrong;
- rights and duties;
- good and bad;
- what goodness itself is;
- the way to live a good life;
- how people use the language of right and wrong.

In turn ethics tackles some of the fundamentals of life, for example:

- how should people live?
- what should people do in particular situations?

Therefore, ethics can provide a moral map, a framework that can be used to find a way through difficult professional issues. Business ethics is about the rightness and wrongness of business practices

Where do ethics come from?

Where do ethics come from, were they handed down in tablets of stone? Some people do think so and philosophers have several answers to this question when they suggest that ethics originate from;

- God – supernaturalism;
- the intuitive moral sense of human beings – intuitionism;
- the example of 'good' human beings – consequentialism;
- a desire for the best for people in each unique situation – situation ethics.

Ethical dilemmas

Instead of trying to arrive at a standard, all-encompassing rule of what is ethical, it is helpful to illustrate the depth and variety of ethics through suitable examples. An ethical dilemma is a situation in which two or more deeply held values come into conflict. In these situations, the correct ethical choice may be unclear.

Perhaps the most common ethical dilemma experienced by quantity surveyors concerns the acceptance of hospitality or gifts from contractors, sub-contractors and clients. In the public sector the position is somewhat clearer: employees should not accept gifts as they could be construed as a bribe. The common law offence of bribery involves:

> receiving or offering any undue reward by or to any person whatsoever, in a public office, in order to influence his behaviour in office, and incline him to act contrary to known rules of honesty and integrity.

In addition, Section 1 of the Public Bodies Corrupt Practices Act 1889 makes the bribery of any member, officer or servant of a public body a criminal offence. In particular, the 1889 Act prohibits the corrupt giving or receiving of any gift, loan, fee, reward or advantage whatever, as an inducement to, or reward . . .'. However, in the private sector the guidelines are not so well defined.

Back-handers

You are a freelance quantity surveyor/project manager who has been offered work by an employee of a large practice at £40 per hour, with £6 per hour being paid back to him/her in cash.

- do you accept the work?
- do you refuse?
- do you reject the work and report the matter to the practice partners?

An answer is given at the end of this chapter.

Unethical behaviour, activities and policies, etc.

In the past few years a number of studies have taken place to try and determine the views of practitioners and students on ethical standards and there now follows a brief review of some of these.

How do you/your organisation measure up? More and more leaders of businesses and other organisations are now waking up to the reality of social responsibility and organisational ethics. Public opinion, unleashed by the internet and social media particularly, is reshaping expectations and standards. with organisational behaviour – good and bad – more transparent than ever – globally, and injustice anywhere in the world is becoming more visible, and less acceptable. As a result, the reaction to corporate recklessness, exploitation, dishonesty and negligence is becoming more and more organised and potent. So how is it possible to recognise unethical practices within an organisation?

Robert Cooke, former Director of the Institute of Business Ethics at DePaul University, Chicago, has identified fourteen danger signs that show an organisation is at risk of unethical behaviour. These are if the organisation:

- normally emphasises short-term revenues over long-term considerations;
- routinely ignores or violates internal or professional codes of ethics;
- always looks for simple solutions to ethical problems and is satisfied with 'quick fixes';
- is unwilling to take an ethical stand when there is a financial cost to the decision;
- creates an internal environment that either discourages ethical behaviour or encourages unethical behaviour;
- usually sends ethical problems to the legal department;
- looks at ethics solely as a public relations tool to enhance its image;
- treats its employees differently than its customers;
- is unfair or arbitrary in its performance-appraisal standards;
- has no procedures or policies for handling ethical problems;
- provides no mechanisms for internal whistle-blowing;

- lacks clear lines of communication within the organisation;
- is only sensitive to the needs and demands of the shareholders;
- encourages people to leave their personal ethical values at the office door.

Many commentators have laid the blame for the attitude of corporations at the feet of business schools who have for years put the financial well-being of shareholders at the top of the list of priorities.

Ethics: the business case

Does the financial well-being affect attitudes to ethics – is there a business case for ethics? Does ethics add value? There is evidence (Moore and Robson, 2002) from other sectors that as organisations' turnover increases, their social performance worsens! However, businesses and organisations of all sorts – especially the big high-profile ones – are now recognising that there are solid effects and outcomes driving organisational change. There are now real incentives for doing the right thing, and real disincentives not to do the wrong things.

As never before, there are huge organisational advantages from behaving ethically, with humanity, compassion, and with proper consideration for the world beyond the boardroom and the shareholders:

- *competitive advantage* – customers are increasingly favouring providers and suppliers who demonstrate responsibility and ethical practices. Failure to do so means lost market share, and shrinking popularity, which reduces revenues, profits, or whatever other results the organisation seeks to achieve;
- *better staff attraction and retention* – the best staff want to work for truly responsible and ethical employers. Failing to be a good employer means good staff leave, and this reduces the likelihood of attracting good new-starters. This pushes up costs and undermines performance and efficiency. Aside from this, good organisations simply cannot function without good people;
- *investment* – fewer and fewer investors want to invest in organisations which lack integrity and responsibility, because they do not want the association, and because they know that for all the other reasons here, performance will eventually decline, and who wants to invest in a lost cause?
- *morale and culture* – staff who work in a high-integrity, socially responsible, globally considerate organisation are far less prone to stress, attrition and dissatisfaction. Therefore, they are happier and more productive. Happy productive people are a common feature in highly successful organisations. Stressed unhappy staff are less productive, take more time off, need more managing, and also take no interest in sorting out the organisation's failings when the whole thing implodes;
- *reputation* – it takes years, decades, to build organisational reputation – but only one scandal to destroy it. Ethically responsible organisations are far less prone to scandals and disasters. And if one does occur, an ethically responsible organisation will automatically know how to deal with it quickly and

openly and honestly. People tend to forgive organisations who are genuinely trying to do the right thing. People do not forgive, and are actually deeply insulted by, organisations who fail and then fail again by not addressing the problem and the root cause. Arrogant leaders share this weird delusion that no one can see what they're up to. Years ago maybe they could hide, but now there's absolutely no hiding place;

- *legal and regulatory reasons* – soon there will be no choice anyway – all organisations will have to comply with proper ethical and socially responsible standards. And these standards and compliance mechanisms will be global. Welcome to the age of transparency and accountability. So it makes sense to change before you are forced to;
- *legacy* – even the most deluded leaders will admit in the cold light of day that they'd prefer to be remembered for doing something good, rather than making a pile of money or building a great big empire. It's human nature to be good. Humankind would not have survived were this not so. The greedy and the deluded have traditionally been able to persist with unethical irresponsible behaviour because there's been nothing much stopping them, or reminding them that maybe there is another way. But no longer. Part of the reshaping of attitudes and expectations is that making a pile of money, and building a great big empire, are becoming stigmatised. What's so great about leaving behind a pile of money or a great big empire if it's been at the cost of others' well-being, or the health of the planet? The ethics and responsibility *Zeitgeist* is fundamentally changing the view of what a lifetime legacy should be and can be. And this will change the deeper aspirations of leaders, present and future, who can now see more clearly what a real legacy is.

Ethical decision-making models

The AAO (American Accounting Organisation) has incorporated the work of several organisational experts into a practical, sequential, ten-step, ethical decision-making model. A description and discussion of the steps follow.

1 *Identify the Problem*. Gather as much information as you can that will illuminate the situation. In doing so, it is important to be as specific and objective as possible. Writing ideas on paper may help you gain clarity. Outline the facts, separating out innuendos, assumptions, hypotheses, or suspicions. There are several questions you can ask yourself: Is it an ethical, legal, professional, or clinical problem? Is it a combination of more than one of these? If a legal question exists, seek legal advice.
2 Other questions that it may be useful to ask yourself are: Is the issue related to me and what I am or am not doing? Is it related to a client and/or the client's significant others and what they are or are not doing? Is it related to the institution or agency and their policies and procedures? If the problem can be resolved by implementing a policy of an institution or agency, you can look

to the agency's guidelines. It is good to remember that dilemmas you face are often complex, so a useful guideline is to examine the problem from several perspectives and avoid searching for a simplistic solution.

3 *Apply the American Counseling Association (ACA) Code of Ethics*. After you have clarified the problem, refer to the Code of Ethics (ACA, 2005) to see if the issue is addressed there. If there is an applicable standard or several standards and they are specific and clear, following the course of action indicated should lead to a resolution of the problem. To be able to apply the ethical standards, it is essential that you have read them carefully and that you understand their implications.

4 If the problem is more complex and a resolution does not seem apparent, then you probably have a true ethical dilemma and need to proceed with further steps in the ethical decision-making process.

5 *Determine the nature and dimensions of the dilemma*. There are several avenues to follow in order to ensure that you have examined the problem in all its various dimensions.

   - Consider the moral principles of autonomy, non-maleficence, beneficence, justice and fidelity. Decide which principles apply to the specific situation, and determine which principle takes priority for you in this case. In theory, each principle is of equal value, which means that it is your challenge to determine the priorities when two or more of them are in conflict.
   - Review the relevant professional literature to ensure that you are using the most current professional thinking in reaching a decision.
   - Consult with experienced professional colleagues and/or supervisors. As they review with you the information you have gathered, they may see other issues that are relevant or provide a perspective you have not considered. They may also be able to identify aspects of the dilemma that you are not viewing objectively.
   - Consult your state or national professional associations to see if they can provide help with the dilemma.

6 *Generate potential courses of action*. Brainstorm as many possible courses of action as possible. Be creative and consider all options. If possible, enlist the assistance of at least one colleague to help you generate options. *Consider the potential consequences of all options and determine a course of action*. Considering the information you have gathered and the priorities you have set, evaluate each option and assess the potential consequences for all the parties involved. Ponder the implications of each course of action for the client, for others who will be affected and for yourself as a counsellor. Eliminate the options that clearly do not give the desired results or cause even more problematic consequences. Review the remaining options to determine which option or combination of options best fits the situation and addresses the priorities you have identified.

7 *Evaluate the selected course of action*. Review the selected course of action to see if it presents any new ethical considerations. Stadler (1986) suggests

applying three simple tests to the selected course of action to ensure that it is appropriate. In applying the test of justice, assess your own sense of fairness by determining whether you would treat others the same in this situation. For the test of publicity, ask yourself whether you would want your behaviour reported in the press. The test of universality asks you to assess whether you could recommend the same course of action to another counsellor in the same situation.

8 If the course of action you have selected seems to present new ethical issues, then you'll need to go back to the beginning and re-evaluate each step of the process. Perhaps you have chosen the wrong option or you might have identified the problem incorrectly.

9 If you can answer in the affirmative to each of the questions suggested by Stadler (thus passing the tests of justice, publicity and universality) and you are satisfied that you have selected an appropriate course of action, then you are ready to move on to implementation.

10 *Implement the course of action*. Taking the appropriate action in an ethical dilemma is often difficult. The final step involves strengthening your ego to allow you to carry out your plan. After implementing your course of action, it is good practice to follow up on the situation to assess whether your actions had the anticipated effect and consequences.

Another commonly used ethical decision-making model is the American Accounting Association. Again, similar to the previous AAO model, this process poses a number of questions.

Step 1: What are the facts of the case?

Step 2: What are the ethical issues in the case?

Step 3: What are the norms, principles and values related to the case?

Step 4: What are the alternative courses of action?

Step 5: What is the best course of action that is consistent with the norms, principles, and values identified in Step 3?

Step 6: What are the consequences of each possible course of action?

Step 7: What is the decision?

The Laura Nash model

Laura Nash was a senior research fellow at Harvard Business School in 1981 when she drafted a series of twelve questions to help in making difficult ethical decisions (Nash, 1981):

1 Have you defined the problem accurately?

2 How would you define the problem if you stood on the other side of the fence?

3 How did this situation occur in the first place?
4 To whom and to what do you give your loyalty as a person and as a member of an organisation?
5 What is your intention in making this decision?
6 How does the intention compare with the probable results?
7 Whom could your decision injure?
8 Can you discuss the problem with the affected parties before you make a decision?
9 Are you confident that your position will be as valid over a long period of time as it seems now?
10 Could you disclose without qualm your decision or action to your boss, the head of your organisation, your colleagues, your family, the person you most admire, or society as a whole?
11 What is the symbolic potential of your action if understood? If misunderstood?
12 Are there circumstances when you would allow exceptions to your stand? What are they?

Of all the decision-making models that have been developed, the Nash model would appear to be one of the more respected. Other models include:

Tucker's 5 question model

Mary Guy model (1990)

The Rion model (1990)

The Langenderfer and Rockness Model (1990)

Sustainability and ethics

The question of sustainability is discussed in Chapter 3.

An international perspective

If ethical dilemmas are problematic on home turf, the problems become magnified and more diverse for construction professionals working outside of the UK.

Transparency International (TI) is an organisation that seeks to provide reliable quantitative diagnostic tools regarding levels of transparency and corruption, both at global and local levels. Each year they publish a Corruption Perceptions Index (CPI) that ranks countries and illustrates how countries compare against in other in terms of perceived levels of public sector corruption. Table 5.3 illustrates the results of the 2015 transparency survey. There are 167 counties in the full survey, that can be accessed at www.transparency.org.

By its very nature, there is little concrete evidence on the levels of bribery and corruption in world market but companies based in emerging economic giants,

Table 5.3 Transparency International survey results on corruption, 2015

Country	*Rank*	*CPI Score*	*Country*	*Rank*	*CPI Score*
Denmark	1	91	Oman	60	45
UK	10	81	Italy	61	44
Belgium	15	77	China	83	37
Hong Kong	18	75	Mexico	95	35
Qatar	22	68	Russia	119	29
Poland	30	63	Uganda	139	25
Cuba	56	47	Somalia	167	8

such as China, India and Russia, are perceived to routinely engage in bribery when doing business abroad, according to Transparency International's 2015 Bribe Payers Index (BPI).

Denmark and Finland shared first place in the 2015 BPI with a score of 91 out of a very clean 100, indicating that Danish and Finish firms are seen as least likely to bribe abroad. Sweden and New Zealand shared third place on the index, each with a score of 88. At the other end of the spectrum, Somalia ranked last with a score of 8, just below Uganda (25), Mexico (35) and Russia (29). Interestingly the BPI also shows public works and construction companies to be the most corruption-prone when dealing with the public sector, and most likely to exert undue influence on the policies, decisions and practices of governments.

The BPI provides evidence that a number of companies from major exporting countries still use bribery to win business abroad, despite awareness of its damaging impact on corporate reputations and ordinary communities.

The Bribe Payers Survey, which serves as the basis for the BPI, also looks at the likelihood of firms in 19 specific sectors to engage in bribery. In the first of two new sectoral rankings, companies in public works contracts and construction; real estate and property development; oil and gas; heavy manufacturing; and mining were seen to bribe officials most frequently. The cleanest sectors, in terms of bribery of public officials, were identified as information technology, fisheries, and banking and finance.

A second sectoral ranking evaluates the likelihood of companies from the 19 sectors to engage in state capture, whereby parties attempt to wield undue influence on government rules, regulations and decision-making through private payments to public officials. Public works contracts and construction; oil and gas; mining; and real estate and property development were seen as the sectors whose companies were most likely to use legal or illegal payments to influence the state. The banking and finance sector is seen to perform considerably worse in terms of state capture than in willingness to bribe public officials, meaning that its companies may exert considerable undue influence on regulators, a significant finding in light of the ongoing global financial crisis. The sectors where companies are seen as least likely to exert undue pressure on the public policy process are agriculture,

fisheries and light manufacturing; however, TI estimated that in 2005 corruption was costing the construction industry worldwide £3.75 billion per annum.

While most of the world's wealthiest countries already subscribe to a ban on foreign bribery under the OECD Anti-Bribery Convention, there is little awareness of the convention among the senior business executives interviewed in the Bribe Payers Survey. Governments have a key role to play in ensuring that foreign bribery is stopped at the source – and by making good on commitments to prevent and prosecute such practices.

Table 5.4 shows the 2011 BPI results along with additional statistical information that indicates the level of agreement among respondents about the country's performance, and the precision of the results. Scores range from 0 to 10, indicating the likelihood of firms headquartered in these countries to bribe when

Table 5.4 Transparency International's Bribe Payers Index, 2011

Rank	*Country*	*BPI Score 2011*
1	The Netherlands	8.8
1	Switzerland	8.8
3	Belgium	8.7
4	Germany	8.6
4	Japan	8.6
6	Australia	8.5
6	Canada	8.5
8	Singapore	8.3
8	United Kingdom	8.3
10	United States	8.1
11	France	8.0
11	Spain	8.0
13	South Korea	7.9
14	Brazil	7.7
15	Hong Kong	7.6
15	Italy	7.6
15	Malaysia	7.6
15	South Africa	7.6
19	Taiwan	7.5
19	India	7.5
19	Turkey	7.5
22	Saudi Arabia	7.4
23	Argentina	7.3
23	United Arab Emirates	7.3
25	Indonesia	7.1
26	Mexico	7.0
27	China	6.5
28	Russia	6.1

operating abroad. The higher the score for the country, the lower the likelihood of companies from this country to engage in bribery when doing business abroad.

In 2009, the European Construction Industry Federation (FIEC) issued a statement in its annual report that the World Bank and the European Union had singled out the construction industry as a sector which, according to their perception, is particularly prone to unethical business practices. As a result, a joint FIEC/EIC Working Group of Ethics was established which in 2009 published a Statement on Corruption Prevention in the Construction Industry, that basically denounced corruption in the construction sector and briefly outlined a code of conduct to promote transparency.

An ethics charter

One step in raising the awareness of ethics within an organisation is by drawing up an ethics charter. Some guidelines on implementing this are set out below:

1 Get endorsement from the Board. Corporate values and ethics are matters of governance.
2 Find a champion. It is good practice to set up a board-level (ethics or corporate responsibility) committee, preferably chaired by a non-executive director, or to assign responsibility to an existing committee (such as Audit or Risk). A senior manager will need to be responsible for the development of the policy and code and the implementation of the ethics programme.
3 Understand the purpose. It is important to clarify the relationship between and understand your organisation's approach to corporate responsibility, ethics, compliance and corporate social responsibility strategies.
4 Find out what bothers people. Merely endorsing an external standard or copying a code from another organisation will not suffice. It is important to find out what topics employees require guidance on, to be clear what issues are of concern to stakeholders and what issues are material to your business activities, locations and sector.
5 Be familiar with external standards and good practice. Find out how other companies in your sector approach ethics and corporate responsibility. Understand what makes an effective policy, code and programme from the point of view of the business, the staff and other stakeholders. How will you embed your code into business practice?
6 Monitoring and assurance. Consider how the success of the policy will be monitored and to whom the business will be accountable regarding its ethical commitments. How will you know it is working? What are the key indicators/measures of an ethical culture for your organisation?
7 Try it out first. The draft code needs piloting – perhaps with a sample of employees drawn from all levels and different locations.
8 Plan a process of review that will take account of changing business environments, strategy, stakeholder concerns and social expectations, new standards, and strengths and weakness in your ethical performance.

Another major ethical dilemma that sometimes has to be faced is whether to expose malpractice within an organisation for which you work to the public domain, a practice that has become known as whistle-blowing.

Whistle-blowing

The definition of whistle-blowing can be said to be speaking out to the media or the public on malpractice, misconduct, corruption, or mismanagement witnessed in an organisation. Whistle-blowing occurs when a worker raises a concern about danger or illegality that affects others, for example members of the public. Whistle-blowing is usually undertaken on the grounds of morality or conscience, or because of a failure of business ethics on the part of the organisation being reported. Put at its simplest, whistle-blowing occurs when an employee or worker provides certain types of information, usually to the employer or a regulator, which has come to their attention through work. The whistle-blower is usually not directly, personally affected by the danger or illegality.

Whistle-blowing is not for the faint-hearted as often whistle-blowers have been the subject of victimisation, threats, bullying and dismissal. As mentioned earlier, there are many case studies on ethical/whistle-blowing issues in other sectors, particularly the health sector, but far fewer in construction and related professions. There is, however, one case that came to prominence in 2005 when Production Manager Alan Wainwright, an ex-employee of Haden Young, alleged that the company operated a policy of keeping a blacklist database. The database, it was alleged, contained over 500 names of people and companies considered to be disruptive or militant and who should not be hired. In 2005, Wainwright went public on the blacklist issue and shortly afterwards left the company and subsequently failed after 150 job applications to secure a new job, leading to the conclusion that he himself had been placed on a blacklist. Finally, after 200 applications, Alan Wainwright now works as a concert ticket buyer. The consequences for Wainwright were losing his job, having no income, stress and fear of eviction from his home. In May 2009, Lord Mandleson vowed to introduce legislation to outlaw the compiling and operation of blacklists.

While waiting for the promised legislation, the key piece of existing whistle-blowing legislation is the Public Interest Disclosure Act 1998 (PIDA), which applies to almost all workers and employees who ordinarily work in Great Britain. The provisions introduced by the Public Interest Disclosure Act 1998 protect most workers from being subjected to a detriment by their employer. Detriment may take a number of forms, such as denial of promotion, facilities or training opportunities which the employer would otherwise have offered. Under the provisions of the PIDA, certain kinds of disclosures qualify for protection ('qualifying disclosures'). Qualifying disclosures are disclosures of information which the worker reasonably believes tend to show one or more of the following matters is either happening now, took place in the past, or is likely to happen in the future:

- a criminal offence;
- the breach of a legal obligation;
- a miscarriage of justice;
- a danger to the health or safety of any individual;
- damage to the environment; or
- deliberate covering up of information tending to show any of the above five matters.

It should be noted that in making a disclosure the worker must have reasonable belief that the information disclosed tends to show one or more of the offences or breaches listed above ('a relevant failure'). The belief need not be correct – it might be discovered subsequently that the worker was in fact wrong – but the worker must show that he held the belief, and that it was a reasonable belief in the circumstances at the time of disclosure.

Employment tribunal statistics show that the total number of people using whistle-blowing legislation, which aims to protect workers from victimisation if they have exposed wrongdoing, increased from 157 cases in 1999 to 1,791 10 years later. The figures, compiled for the first time, will increase fears among campaigners that whistle-blowers are being deliberately undermined or removed from their workplace, despite repeated promises to protect them.

Whistle-blowing procedures

Attitudes towards whistle-blowing have evolved considerably during the past 50 years in the early days of the 'organisation man' ethos where loyalty to the company was the ruling norm, to the present when public outrage about corporate misconduct has created a more auspicious climate for whistle-blowing.

Companies in the past had broad autonomy in employee policies and could fire an employee at will, even for no reason. Employees were expected to be loyal to their organisations at all costs. Among the few exceptions to this rule were unionised employees, who could only be fired for 'just cause', and government employees because the courts upheld their constitutional right to criticise agency policies. In private industry, few real mechanisms for airing grievances existed although, for example, IBM claimed from its earliest days, to have an effective open-door policy that allowed employees to raise any issue. In part, because of this lack of protection for whistle-blowers, problems were often concealed rather than solved. Probably the clearest example was in asbestos manufacturing, where the link to lung disease was clearly established as early as 1924 but actively suppressed by company officials for 50 years. In the late 1960s it was commonplace in the UK to see joiners cutting and drilling asbestos sheets on site, without any form or protection, before fixing it below board flooring as a fire barrier.

Any whistle-blowing policy should aim to do the following:

- encourage staff to feel confident in raising serious concerns and to question and act upon concerns about practice;
- provide avenues for staff to raise those concerns and receive feedback on any action taken;
- ensure staff receive a response to their concerns and that they are aware of how to pursue them if not satisfied
- reassure staff that they will be protected from possible reprisals or victimisation if they have a reasonable belief that any disclosure has been made in good faith.

Whistle-blowing Code of Practice

It is important that employers encourage whistle-blowing as a way to report wrongdoing and manage risks to the organisation. Employers also need to be well equipped for handling any such concerns raised by workers. According to the Department for Business, Innovation and Skills (2015), it is considered best practice for an employer:

- to have a whistle-blowing policy or appropriate written procedures in place;
- to ensure the whistle-blowing policy or procedures are easily accessible to all workers;
- to raise awareness of the policy or procedures through all available means such as staff engagement, intranet sites, and other marketing communications;
- to provide training to all workers on how disclosures should be raised and how they will be acted upon;
- to provide training to managers on how to deal with disclosures;
- to create an understanding that all staff at all levels of the organisation should demonstrate that they support and encourage whistle-blowing;
- to confirm that any clauses in settlement agreements do not prevent workers from making disclosures in the public interest;
- to ensure the organisation's whistle-blowing policy or procedures clearly identify who can be approached by workers who want to raise a disclosure. Organisations should ensure a range of alternative persons whom a whistle-blower can approach in the event a worker feels unable to approach their manager. If your organisation works with a recognised union, a representative from that union could be an appropriate contact for a worker to approach.
- to create an organisational culture where workers feel safe to raise a disclosure in the knowledge that they will not face any detriment from the organisation as a result of speaking up.
- to undertake that any detriment towards an individual who raises a disclosure is not acceptable;
- to make a commitment that all disclosures raised will be dealt with appropriately, consistently, fairly and professionally;

- to undertake to protect the identity of the worker raising a disclosure, unless required by law to reveal it and to offer support throughout with access to mentoring, advice and counselling;
- to provide feedback to the worker who raised the disclosure where possible and appropriate subject to other legal requirements. Feedback should include an indication of timings for any actions or next steps.

How not to operate a whistle-blower policy was clearly demonstrated by Barclays in April 2017. Despite the bank having a clear policy towards whistle-blowing as follows:

> *Sometimes the actions of a few may put our reputation at stake. If you believe something is not right – like misconduct, fraud or illegal activity – or if you feel that our standards aren't being met, it is really important that you speak up. Any concerns you may have can be raised in confidence by:*
>
> - *Discussing the matter with your manager, or manager's manager.*
> - *Talking directly to your local Compliance team.*
> - *Contacting the Whistleblowing team via the Raising Concerns hotline or mail-box.*
>
> *Concerns raised are taken seriously, treated sensitively, and where appropriate, independently investigated. Where permitted by law, you can raise your concerns with the Whistleblowing team anonymously.*

Barclay's chief executive Jes Staley was severely reprimanded and fined £1.3 million for attempting to discover a whistle-blower's identity within the bank following what Mr Staley regarded as 'an unfair personal attack'.

Conflict of interest

The RICS publication: *Conflicts of Interest RICS Professional Statement, Global 1st Edition, March 2017 – Effective from 1st January 2018*, is a document that provides members with mandatory requirements, that is a rule that a member or firm is expected to adhere to. The professional statement defines 'conflict of interest' as:

> a situation in which the duty of an RICS member (working independently or within a non-regulated firm or within a regulated firm) or a regulated firm to act in the interests of a client or other party in a professional assignment conflicts with a duty owed to another client or party in relation to the same or a related professional assignment.

The statement goes on to suggest that the most important reason for avoiding conflicts of interest is to prevent anything getting in the way of a surveyor's duty to advise and represent each client objectively and independently, without regard

to the consequences to another client, any third party, or self-interest and that the clients and in turn the public can have confidence in the system.

Non-UK markets

In international terms the UK accounted for almost 16 per cent of construction contracting value added and about 8 per cent of construction enterprises in the EU in 2012. In the same period the UK also accounted for about 10 per cent of construction contracting employment among the 27 EU states, according to the Chartered Institute of Building. UK-based companies perform relatively well in comparison to their European counterparts. According to a recent assessment by the FIEC, the UK takes second place in the ranking of total sales by country. Thirteen UK-based companies were among the top fifty companies accounting for combined sales of around €157 billion – these include Balfour Beatty, Carillion and the Kier Group. Companies that export tend to be larger, more productive and have greater know-how and are more likely to engage in research, development or wider innovation activity. At the same time UK construction has a large number of privately owned companies and is considered to be more fragmented than its major competitors in Germany or France, driven by a relatively high proportion of self-employment and a relatively high number of small and micro-businesses.

Evidence shows that a relatively small proportion of UK construction contracting firms are exporters comparing to other sectors. In 2012, about 6 per cent of construction contracting SMEs were exporting. Of those contracting SMEs that are non-exporters, about two-thirds said that they did not have a product or a service suitable for exporting and a quarter said that exporting was not part of their business plan. Construction businesses may not be fully aware of the potential benefits of exporting and lack the necessary knowledge or management skills to successfully exploit overseas markets. UK construction companies tend to be

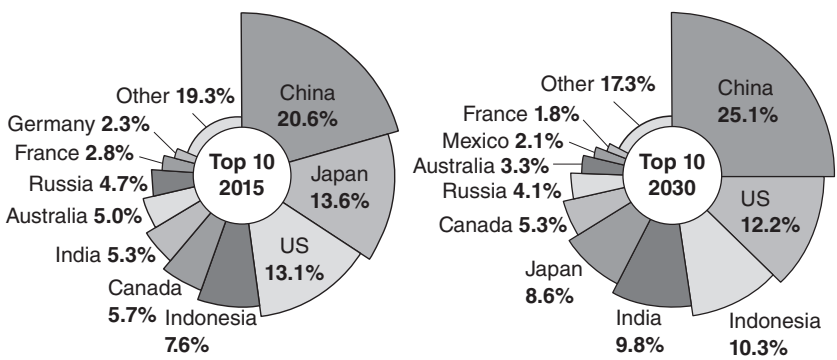


Figure 5.1 Top infrastructure markets, 2015 and 2030

Source: NBS National Construction Contracts and Law Survey 2015.

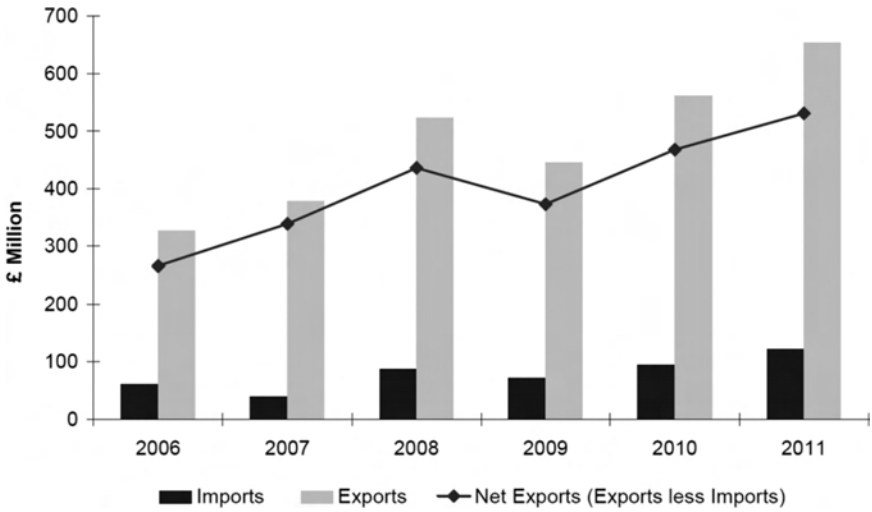


Figure 5.2 UK trade in architecture and quantity surveying services
Source: ONS Pink Book (2015).

smaller and collaborate less in comparison to many European countries which may make accessing foreign markets more difficult (Department for Business, Innovation and Skills, 2013). The UK is strong in exports of architecture and surveying services, with a trade surplus of about £530 million in 2011 (see Figure 5.2).

Over the last five years there have been some dramatic changes in the construction market. Businesses across many parts of the world have been faced with unprecedented challenges arising from a number of factors. These include rising prices of raw materials, limited availability of funding, corporate failures arising from the inappropriate management of risks, government spending cuts and failing consumer spending, coupled with new accounting standards and regulatory requirements. It is anticipated that the global construction market will increase by 4.3 per cent per annum. Demographic change is also expected to have a major impact on such facilities as healthcare facilities, housing, education and infrastructure. A similar scenario was outlined by the RICS in *Futures, Our Changing World: Let's Be Ready* (2015).

One of the many factors having to be faced when considering expansion into non-UK markets is the question of differing ethical standards and how these should be navigated. During the last five years the RICS has increased its global presence, including the appearance of several European and US universities and higher education establishments in the RICS Partnership Programme. However, all eyes are on China, with an economy growing at 9 per cent per annum compared with the average for the Euro Zone of 1.8 per cent and a 26 per cent year-on-year increase in infrastructure investment, such as bridges, factories and power plants.

The multi-cultural team

Quantity surveyors have proved themselves to be adept in a diverse range of skills, often over and above their technical knowledge, with which they serve the needs of their clients. However, when operating in an international environment these skills and requirements are complicated by the added dimension of a whole series of other factors, including perhaps the most influential – cultural diversity. Companies operating at an international level in many sectors have come to realise the importance of a good understanding of cultural issues and the impact that they have on their business operations. In an increasingly global business environment in which the RICS is constantly promoting the surveyor as a global player (for example, the RICS Global Manifesto), it is a fact that the realisation of the importance and influence of cultural diversity is still lacking in many organisations seeking to expand their business outside of the UK.

Today, for many quantity surveyors, international work is no longer separated from the mainstream surveying activity; EU Procurement Directives, GATT/GPA (Government Procurement Agreement of the World Trade Organization), etc. are bringing an international dimension to the work of the property professionals. Consultants from the UK are increasingly looking to newer overseas markets such as Europe and regions where they have few traditional historical connections, such as South-East Asia and China. Consultants must compete with local firms in all aspects of their services, including business etiquette, market knowledge and fees, but above all, delivering added value, in order to succeed. With the creation of the Single European Market in 1993, many UK firms were surprised that European clients were not at all interested in the novelty value of using UK professionals, but continued to award work on the basis of best value for money. As pointed out in Chapter 1, the UK construction industry and its associated professions have ploughed a lonely furrow for the last 150 years or so as far as the status and nature of the professions, procurement and approach to design are concerned, and it could be argued that this baggage makes it even more difficult to align with and/or adapt to overseas markets. Certainly companies like the French giant Bouygues, with its multidisciplinary *bureau d'études techniques*, have a major advantage in the international markets because of their long-established capability to re-engineer initial designs in-house and present alternative technical offers.

Outside Europe, the USA, for example, has seen a decline in the performance of the US construction industry in international markets, a trend that has been attributed in part to its parochial nature in an increasingly global market. Internally, strong trade unions exercise a vice-like grip on the American construction industry.

The construction industry, in common with many other major business sectors, has been dramatically affected by market globalisation. Previous chapters have described the impact of the digital economy on working practices; multinational clients such as Coca-Cola and BP demand global solutions to their building needs, and professional practices as well as contractors are forging

international alliances (either temporary or permanent) in order to meet demand. It is a fast-moving and highly competitive market, where big is beautiful and response time is all important. The demands placed on professional consultants with a global presence are high, particularly in handling unfamiliar local cultures, planning regimes and procurement practice, but the reward is greater consistency of workload for consultants and contractors alike. In an increasingly competitive environment, the companies that are operating at an international level in many sectors have come to realise that a good awareness and understanding of cultural issues are essential to their international business performance. Closeness and interrelationships within the international business community are hard to achieve without acceptance as an insider, which only comes after cultural and social understanding. In order to maintain market share, quantity surveyors need to tailor their marketing strategies, for example, to take account of the different national cultures. Although some differences turn out to be ephemeral, when exploring international markets there is often a tightrope that has to be walked between an exaggerated respect, which can appear insulting, and a crass insensitivity, which is even more damaging. It comes as no surprise that cultural diversity has been identified as the single greatest barrier to international business success.

It is no coincidence that the global explosion happened just as the e-commerce revolution arrived, with its 365-days-a-year/24-hours-a-day culture, allowing round-the-clock working and creating a market requiring international expertise backed by local knowledge and innovative management systems. Although it could be argued that in an e-commerce age, cultural differences are likely to decrease in significance, they are in fact still very important, and remain major barriers to the globalisation of e-commerce. These differences extend also to commercial practice. Even in a digital economy an organisation still needs to discover and analyse a client's values and preferences, and there is still a role for trading intermediaries such as banks, trading companies, international supply chain managers, chambers of commerce, etc. in helping to bridge differences in culture, language and commercial practice. In an era of global markets, purists could perhaps say that splitting markets into European and global sectors is a contradiction. However, Europe does have its own unique features, not least its public procurement directives, physical link and proximity to the UK, and for some states a single currency. Therefore, this chapter will first consider the European market, before looking at other opportunities.

Europe

During the early 1990s Euromania broke out in the UK construction industry, and 1 January 1993 was to herald the dawn of new opportunity. It was the day the remaining physical, technical and trade barriers were removed across Europe, and from now on Europe and its markets lay at the UK construction industry's feet.

Optimism was high within the UK construction industry – after all, it seemed as though a barrier-free Europe with a multi-billion pound construction related output (€1,305 billion in 2015; Table 5.5) was the solution to the falling turnover in the UK. Almost every month conferences were held on the theme of how to exploit construction industry opportunities in Europe. So, more than two decades later, has the promise been turned into a reality? There follows a review of developments in Europe, with an examination of the procurement opportunities for both the public and private sectors.

European public procurement law

Procurement in the European public sector involves governments, utilities (i.e. entities operating in the water, energy and transport sectors) and local authorities purchasing goods, services and works over a wide range of market sectors, of which construction is a major part. For the purposes of legislation, public bodies are divided into three classes:

1 central government and related bodies, e.g. NHS trusts;
2 other public bodies, e.g. local authorities, universities, etc.;
3 public utilities, e.g. water, electricity, gas, rail.

Table 5.5 Construction-related output, billion €, 2015

Country	*Billion €*
Germany	285
France	200
United Kingdom	177
Italy	163
Spain	63
The Netherlands	60
Switzerland	53
Norway	46
Poland	44
Belgium	39
Sweden	34
Austria	32
Finland	29
Denmark	27
Czech Republic	16
Portugal	15
Ireland	9
Hungary	9
Slovak Republic	4

Source: building radar

Public procurement is different from private business transactions in several aspects; the procedures and practices are heavily regulated and, while private organisations can spend their own budgets more or less as they wish (with the agreement of their shareholders), public authorities receive their budgets from taxpayers and therefore have a responsibility to obtain value for money, traditionally based on lowest economic cost. However, in recent years the clear blue water between private and public sectors has disappeared rapidly with the widespread adoption of public–private partnerships and the privatisation of what were once publicly owned utilities or entities.

At the time of going to press the impact of the UK leaving the EU and possibly the single market is unknown. For example, if the UK were to adopt the so-called Norwegian model, it would become a member of EFTA and the EEA, and the UK's obligations as members of the EEA would include the adoption of the EU procurement rules which are briefly described below.

The EU Directives: theory and practice

The EU Directives provide the legal framework for the matching of supply and demand in public procurement. A directive is an instruction addressed to the EU Member States to achieve a given legislative result by a given deadline. This is usually done by transposing the terms of the directive into national legislation. The European public procurement regulatory framework was established by the public procurement Directives 93/36/EEC, 93/37/EEC and 92/50/EEC for supplies, works and services, and Directive 93/38/EEC for utilities, which, together with the general principles enshrined in the Treaty of Rome (1957), established the following principles for cross-border trading (references apply to the Treaty of Rome):

- a ban on any discrimination on the grounds of nationality (Article 6);
- a ban on quantitative restrictions on imports and all measures having equivalent effect (Articles 30 to 36);
- the freedom of nationals of one Member State to establish themselves in another Member State (Articles 52 *et seq.*) and to provide services in another Member State (Articles 59 *et seq.*).

Enforcement Directives (89/665EEC and 92/13EEC) were added in 1991 in order to deal with breaches and infringements of the system by Member States.

The quantity surveyor and EU public procurement

How is the quantity surveyor likely to come into contact with the European public procurement system? The following scenarios are discussed:

- a surveyor working within a public body (contracting authority) and dealing with a works contract;
- a surveyor in private practice wishing to bid for work in Europe as a result of a service contract announcement.

A surveyor within a public body

A quantity surveyor working within a body governed by public law (if in doubt, a list of European bodies and categories of bodies is listed in the Directives) should be familiar with procedures for compliance with European public procurement law. The Directives lay down thresholds above which it is mandatory to announce the contract particulars. The *Official Journal of the European Communities* (OJEU) is the required medium for contract announcements and is published five times each week, containing up to 1,000 notices covering every imaginable contract required by central and local government and the utilities – from binoculars in Barcelona to project management in Porto. Major private sector companies also increasingly use the *Official Journal* for market research. The Directives lay down thresholds above which it is mandatory to announce the contract particulars. The current thresholds (effective from 1 January 2016 until 31 December 2017) for announcements in the *Official Journal* are:

- works: €5,225,000;
- services: €135,000;
- public supply: €209,000.

All figures exclude VAT.

The Directorate General (DG) for Internal Market, Industry, Entrepreneurship and SMEs actively encourages contracting authorities and entities to announce contracts that are below threshold limits. Information on these impending tenders is published by the European Commission in the *Official Journal of the European Communities*, often otherwise known as the OJEU that is available free of charge, electronically at http://simap.ted.europa.eu/. The Directive also clarifies existing law in areas such as the selection of tenderers and the award of contracts, bringing the law as stated into line with judgements of the European Court of Justice.

The EU procurement procedure

The OJEU announcement procedure involves three stages:

1 prior information notices (PINs) or indicative notices;
2 contract notices;
3 contract award notices (CANs).

Examples of these notices can be found in Annex IV of the Directive.

- *a prior information notice*, or PIN, that is not mandatory, is an indication of the essential characteristics of a works contract and the estimated value. It should be confined to a brief statement, and posted as soon as planning permission has been granted. The aim is to enable contractors to schedule their work better and allow contractors from other Member States the time to compete on an equal footing;

- *contract notices* are mandatory and must include the award criteria, which can be based on either the lowest price or the most economically advantageous tender, specifying the factors that will be taken into consideration. Once drafted, the notices are published, five times a week, via the Publications Office of the European Commission in Luxembourg in the *Official Journal* via the Tenders Electronic Daily (TED) database, and translated into the official languages of the community, all costs being borne by the community. TED is updated twice weekly and may be accessed through the Commission's website at http://simap.ted.europa.eu/. Extracts from TED are also published weekly in the trade press. In order to give all potential contractors a chance to tender for a contract, the Directives lay down minimum periods of time to be allowed at various stages of the procedure – for example, in the case of Open Procedure this ranges from 36 to 52 days from the date of dispatch of the notice for publication in the *Official Journal*. Restricted and negotiated procedures have their own time limits. These timescales should be greatly reduced with the wide-scale adoption of electronic procurement;
- *contract award notices* inform contractors about the outcome of the procedure. If the lowest price was the standard criterion, this is not difficult to apply. If, however, the award was based on the 'most economically advantageous tender', then further clarification is required to explain the criteria, e.g. price, period for completion, running costs, profitability and technical merit, listed in descending order of importance. Once established, the criteria should be stated in the contract notices or contract documents.

Award procedures

The quantity surveyor must decide at an early stage which award procedure is to be adopted. The following general criteria apply:

- the minimum number of bidders must be five for the restricted procedure and three for the negotiated and competitive dialogue procedures;
- contract award is made on the basis of lowest price or most economically advantageous tender (MEAT). Note that from April 2014 MEAT may also now include the 'best price-quality ratio' assessed on the basis of qualitative, environmental and/or social aspects linked to the subject matter of the contract;
- contract notices or contract documents must provide the relative weighting given to each criterion used to judge the most economically advantageous tender and where this is not possible, award criteria must be stated in descending order of importance;
- MEAT award criteria may now include environmental characteristics, e.g. energy savings, disposal costs, provided these are linked to the subject matter of the contract.

For the second time since their introduction the EU public procurement directives have recently been amended, the first being in 2004. The reasons for the

changes, according to the EU Commission, which are effective from 17 April 2014, were:

- greater flexibility;
- simplification;
- easier access for SMEs;
- encouragement for contracting authorities and bidders to interact throughout the procurement process.

However, there still remains a good deal of scepticism among those who use the public procurement that the changes will make the process easier to navigate.

The new EU procurement regime comprises three new directives:

- the directive on public procurement, which repeals Directive 2004/18/EC on public works, supply and service contracts;
- the directive on procurement by entities operating in the water, energy, transport and postal services sectors, which repeals Directive 2004/17/EC;
- a new directive on the award of concession contracts.

The key changes in the process are:

- the introduction of a new procurement regimes for concession awards. Services concessions fall outside the scope of the existing 2004 legislation. Common examples of concessions include: running catering establishments in publicly owned sports and leisure facilities, provision of car parking facilities and services; or the operation of toll roads, etc.
- new award procedures, giving scope for more negotiation between contracting authorities and bidders;
- an extension of the grounds for disqualification of bidders;
- changes to the award criteria;
- new provisions on the modification of contracts post-award.

The choices are as follows:

- *open procedure*, which allows all interested parties to submit tenders;
- *restricted procedure*, which initially operates as the open procedure but then the contracting authority only invites certain contractors, based on their standing and technical competence, to submit a tender. Under certain circumstances, for example, extreme urgency, this procedure may be accelerated;
- *negotiated procedure*, in which the contracting authority negotiates directly with the contractor of its choice. Used in cases where it is strictly necessary to cope with unforeseeable circumstances, such as earthquake or flood. Most commonly used in PPP models in the UK. From 2014, this may now be used without prior notification;

- *competitive dialogue*, the introduction of this procedure addresses the need to grant, in the opinion of the European Commission, contracting authorities more flexibility to negotiate on public–private partnership (PPP) projects. Some contracting authorities have complained that the existing procurement rules are too inflexible to allow a fully effective tendering process. Undoubtedly, the degree of concern has depended largely on how a contracting authority has interpreted the procurement rules as there are numerous examples of PPP projects which have been successfully tendered since the introduction of the public procurement rules using the negotiated procedure. However, the European Commission recognised the concerns being expressed, not only in the UK but also across Europe and it has sought to introduce a new procedure which will accommodate these concerns. In essence, the new competitive dialogue procedure permits a contracting authority to discuss bidders' proposed solutions with them before preparing revised specifications for the project and going out to bidders asking for modified or upgraded solutions. This process can be undertaken repeatedly until the authority is satisfied with the specifications that have been developed. Some contracting authorities are pleased that there is to be more flexibility to negotiations; however, for bidders, this reform does undoubtedly mean that tendering processes could become longer and more complex. This in turn would lead to more expense for bidders and could pose a threat to new entrants to the PPP market as well as existing players. According to the Commission the introduction of this procedure will enable:

    - dialogue with selected suppliers to identify and define solutions to meet the needs of the procuring body; and
    - awards to be made only on the basis of the most economically advantageous basis.

In addition,

- all candidates and tenderers must be treated equally and commercial confidentiality must be maintained unless the candidate agrees that information may be passed on to others;
- dialogue may be conducted in successive stages. Those unable to meet the need or provide value for money, as measured against the published award criteria, may drop out or be dropped, although this must be conveyed to all tenderers at the outset;
- final tenders are invited from those remaining on the basis of the identified solution or solutions;
- clarification of bids can occur pre- and post-assessment, provided this does not distort competition.

To summarise, therefore, the competitive dialogue procedure is, according to the Commission, to be used in cases where it is difficult to assess what would be the

best technical, legal or financial solution because of the market for such a scheme or the project being particularly complex. However, the competitive dialogue procedure leaves many practical questions over its implementation, for example:

- the exceptional nature of the competitive dialogue and its hierarchy with other award procedures;
- the discretion of the contracting authorities to initiate the procedure (Who is to determine the nature of a particular complex project?);
- the response of the private sector, with particular reference to the high bid costs;
- the overall value for money;
- the degree of competition achieved as there is great potential for post-contract negotiations.

From April 2014 the competitive dialogue procedure is no longer restricted to complex projects such as the PPPs.

In addition to the above procedures the following new procedures have been introduced.

Competitive procedure with negotiation

Like the competitive dialogue procedure, and actually like the existing negotiated procedure, it is a competitive process where negotiations are to be carried out with all the bidders still in the procurement process. The major change from the current negotiated procedure will be that, following negotiation on submitted tenders, there will be a formal end to the negotiating and bidders will then be invited to submit a revised tender (very much like the tender phase in the competitive dialogue procedure). Another aspect is that it specifies the extent to which the authority can change its requirements during the process. The Directive specifically precludes an authority from making changes to:

- the description of the procurement;
- the part of the technical specifications which define the minimum requirements of the award criteria.

However, it acknowledges the right to make changes to other parts of the specification, provided bidders are given sufficient time to make an adequate response.

Other points to note include:

- as with the competitive dialogue procedure, there will be specific grounds which permit its use. This will include that 'due to specific circumstances related to the nature or the complexity of the works, supplies or services or the risks attaching thereto, the contract cannot be awarded without prior negotiations';
- the minimum number of bidders to be invited is three;

- it will be possible to hold the negotiation in stages and reduce the number of bidders at the end of a stage;
- the ability to hold an accelerated procedure, currently limited to the restricted procedure, will be extended to the new procedure, making it possible to use it in cases of urgency;
- a bidder's solution or other confidential information is not to be revealed to other bidders without specific consent.

The new procedure has much in common with the competitive dialogue procedure. What will distinguish it is that, in the competitive dialogue procedure, the first phase solutions are developed until the authority considers that it has identified one or more capable of meeting its needs and then seeks to formalise positions in a tender, whereas in the new competitive procedure with negotiation tenders are submitted initially, are then subject to negotiation and then resubmitted to finalise positions.

Innovative partnership (where solutions are not already available on the market)

The new EU concessions regime sets out a basic framework for the award of works and services concessions in the public and utilities sector, subject to certain exemptions in respect of water (such as the disposal or treatment of sewage) with a value of €5.186 million or greater. The new regime leaves the choice of the most appropriate procedure for the award of concessions to individual contracting entities, subject to basic procedural guarantees, including:

- the publication of the 'concession notice' in the *Official Journal of the EU* advertising the opportunity;
- certain minimum time limits for the receipt of applications and tenders;
- the selection criteria must relate exclusively to the technical, financial and economic capacity of operators;
- the award criteria must be objective and linked to the subject matter of the concession;
- acceptable modifications to concessions contracts during their term, in particular where changes are required as a result of unforeseen circumstances.

Electronic tendering

Electronic auctions

The internet is making the use of electronic auctions increasingly more attractive as a means of obtaining bids in both public and private sectors; indeed, it can be one of the most transparent methods of procurement (see Chapter 4). At present, electronic auctions can be used in both open and restricted framework procedures. The system works as follows:

- the framework (i.e. a list of the selected bidders) is drawn up;
- the specification is prepared;
- the public entity then establishes the lowest price award criterion, for example, with a benchmark price as a starting point for bidding;
- reverse bidding on a price then takes place, with framework organisations agreeing to bid openly against the benchmark price;
- prices/bids are posted up to a stated deadline;
- all bidders see the final price.

Technical specifications

At the heart of all domestic procurement practice is compliance with the technical requirements of the contract documentation in order to produce a completed project that performs to the standards of the brief. The project must comply with national standards to be compatible with existing systems and technical performance. The task of achieving technical excellence becomes more difficult when there is the possibility of the works being carried out by a contractor who is unfamiliar with domestic conventions and is attempting to translate complex data into another language. It is therefore very important that standards and technical requirements are described in clear terms with regard to the levels of quality, performance, safety, dimensions, testing, marking or labelling, inspection, and methods or techniques of construction, etc. References should be made to:

- *A Standard*: a technical specification approved by recognised standardising body for repeated and continuous application.
- *A European Standard*: a standard approved by the European Committee for Standardisation (CEN).
- *European technical approval*: a favourable technical assessment of the fitness for use of a product, issued by an approval body designated for the purpose (sector-specific information regarding European technical approval for building products is provided in Directive 89/106/EEC).
- *Common technical specification*: a technical specification laid down to ensure uniform application in all Member States, which has been published in the *Official Journal*.
- *Essential requirements*: requirements regarding safety, health and certain other aspects in the general interests that the construction works must meet.

Given the increased complexity of construction projects, the dissemination of accurate and comprehensive technical data is gaining in importance. It is therefore not surprising that the Commission is concerned that contracting authorities are, either deliberately or otherwise, including discriminatory requirements in contract documents. These include:

- lack of reference to European standards;
- application of technical specifications that give preference to domestic production;
- requirements of tests and certification by a domestic laboratory.

The result of this is in direct contravention of Article 30 of the Treaty of Rome, and effectively restricts competition to domestic contractors. In attempt to reduce the potential problems outlined above, the EU has embarked on a campaign to encourage contracts to be based on an output or performance specification, which removes the need for detailed and prescriptive documentation.

The Code of Conduct for European Surveyors

The European Commission has encouraged all professions to develop a Code of Conduct and in 2009 published guidance on the development of such codes. The aim of the codes is to encourage trust among European consumers, who may otherwise consider that organisations who have only national codes are unsuitable, as well as making penetration of European markets more difficult. The responsibility for the development of a Code of Conduct for European Surveyors has been given to the Comité de Liaison des Géomètres Européens Geometer Europas. The latest version on the code was released in 2015 and can be viewed at: https://ec.europa.eu/digital-single-market/en/content/code-conduct-council-european-geodetic-surveyors-geometer-europas-clge-ge.

Public procurement beyond Europe

There are no multilateral rules governing public procurement. As a result, governments are able to maintain procurement policies and practices that are trade distortive. That many governments wish to do so is understandable; government purchasing is used by many as a means of pursuing important policy objectives that have little to do with economics – social and industrial policy objectives rank high among these. The plurilateral Government Procurement Agreement (GPA) partially fills the void. GPA is based on the GATT provisions negotiated during the 1970s, and is reviewed and refined at meetings (or rounds) by ministers at regular intervals. Its main objective is to open up international procurement markets by applying the obligations of non-discrimination and transparency to the tendering procedures of government entities. It has been estimated that market opportunities for public procurement increased tenfold as a result of the GPA. The GPA's approach follows that of the European rules. The Agreement establishes a set of rules governing the procurement activities of member countries and provides for market access opportunities. It contains general provisions prohibiting discrimination as well as detailed award procedures. These are quite similar to those under the European regime, covering both works and other services involving, for example, competition, the use of

formal tendering and enforcement, although the procedures are generally more flexible than under the European rules. However, GPA does have a number of shortcomings. First, and perhaps most significantly, its disciplines apply only to those World Trade Organization members who have signed it. The net result is a continuing black hole in multilateral WTO rules that denies access or provides no legal guarantees of access to billions of dollars of market opportunities in both the goods and services sector. The present parties include the European Union, Aruba, Norway, Canada, Israel, Japan, Liechtenstein, South Korea, the USA, Switzerland, Singapore, a total membership of 164 countries and states.

Developments in public procurement

As in the private sector, information technology is the driving force in bringing efficiency and added value to procurement. However, despite the many independent research projects that have been undertaken by the private sector, the findings cannot simply be lifted and incorporated into the public sector due to the numerous UK and European Community regulations that must be adhered to. Notwithstanding these potential problems, the UK Government has set a ambitious targets for the adoption of e-tendering in the public sector.

Of all strands of the e-business revolution, it is e-procurement that has been the most broadly adopted, has laid claim to the greatest benefits, and accounts for the vast majority of electronic trading.

Exporting construction expertise

The effect of culture on surveyors operating in international markets

As discussed in the opening of this chapter, culture can be a major barrier to international success. Culture must first be defined and then analysed so that it can be managed effectively; thereafter, there is the possibility of modelling the variables as an aid to business. A business culture does not change quickly, but the business environment from which it is derived and with which it constantly interacts is sometimes subject to radical and dramatic change. The business culture in a particular country grows partly out of what could be called the current business environment of that country. Yet business culture is a much broader concept, because alongside the impulses that are derived from the present business environment, there are historical examples of the business community. For example, as discussed in Chapter 1, the 1990 recession saw widespread hardship, particularly in the UK construction industry. There were many forecasts of doom during the early twenty-first century from analysts drawing comparisons between the state of business at this time with that in 1990, when record output, rising prices and full employment were threatening to overheat the economy as well as construction – can there be many quantity surveying practices in the UK that are not looking over their shoulders to see

Table 5.6 Sample of responses from 1,500 European companies as to effects of culture on business

China	Cultural differences are as important as an understanding of Asian or indeed other foreign languages.
Far East	One needs to know etiquette/hierarchical structure/manner of conduct in meetings.
Germany	Rigid approach to most operational procedures.
Middle East	Totally different culture – time, motivation, responsibility.
Russia	Inability to believe terms and conditions as stated really are what they are stated to be.
SE Asia	Strict etiquette of business in S. Korea and China can be a major problem if not understood.
France	Misunderstandings occurred through misinterpretation of cultural differences.

if and when the next recession is coming? Table 5.6 outlines a sample of the responses by 1,500 European companies questioned during a study into the effects of culture on business.

So what is culture? Of the many definitions of culture, the one that seems most accurately to sum up this complex topic is 'an historical emergent set of values'. The cultural differences within the property/construction sectors can be seen to operate at a number of levels, but can be categorised as follows:

1 Business/economic factors – e.g. differences in the economic and legal systems, labour markets, professional institutions etc. of different countries.
2 Anthropological factors, as explored by Hofstede (1984). The Hofstede IBM study involved 116,000 employees in 40 different countries, and is widely accepted as being the benchmark study in this field.

Of these two groups of factors, the first can be regarded as fairly mechanistic in nature, and the learning curve for most organisations can be comparatively steep. For example, the practice of quantity surveyors in France of paying the contractor a sum of money in advance of any works on site may seem anathema, but it is usual practice in a system where the contractor is a trusted member of the project team. It is the second category of cultural factors, the anthropological factors, that is more problematic. This is particularly so for small and medium enterprises, as larger organisations have sufficient experience (albeit via a local subsidiary) to navigate a path through the cultural maze.

Perhaps one of the most famous pieces of research on the effects of culture was carried out by Geert Hofstede for IBM. Hofstede identified four key value dimensions on which national culture differed (Figure 5.3), a fifth being identified and added by Bond in 1988 (Hofstede and Bond, 1988). These value dimensions were power distance, uncertainty avoidance, individualism/collectivism, and masculinity/femininity, plus the added long-/short-termism. Although neatly

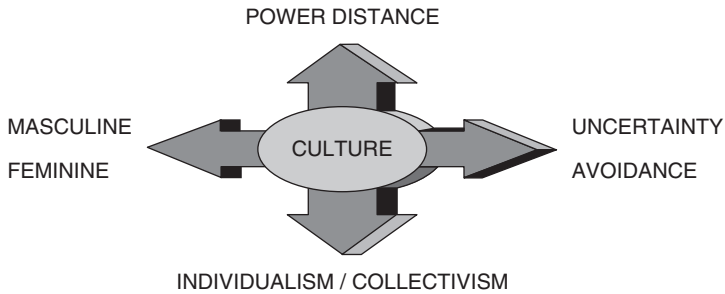


Figure 5.3 Four key value dimensions on which national culture differs

categorised and explained below, these values do of course in practice interweave and interact to varying degrees.

- *Power distance* indicates the extent to which a society accepts the unequal distribution of power in institutions and organisations, as characterised by organisations with high levels of hierarchy, supervisory control and centralised decision-making. For example, managers in Latin countries expect their position within the organisation to be revered and respected. For French managers, the most important function is control, which is derived from hierarchy.
- *Uncertainty avoidance* refers to a society's ability to cope with unpredictability. Managers avoid taking risks and tend to have more of a role in planning and co-ordination. There is a tendency towards a greater quantity of written procedures and codes of conduct. In Germany, managers tend to be specialists and stay longer in one job, and feel uncomfortable with any divergence between written procedures – for example, the specification for concrete work and the works on site. They expect instructions to be carried out to the letter.
- *Individualism/collectivism* reflects the extent to which the members of a society prefer to take care of themselves and their immediate families as opposed to being dependent on groups or other collectives. In these societies, decisions would be taken by groups rather than individuals, and the role of the manager is as a facilitator of the team (e.g. Asian countries). In Japan, tasks are assigned to groups rather than individuals, creating stronger links between individuals and the company.
- *Masculinity/femininity* refers to the bias towards an assertive, competitive, materialistic society (masculine) or the feminine values of nurturing and relationships. Masculine cultures are characterised by a management style that reflects the importance of producing profits, whereas in a feminine culture the role of the manager is to safeguard the well-being of the workforce. To the American manager, a low head count is an essential part of business success and high profit; anyone thought to be surplus to requirements will be told to clear his/her desk and leave the company.

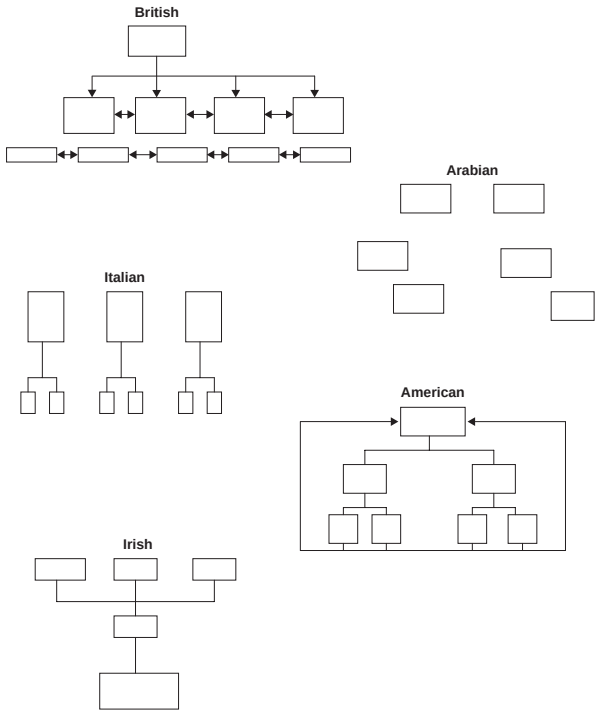


Figure 5.4 Organisational chart
Source: Adapted from International Management, Reed Business Publishing.

As a starting point for an organisation considering looking outside the UK for work, Figure 5.4 may be a somewhat light-hearted but useful discussion aid to help recognise and identify the different approaches to be found towards organisational behaviour in other countries/cultures – approaches that, if not recognised, can be a major roadblock to success.

Developing a strategy

The development process, when carried out internationally, is particularly complex to manage due to the weaving together of various cultures, including language (both generic and technical), professional standards and construction codes, design approaches and technology, codes of conduct, and ethical standards. Technical competency and cultural integration must be taken as read. The competencies necessary to achieve cultural fluency can therefore be said to be:

- interpersonal skills;
- linguistic ability;

- motivation to work abroad;
- tolerance of uncertainty;
- flexibility;
- respect;
- cultural empathy.

Case studies of SMEs show that 60 per cent of companies react to an approach from a company in another country to become involved in international working. The advantages of reacting to an enquiry are that this approach involves the minimum amount of risk and requires no investment in market research, but consequentially it never approaches the status of a core activity, it is usually confined to occasional involvement and is only ever of a superficial interest. However, to be successful, the move into overseas markets requires commitment, investment and a good business plan linked to the core business of the organisation.

A traditional approach taken by many surveying practices operating in world markets, particularly where English is not the first language, is to take the view that the operation should be headed up by a native professional, based on the maxim that, for example, 'it takes an Italian to negotiate with an Italian'. Although recognising the importance of cultural diversity, the disadvantages of this approach are that the parent company can sometimes feel like a wallflower, there is no opportunity for parent company employees to build up management skills, and in the course of time local professionals may decide to start their own business and take the local client base with them. If culture is defined as shared values and beliefs, then no wonder so many UK companies take this approach. How long, for example, would it take for a British quantity surveyor to acquire the cultural values of Spain? Reasons given by SMEs for not exporting are shown in Table 5.7.

The Review of Engineering Construction (2009) study *Changing to Compete* found that cultural and linguistic differences may pose significant barriers for UK companies seeking to win work in other countries. In addition, the skills required for international competition are thought to be more varied than those required when operating in a domestic market (UKCES) 2012). As a starting point,

Table 5.7 Reasons given by SMEs for not exporting

Reason for not exporting	*% of contracting SMEs*
Do not have a service suitable for exporting	66
Not part of business plan	26
Have sufficient UK business	11
Too costly	3
Lack of time to pursue export opportunities	2

Source: BIS Small business survey

a practice considering expanding into new markets outside the UK should undertake the following:

1 Carry out extensive market research:

- ensure market research covers communication (language and cultural issues);
- make frequent visits to the market; it shows commitment rather than trying to pick up the occasional piece of work;
- use written language to explain issues, since verbal skills may be less apparent;
- use exhibitions to obtain local market intelligence and feedback.

2 Ensure documentation is culturally adapted and not literally translated:

- brochures should be fully translated into local language on advice from local contacts;
- publish new catalogues in the local culture;
- set up the website in the local language, with the web manager able to respond to any leads – after all, if a prospective client is expecting a fast response, waiting for a translator to arrive is not the way to provide it;
- adapt the titles of the services offered to match local perceptions;
- emphasise added value services.

3 Depending on the country or countries being targeted, operate as, for example, a European or Asian company, rather than a British company with a multilingual approach – think global, act local:

- arrange a comprehensive, multi-level programme of visits to the country;
- set up a local subsidiary company or local office or, failing that, set up a foreign desk inside the head office operating as if it is in the foreign country (keeping foreign hours, speaking foreign language, etc.);
- change the culture of the whole company at all levels from British to European, Asian, etc. as relevant;
- recruit local agents who have been educated in the UK, so they have a good understanding of UK culture too.

4 Implement a whole company development strategy:

- language strategy should be an integral part of a company's overall strategy as a learning organisation;
- identify the few individuals who can learn languages quickly and build on this;
- create in-house language provision;

- set up short-term student placements in the UK for foreign students, via a sponsored scheme such as the EU Lifelong Learning Programmes;
- target markets whose specialist language ability gives a competitive edge, e.g. China.

5 Sub-contract the whole export process to a specialist company:

- hire a company to provide an export package of contacts, liaison, translation, language training, etc.

6 Pool resources with other companies:

- share language expertise and expenses with other companies.

7 In joint ventures, collaboration can be based on:

- equity/operating joint ventures, in which a new entity is created to carry out a specific activity. Seen as a long-term commitment, the new entity has separate legal standing;
- contractual ventures, in which no separate entity is created and instead firms co-operate and share the risk and rewards in clearly specified and predetermined ways. On the face of it, this form of joint venture appears to be more formal.

8 Management contracts:

- the transfer of managerial skills and expertise in the operation of a business in return for remuneration.

Conclusion

With the advent of electronic communications, the possibilities that exist for quantity surveyors to operate on a European or global level have never been greater or easier to access. However, despite what some multinational organisations would have us believe, the world is not a bland homogeneous mass and organisations still need to pay attention to the basics of how to conduct interpersonal relationships if they are to succeed.

Ethical dilemma solution

Reject the work and report the matter to the practice partners.

RICS Members' confidential helpline is available to members on a 9–5 daily basis on +44 (0)20 7334 3867 and one of the range of matters that members can get help and advice on is ethical dilemmas.

Bibliography

ACA (2005) Code of Ethics. Available at: www.counseling.org/Resources/aca-code-of-ethics.pdf

Bardouil, S. (2001) Surveying takes on Europe. *Chartered Surveyor Monthly*, Jul/Aug: 20–22.

Brooke, M. Z. (1996) *International Management*, 3rd edn. Stanley Thornes.
Button, R. and Mills, R. (2000) Public sector procurement: the Harmon case. *Chartered Surveyor Monthly*, May 24.
Cartlidge, D. (1997) It's time to tackle cheating in EU public procurement. *Chartered Surveyor Monthly*, Nov/Dec: 44–45.
Cartlidge, D. and Gray, C. (1996) *Cross Border Trading for Public Sector Building Work within the EU*. European Procurement Group, Robert Gordon University.
CIOB (2006) *Corruption in the Construction Industry: A Survey*. The Chartered Institute of Building.
Commission of the European Communities (1994) *Public Procurement in Europe: The Directives*. Office for Official Publications of the European Communities.
Department for Business, Innovation and Skills (2013) *UK Construction: An Economic Analysis of the Sector*. HMSO.
Department for Business, Innovation and Skills (2015) *Guide for Employers: Whistleblowing*. HMSO.
Evans, R. (2009) Alan Wainwright: The lonely life of the construction industry whistle-blower. *The Guardian*, 15 May.
Fisher, C. and Lovell, A. (2009) *Business Ethics and Values*, 3rd edn. Prentice Hall.
Hagen, S. (ed.) (1997) *Successful Cross-Cultural Communication Strategies in European Business*. Elucidate.
Hagen, S. (1998) *Business Communication Across Borders: A Study of the Language Use and Practice in European Companies*. The Centre for Information on Language Teaching and Research.
Hall, E. T. (1990) *Understanding Cultural Differences*. Intercultural Press.
Hall, M. A. and Jaggar, D. M. (1997) Should construction enterprises work internationally, take account of differences in culture? *Proceedings of the Thirteenth Annual ARCOM 97 Conference, King's College Cambridge, 15–17 September*.
Hofstede, G. (1984) *Culture's Consequences: International Differences in Work-Related Values*. Sage Publications.
Hofstede, G. and Bond, M. H. (1988) *The Confucius Connection: From Cultural Roots to Economic Growth*. Organizational Dynamics.
International Ethics Standards Coalition (IESC) (2016) *An Ethical Framework for the Global Property Market*. IESC.
Matthews, D. (2010) Cover pricing 'as common now as it was two years ago'. *Building*, 11 June.
McKendrick, P. (1998) RICS Annual Report and Accounts: President's Statement. *Chartered Surveyor Monthly*, 2 Feb.
McKillop, G. (2009) Fraud in construction – follow the money. *isurv*, December.
Moore, G. and Robson, A. (2002) The UK supermarket industry: an analysis of corporate and social responsibility. *Business Ethics: A European Review*.
Nash, L. (1981) Ethics without the sermon. *Harvard Business Review*, 59, Nov/Dec.
Plimmer, F. (2009) *Professional Ethics: The European Code*. College of Estate Management, Reading.
Review of Engineering Construction (2009) *Changing to Compete*. NBS.
RICS (1998) *Agenda for Change*. RICS.
RICS (2000) Professional ethics guidance note, RICS Professional Regulation and Consumer Protection Department, RICS.
RICS (2003) Professional Ethics Guidance Note (2003) Part 2 Case Studies. Available at: www.joinmyapc.eu/documents/en/guidance.notes.case.studies
RICS (2006) *Core Values*. RICS.

RICS (2007a) *Rules of Conduct for Firms*. RICS.
RICS (2007b) *Rules of Conduct for Members*. RICS.
RICS (2007c) Ethics Help Sheet. RICS.
RICS (2010) Fraud in Construction Guidance Note. Available at: www.rics.org/uk/regulation1/compliance1/ethics--professional-standards/
RICS (2015) *RICS Futures: Our Changing World: Let's Be Ready*. RICS.
RICS (2017) *Professional Standards and Guidance: Global Conflicts of Interest*, 1st edn, RICS.
Stadler, H. A. (1986). *Making hard choices: Clarifying controversial ethical issues*. *Counseling & Human Development*, 19, 1–10.
Tisser, M. *et al*. (1996) Chartered surveyors: an international future. *Chartered Surveyor Monthly*, 15 Oct.
UKCES (2012) *Sector Skills Insights Report*. HMSO.

6 Delivering added value

> The QS of 2025 is expected to be an expert in their field, innovative, yet traditional, competent while coping with new demands on their time and services. Developing new practices and embracing new technologies but still delivering significantly more for less.
>
> (David Bucknall, Chairman of the RICS QS and Construction Professional Group Board, 2015)

Introduction

As discussed in Chapter 1, there has been a trend in recent years for traditional quantity surveying practices to be subsumed into large multidisciplinary, multinational organisations.

This chapter examines the ways by which quantity surveyors are increasingly delivering a range of added value services to clients, based upon increased client focus and greater understanding of the function of built assets including such basic questions as why new buildings are commissioned in the first instance, and what is their function? Many construction clients who operate in highly competitive global markets (see Chapter 5) are increasingly basing procurement strategies on the degree of added value that can be demonstrated by a particular strategy. In order to meet these criteria, quantity surveyors must: 'get inside the head' of their clients, fully appreciate their business objectives and find new ways to deliver value and thereby conversely remove waste from the procurement and construction process.

Procurement

The dictionary definition of procurement is 'the management of obtaining goods and services'. For many years quantity surveyors took this to mean appointing a contractor who submitted the lowest, that is to say cheapest tender price, based upon a bill of quantities and drawings, in competition with several other contractors. For public sector works, a low-priced tender was almost guaranteed to win the contract, as public entities had to be seen to be spending public money prudently and would have had to develop a very strong case not to award a contract

on the basis of the cheapest price. It is now clear that assembling an ad hoc list of six or so contractors, selected primarily on their availability, to tender for building work, for which they have very little detailed information, is not the best way to obtain value for money. In fact, it does little more than reinforce the system in which contractors submit low initial prices secure in the knowledge that the contract will bring many opportunities to increase profit margins in the form of variation orders, claims for extensions of time/loss and expense or mismanagement by the design team. Before the Latham Report, the over-riding ethos for procuring building works was to treat the supply chain with great suspicion; it was almost as if a cold war existed between client, design team and contractor/sub-contractors. The emphasis in construction procurement has now swung away from the system described above towards systems that encourage partnerships and inclusion of the supply chain at an early stage – in fact, to a point where the definition of procurement could be restated as 'obtaining value for money deals'. As discussed in Chapter 1, there can now be few individuals involved within the construction process who do not believe that the design, procurement and construction of new built assets have to become more efficient and client-orientated. The evidence of wastage, in terms of materials, time and money not only in the short term, but also throughout the life-cycle of a building, leaves the UK construction industry as well as its associated professions, including quantity surveyors, in an embarrassing position and open to criticism from all sides for participating in the production of such a low value product. For whatever reason, the quantity surveyor and the traditional brick-counting image enthusiastically fostered by so many within the industry, including the trade press, have also been the focus for this 'out of touch' image. For many years the quantity surveyor has been seen as the accountant to the construction industry, a knight in shining armour, safeguarding the client to ensure that they receive a building as close as possible to the initial agreed target price, although in practice, this has seldom been achieved. Traditionally, a target cost was set by the quantity surveyor, in discussion with the client at the outset and then the process has been worked backwards squeezing in turn: the contractors, sub-contractors and suppliers in order to keep within this target cost. The squeezing increases in direct proportion to the further down the supply chain the organisation comes.

The consequences of the supply chain squeeze illustrated in Figure 6.1 are low profit margins, lack of certainty and continuity for suppliers, delays in production, lack of consideration of whole life costs, sub-optimal functionality and rampant waste. In turn, low profits ensure that few, if any, resources can be channelled into research, technological improvement, or quality assurance procedures. The Housing Grants, Construction and Regeneration Act 1996 and the Local Democracy, Economic Development and Construction Act 2009 (now called the new Act) did, to a certain extent, make the position of sub-contractors more secure; however, their position in the supply chain still makes them vulnerable.

Construction productivity lags behind that of manufacturing and yet manufacturing has been a reference point and a source of innovation in construction

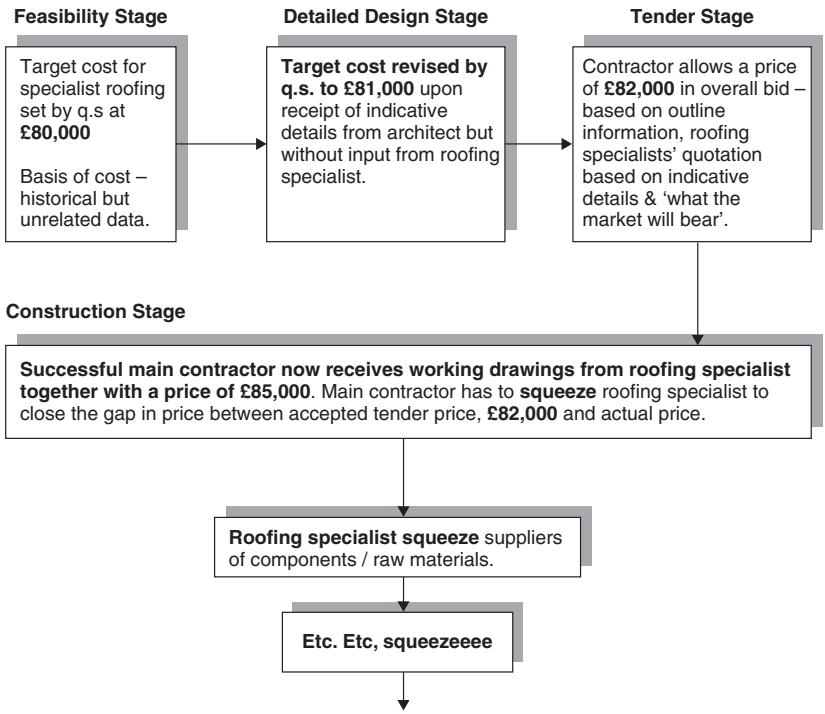


Figure 6.1 Consequences of the supply chain squeeze

for many decades, for example, modern methods of construction (MMC), currently undergoing a resurgence in interest in the UK, and the use of BIM, come directly from the manufacturing sector. But while some innovations have crossed the divide from manufacturing to construction, there has been little enthusiasm for other production philosophies. However, new manufacturing industry-based approaches to supply chain management are now being used by the construction industry to enable the early involvement of suppliers and sub-contractors in a project with devolved responsibility for design and production of a specific section of a building, with predicted and guaranteed whole life costs, for periods of up to 35 years. The benefits of this new approach for clients include the delivery of increased functionality at reduced cost and for the supply chain members: certainty, less waste and increased profits.

Supply chain relationships and management

Analysis carried out by E.C. Harris in 2013 (*Supply Chain Analysis into the UK Construction Sector*) indicates that for a typical £25 million project, the main contractor may be directly managing around 70 sub-contracts, a large proportion

of which are small at £50,000 or less. For regional contracts, the size may even be smaller with 70 per cent of sub-contracts being less than £10,000. According to BIS Research Paper No. 145 (2013), project managers have a key role in connection with project performance as follows:

- behavioural issues within project teams were identified as a very important positive improvement driver. Interviewees identified the contractor's project manager as having a key role in positively influencing these behaviours;
- due to the complexity of the supply chain, a high level of informal collaboration, the need to accommodate change and low margins – the research demonstrates that effective site management has a key role in delivering successful outcomes for clients and constructors;
- feedback from the supply chain suggests that investment in the improvement of site management skills will help to drive better performance.

A construction project organisation is traditionally a temporary organisation designed and assembled for the purpose of the particular project. It is made up by different companies and practices, which have not necessarily worked together before and which are tied to the project by means of varying contractual arrangements. This is what has been termed a temporary multi-organisation; its temporary nature extends to the workforce, which may be employed for a particular project, rather than permanently. These traditional design team / supply chain models are the result of managerial policy aimed at sequential execution and letting out the various parts of the work at apparently the lowest costs. The problems for process control and improvement that this temporary multi-organisation approach produces are related to:

- communicating data, knowledge and design solutions across the organisation;
- stimulating and accumulating improvement in processes that cross the organisational borders;
- achieving goal congruity across the project organisation;
- stimulating and accumulating improvement inside an organisation with a transient workforce.

The following quote, attributed to Sir Denys Hinton speaking at the RIBA, seems to sum up the traditional attitude of building design teams:

> The so-called building team. As teams go, it really is rather peculiar, not at all like a cricket eleven, more that a scratch bunch consisting of one batsman, one goal keeper, a pole vaulter and a polo player. Normally brought together for a single enterprise, each member has different objectives, training and techniques and different rules. The relationship is unstable, and with very little functional cohesion and no loyalty to a common end beyond that of coming through unscathed.

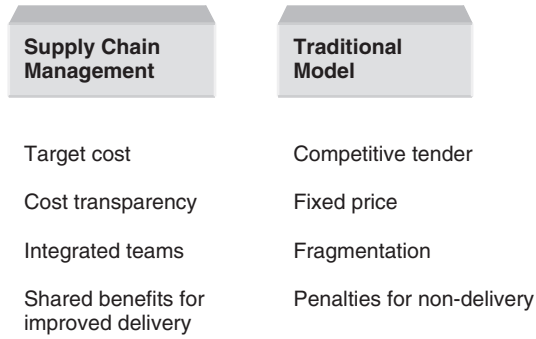


Figure 6.2 The contrast between traditional approaches and supply chain management

Most of what is encompassed by the term supply chain management was formerly referred to by other terms, such as 'operations management' but the coining of a new term is more than just new management speak, it reflects the significant changes that have taken place across this sphere of activity. These changes result from changes in the business environment. Most manufacturing companies are only too aware of such changes, increasing globalisation, savage price competition, increased customer demand for enhanced quality and reliability, etc. Supply chain management was introduced in order that manufacturing companies could increase their competitiveness in an increasingly global environment as well as their market share and profits by:

- minimising the costs of production on a continuing basis;
- introducing new technologies;
- improving quality;
- concentrating on what they do best.

The contrast between traditional approaches and supply chain management can be summed up as shown in Figure 6.2.

The quantity surveyor as supply chain manager

What is the driving force for the introduction of supply chain management into the UK construction industry? As described in Chapter 1, the CRINE initiative in the oil industry was the result of the collapse of world oil prices to what seems like today an unbelievable $13 a barrel in 1992; however, in construction very little impetus has come from the industry, it is clients who are the

driving force. As discussed elsewhere, unlike other market sectors, because the majority of organisations working in construction are small, the industry has no single organisation to champion change. When Latham called for a 30 per cent reduction in costs, the knee-jerk response from some quarters of the profession and industry was that cost = prices and therefore it was impossible to reduce the prices entered in the bill of quantities by this amount, therefore the target was unrealistic and unachievable. But, this was not what Latham was calling for, as will be demonstrated in the following paragraphs. Reducing costs goes far beyond cutting the prices entered in the bill of quantities, if it ever did, it extends to the reorganisation of the whole construction supply chain in order to eliminate waste and add value. The immediate implications of supply chain management are:

- key suppliers are chosen on criteria, rather than job-by-job on competitive quotes;
- key suppliers are appointed on a long-term basis and proactively managed;
- all suppliers are expected to make sufficient profits to reinvest.

How many quantity surveyors have asked themselves the following question at the outset of a new project?

'What does value mean for my client?'

In other words, in the case of a new plant to manufacture, say, pharmaceutical products, what is the form of the built asset that will deliver value for money over the life-cycle of the building for that particular client? For many years, whenever clients have voiced their concerns about the deficiencies in the finished product, all too often the patronising response from the profession has been to accuse the complainants of a lack of understanding of either design or the construction process or both. The answer to the value question posed above will of course vary between clients, a large multinational manufacturing organisation will have a different view of value to a wealthy individual commissioning a new house, but it helps to illustrate the revolution in thinking and attitudes that must take place. In general, the definition of value for a client is 'design to meet a functional requirement for a through-life cost'. Quantity surveyors are increasingly developing better client focus, because only by knowing the ways in which a particular client perceives or even measures value, whether in a new factory or a new house, can the construction process ever hope to provide a product or service that matches client expectations. Once these value criteria are acknowledged and understood, quantity surveyors have a number of techniques, described in this chapter, at their disposal in order to deliver to their clients a high degree of the feel-good factor.

Not all of the techniques are new, many practising quantity surveyors would agree that the strength of the profession is expertise in measurement, and in supply chain management there is a lot to measure, for example:

- measure productivity – for benchmarking purposes;
- measure value – demonstrating added value;
- measure out-turn performance – not the starting point;
- measure supply chain development – are suppliers improving as expected?
- measure ultimate customer satisfaction – customers at supermarket, passengers at airport terminal, etc.

Of course, measuring value is extremely difficult.

What is a supply chain?

Before establishing a supply chain or supply chain network, it is crucial to understand fully the concepts behind, and the possible components of, a complete and integrated supply chain. The term supply chain has been used to describe the sequence of processes and activities involved in the complete manufacturing and distribution cycle – this could include everything from product design through materials and component ordering through manufacturing and assembly until the finished product is the hands of the final owner. Of course, the nature of the supply chain varies from industry to industry. Members of the supply chain can be referred to as upstream and downstream supply chain members (Figure 6.3). Supply chain management, which has been practised widely for many years in the manufacturing sector, therefore refers to how any particular manufacturer involved in a supply chain, manages its relationship both upstream and downstream with suppliers to deliver cheaper, faster and better. In addition, good management means creating a safe commercial environment, in order that suppliers can share pricing and cost data with other supply team members.

The more efficient or lean the supply chain, the more value is added to the finished product. As if to emphasise the value point, some managers substitute the word value for supply to create the value chain. In a construction context, supply chain management involves looking beyond the building itself and into the process, the components and materials which make up the building. Supply chain management can bring benefits to all involved, when applied to the total process,

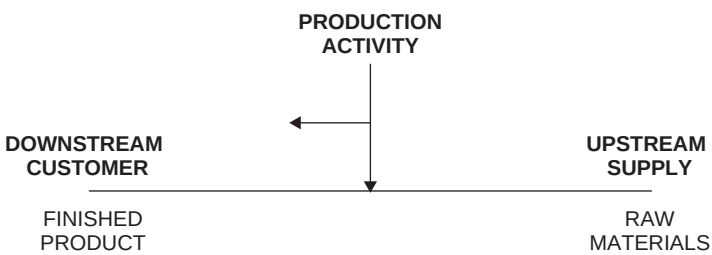


Figure 6.3 Members of the supply chain

which starts with a detailed definition of the client's business needs which can be provided through the use of value management, and ends with the delivery of a building which provides the environment in which those business needs can be carried out with maximum efficiency and minimum maintenance and operating costs. In the traditional methods of procurement the supply chain does not understand the underlying costs, hence suppliers are selected by cost and then squeezed to reduce price and whittle away profit margins:

- bids based on designs to which suppliers have no input;
- no buildability;
- low bids always won;
- unsustainable – costs recovered by other means;
- margins low, so no money to invest in research and development;
- suppliers distant from final customer so took limited interest in quality.

The traditional construction project supply chain can be described as a series of sequential operations by groups of people or organisations.

Typical construction supply chain

Supply chains are unique, but it is possible to classify them generally by their stability or uncertainty on both the supply side and the demand side. On the supply side, low uncertainty refers to stable processes, while high uncertainty refers to processes which are rapidly changing or highly volatile. On the demand side, low uncertainty would relate to functional products in a mature phase of the production life-cycle, while high uncertainty relates to innovative products. Once the chain has been categorised, the most appropriate tools for improvement can be selected.

The construction supply chain is the network of organisations involved in the different processes and activities that produce the materials, components and services that come together to design, procure and deliver a building. Traditionally, it is characterised by lack of management, little understanding between tiers of other tiers' functions or processes and lack of communications and a series of sequential operations by groups of people who are not concerned about the other groups or client. Figure 6.4 illustrates part of a typical construction supply chain, although in reality many more sub-contractors could be involved. The problems for process control and improvement that the traditional supply chain approach produces are related to:

- the various organisations who come together in a specific project at the end of which disband to form new supply chains;
- communicating data, knowledge and design solutions across the organisations that make up the supply chain;
- stimulating and accumulating improvement in processes that cross the organisational borders;

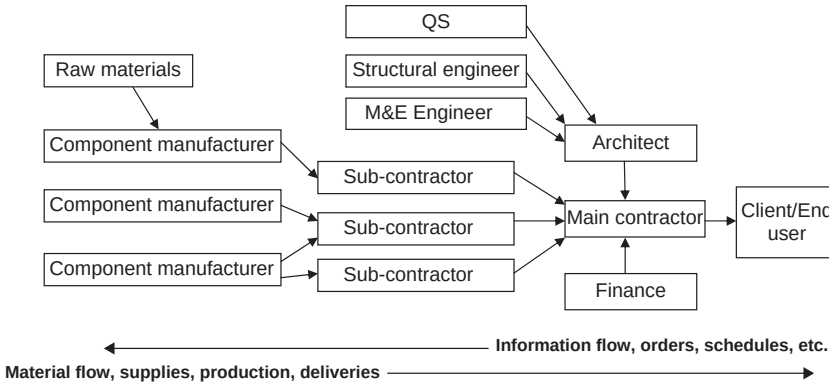


Figure 6.4 The traditional construction project supply chain

- achieving goals and objectives across the supply chain;
- stimulating and accumulating improvement inside an organisation that only exists for the duration of a project.

However, supply chain management takes a different approach that includes:

- prices are developed and agreed, subject to an agreed maximum price with overheads, and profit is ring-fenced. All parties collaborate to drive down cost and enhance value with, for example, the use of an incentive scheme;
- with costs determined and profit ring-fenced, waste can now be attacked to bring down price and add value with an emphasis on continuous improvement;
- as suppliers account for 70–80 per cent of building costs, they should be selected on their capability to deliver excellent work at competitive cost;
- suppliers should be able to contribute new ideas, products and processes;
- suppliers should be able to build alliances outside of the project;
- suppliers should be managed so that waste and inefficiency can be continuously identified and removed.

The philosophy of integrated supply chain management is based upon defining and delivering client value through established supplier links that are constantly reviewing their operation in order to improve efficiency. There are now growing pressures to introduce these production philosophies into construction and it is quantity surveyors with their traditional skills of cost advice and project management who can be at the forefront of this new approach. For example, the philosophy of lean thinking, which is based on the concept of the elimination of waste from the production cycle, is of particular interest in the drive to deliver better value. In order to use the lean thinking philosophy, the first hurdle that must be crossed is the idea that construction is a manufacturing industry which can only operate efficiently by means of a managed and integrated supply chain. At present, the

majority of clients are required to procure the design of a new building separately from the construction; however, as the subsequent delivery often involves a process where sometimes as much as 90 per cent of the total cost of the completed building is delivered by the supply chain members, there would appear to be close comparisons with, say, the production of a motor car or an aeroplane.

The basics of supply chain management can be said to be:

1. Determine which are the strategic suppliers, and concentrate on these key players as the partners who will maximise added value.
2. Work with these key players to improve their contribution to added value.
3. Designate these key suppliers as the 'first tier' on the supply chain and delegate to them the responsibility for the management of their own suppliers, the 'second tier' and beyond.

To give this a construction context, the responsibility for the design and execution of, say, mechanical installations could be given to a 'first tier' engineering specialist. This specialist would in turn work with its 'second tier' suppliers as well as with the design team to produce the finished installation. Timing is crucial as first tier partners must be able to proceed confident that all other matters regarding the interface of the mechanical and engineering installation with the rest of the project have been resolved and that this element can proceed independently. Although at least one food retail organisation, using supply chain management for the construction of its stores, still places the emphasis on the tier partners to keep themselves up to date with progress on the other tiers, as any other approach would be incompatible with the rapid timescales that are demanded.

Despite the fact that, on the face of it, certain aspects of the construction process appear to be a prime candidate for this approach, the biggest obstacles to be overcome by the construction industry in adopting manufacturing industry style supply chain management are:

1. Unlike manufacturing, the planning, design and procurement of a building are very often at present separated from its construction or production.
2. The insistence that, unlike an aeroplane or motor car, every building is bespoke, a prototype, and therefore is unsuited to this type of model or for that matter any other generic production sector management technique. This factor manifests itself by:
    - geographical separation of sites that causes breaks in the flow of production;
    - discontinuous demand;
    - working in the open air, exposed to the elements. Can there be any other manufacturing process, apart from shipbuilding, that does this?
3. Reluctance by the design team to accept early input from suppliers and sub-contractors and unease with the blurring of traditional roles and responsibilities.

There is little doubt that the first and third hurdles are the result of the historical baggage outlined in Chapter 1 and that, given time, they can be overcome, whereas the second hurdle does seem to have some validity despite statements from the proponents of production techniques, buildings are not unique and that commonality even between apparently differing building types is a high as 70 per cent (Ministry of Defence, 1999). Interestingly though, one of the main elements of supply chain management, Just in Time (JIT) was reported to have started in the Japanese shipbuilding industry in the mid-1960s, the very industry that opponents of JIT in construction quote as an example where, like construction, supply chain management techniques are inappropriate. Therefore, the point at which any discussion of the suitability of the application of supply chain management techniques to building has to start is with the acceptance that construction is a manufacturing process, which can only operate efficiently by means of a managed and integrated supply chain. One fact is undeniable – at present the majority of clients are required to procure the design of a new building separately from the construction. Until comparatively recently international competition, which in manufacturing is a major influencing factor, was relatively sparse in domestic construction of the major industrialised countries.

Table 6.1 Key features of the construction industry's nature and its challenges

STRENGTHS	*WEAKNESSES*
KEY SECTOR TO UK ECONOMY Wider construction accounts for nearly 7% of UK's value added: of which: construction related products and services accounts for about 4.7%. Some 3 million jobs are based in construction: 10% of total UK's employment.	**SECTOR INTEGRATION** Vertical integration in the supply chain is low and there is high reliance on sub-contracting. Lack of integration often leads to fracture between the management of construction and its execution leading to lost opportunities to innovate.
WIDER ECONOMIC SIGNIFICANCE Construction sector builds and maintains workplaces to enable businesses to flourish; the economy functions; provides schools, hospitals and homes.	**LOW LEVELS OF INNOVATION** Investment in R&D and intangible assets such as new processes (particularly in contracting sub-sector) is low due to uncertain demand for new goods and limited collaboration.
LARGE SUPPLY CHAIN accounting for around £124 billion of intermediate consumption, almost all sourced within the UK supply chain.	**LACK OF COLLABORATION AND LIMITED KNOWLEDGE SHARING** Learning points from projects are often team breaks up and project ends. Low technology transfer.
WORLD CLASS DESIGN SKILLS particularly in architectural design, civil engineering and sustainable construction with BREEAM as an internationally recognised standard.	**HIGH CONSTRUCTION COSTS** in comparison to foreign competitors driven by inefficient procurement and processes rather than material input costs but there are significant opportunities to reduce them through greater use of technology, new materials and innovation.
LOW ENTRY COST AND LOW CAPITAL required enables small firms to access the market and promotes competition in the sector.	

(continued)

Table 6.1 (continued)

OPPORTUNITIES	*THREATS*
LARGE GROWTH OPPORTUNITIES IN EMERGING MARKETS with expected annual growth of 6% in construction output until 2021 which creates opportunities for UK companies to expand their exports, both in products and high value services. **LOW CARBON CONSTRUCTION** Substantial opportunities both in domestic and foreign markets due to environmental requirements and greater societal demand for greener products. Global green and sustainable building industry is forecasted to grow at an annual rate of 22.8% until 2017. **WIDE IMPLEMENTATION OF BIM TECHNOLOGIES** both domestically and abroad which could improve sector productivity and lower costs due to improved information flow and greater collaboration. **COST REDUCTION** Industry is capable of delivering its product at substantially lower cost e.g through greater technology and information sharing such as Building Information Modeling (BIM). UK Government is committed to reduce the costs of public sector construction by 15–20% by the end of 2014/15.	**ACCESS TO FINANCE** SMEs in construction face more difficulties in accessing bank finance than other sectors. Late payment is a problem. Companies often unaware of support available to them. **SKILLS** Substantial fall in apprenticeship completions in construction related sectors relative to other sectors. Low training among self-employed and skills shortage among trade and professional occupations inhibiting technology deployment and innovation. **LACK OF CAREER ATTRACTION** due to perceived low image, low pay and job security due to cyclical nature of demand for construction contracting and materials. **INTERNATIONAL TRADE** UK has not yet specialised in construction exports despite its capability in construction technology and services and relatively higher proportion of construction-related patents compared to its competitors. UK remains a net importer of construction products and materials. **HIGH DEGREE OF FRAGMENTATION** relative to other sectors and countries which impacts on levels of collaboration, innovation and ability to access foreign markets.

Source: HM Government (2013) Construction 2015

The construction industry is a major contributor to UK growth. Key features of the industry's nature and the challenges it faces are set out in the SWOT analysis featured in Table 6.1. In the context of supply chain management, particular attention should be focused on the perceived lack of integration in the construction process.

Adding value and minimising waste

The primary focus therefore in the design of new built assets is on minimising value loss, whereas in construction it is on minimising waste.

The following statistics are taken from various reports from CIRIA and Movement for Innovation:

- every year in the UK approximately 13 million tonnes of construction materials are delivered to site and thrown away – unused;
- some 10 per cent of products are wasted through oversupply, costing £2.4 billion per annum;
- another £2.4 billion per annum is wasted in stockpiling materials;
- £5 billion per annum is squandered by the misuse of materials.

The lean construction tool box

One of the most powerful and useful tools in the lean construction tool box is value management.

Value analysis/engineering/management

It is a pity that the term value management is today used by many quantity surveyors as a term to describe what has traditionally been termed cost reconciliation – that is to say, making the job fit the price. Nothing could not be further from the concept of value analysis developed by Lawrence Miles in the late 1940s as an organised approach to the identification and elimination of unnecessary cost.

Another confusing trend has been to use the terms value management and value engineering interchangeably. The RICS Black Book guidance note tries to clarify any confusion between the two terms as follows:

> Whereas the output from a VM study is a report outlining different approaches to the relationship between project objectives and business needs, or to strategic, project-related problems such as which site to select for a new development or which procurement route to use, in contrast the output from a VE study produces a summary of different approaches to achieving the required functionality for a particular material, component or system, the comparative costs of each of the approaches assessed, and a recommended approach that provides the best value for the project.

It would appear from the above that value management has close similarities with cost benefit analysis.

The Association for Project Management, in its (2013) White Paper, 'Value Management Specific Interest Group October 2013 Discussion' appears to add to the confusion of the two terms.

Central to the goal of delivering built assets that meet the functional and operational needs of a client are the techniques of value engineering and value management. Developed first in the United States of American for the manufacturing and production sectors, by Lawrence D. Miles, in the immediate post-Second World War era as value analysis, later rebadged as value engineering/management, this approach is now widely practised by UK quantity surveyors

in both public and private sectors. To quote Robert N. Harvey, one-time manager of capital programmes and value management for the Port Authority of New York and New Jersey: 'Value Engineering is like love – until you've experienced it, you just can't begin to understand it.' In the early 1990s, the Port Authority conducted value engineering workshops on nearly $1 billion worth of construction projects. The total cost of the workshops was approximately $1 million, a massive statement of confidence in the technique that paid off delivering nearly $55 million in potential savings.

For a somewhat more objective view of the process, perhaps the reference point should be SAVE, The International Society of American Value Engineers whose definition of value engineering is: 'A powerful problem solving tool that can reduce costs while maintaining or improving performance and quality. It is a function-oriented, systematic team approach to providing value in a product or service.'

The philosophy of value engineering/management is a step change from the traditional quantity surveying belief that delivering value is based on the principle of cutting costs to keep within the original budget – what was and still is euphemistically referred to as cost reconciliation. Unlike this approach, the basis of value management is to analyse, at the outset, the function of a building, or even part of a building, as defined by the client or end user. Then, by the adoption of a structured and systematic approach, to seek alternatives and remove or substitute items that do not contribute to the efficient delivery of this function, thereby adding value. The golden rule of value engineering/management is that as a result of the value process, the function(s) of the object of the study should be maintained and if possible enhanced, but never diminished or compromised (Figure 6.5).

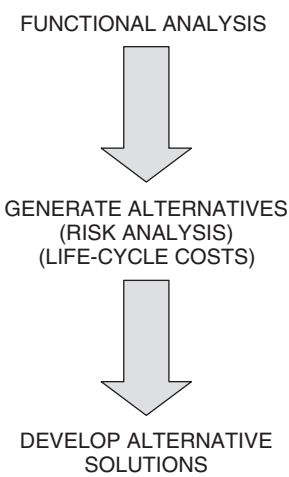


Figure 6.5 Value engineering/management: the functional analysis phase

Therefore, once again, the focus for the production of the built asset is a client's perception of value. Perhaps before continuing much further the terms in common usage associated with various value methodologies should be explained.

Value analysis

The name adopted by Lawrence D. Miles for his early studies and defined as an organised approach to the identification and elimination of unnecessary cost.

Value engineering

The name adopted in 1959 by SAVE when it was established, to formalise the Miles approach. A term widely used in North America; the essential philosophy of VE is: 'A disciplined procedure directed towards the achievement of necessary function for minimum cost without detriment to quality, reliability, performance or delivery.' As if to emphasise the importance now being placed on value engineering, in 2000, Property Advisors to the Civil Estate (PACE) introduced an amendment to GC/Works/1 – Value Engineering Clause 40(4). The amendment states:

> The Contractor shall carry out value engineering appraisals throughout the design and the construction of the Works to identify the function of the relevant building components and to provide the necessary function reliability at the lowest possible costs. If the Contractor considers that a change in the Employer's Requirements could effect savings, the Contractor shall produce a value engineering report.

Value management

Value management involves considerably more emphasis on problem solving as well as exploring in depth functional analysis and the relationship between function and cost. It also incorporates a broader appreciation of the connection between a client's corporate strategy and the strategic management of the project. In essence, value management is concerned with the 'what' rather than the 'how' and would seem to represent the more holistic approach now being demanded by some UK construction industry clients, i.e. to manage value. The function of value management is to reduce total through-life costs comprising initial construction, annual operating, maintenance and energy costs and periodic replacement costs, without affecting the actual improving performance and reliability and other required design parameters. It is a function-oriented study and is accomplished by evaluating functions of the project and its sub-systems and components to determine alternative means of accomplishing these functions at lower cost. Using value management, improved value may be derived in three predominant ways:

- providing for all required functions, but at a lower cost;
- providing enhanced functions at the same cost;
- providing improved function at a lower cost – **the Holy Grail**.

Among other techniques, value management uses a value engineering study or workshop, that brings together a multidisciplinary team of people, independent of the design team, but who own the problem under scrutiny and have the expertise to identify and solve it. A value engineering study team works under the direction of a facilitator, who follows an established set of procedures, for example, the SAVE Value Methodology Standard (Figure 6.6), to review the project, making sure the team understands the client's requirements and develops a cost-effective solution. Perhaps the key player in a VE study is the facilitator or value management practitioner, who must within a comparatively short time ensure that a group of people works effectively together. People like Alphonse Dell'Isola, the Washington, DC-based practitioner, now retired, who rose to be an icon in value management circles and have helped SAVE prove their claim that value management produces savings of 30 per cent of the estimated cost for constructing a project, and that for every pound invested in a VE study,

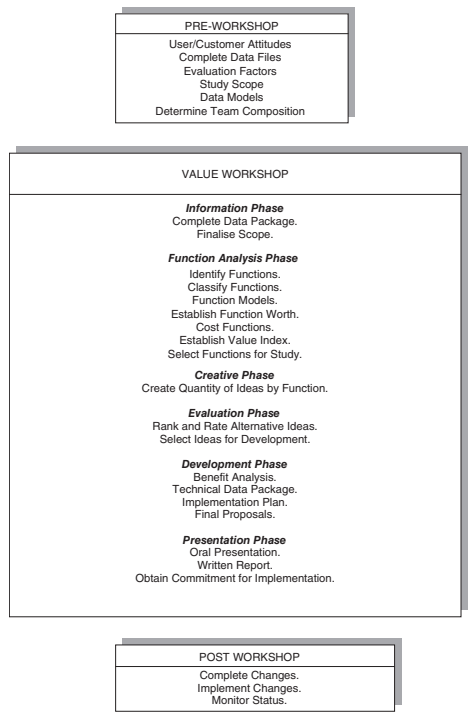


Figure 6.6 FAST diagram

Source: Society of American Value Engineers.

including participants' time and implementation costs, £10 is saved. Certainly, organisations which have introduced VE into their existing procurement process, for example, previously publicly owned water companies, London Underground, etc., all report initial savings of around 10–20 per cent. In some respects, value management is no more than the application of the standard problem-solving approach to building design. If there is one characteristic which makes VM/VE distinctive, it is the emphasis given to functional analysis.

The techniques that can be used to define and analyse function are:

- value trees;
- decision analysis matrix;
- functional Analysis System Technique diagrams (FAST);
- criteria scoring.

Once the function of an item has been defined, then the cost or worth can be calculated and the worth/cost ratio scrutinised to determine value for money. Value management, therefore, can be said to be a holistic approach to managing value that includes the use of value engineering techniques.

The process

The theory of value management is – **buy function, don't buy product**.

While it is not the aim of this book to give a detailed description of every stage of a value engineering workshop, it is worth spending some time to explain the process as well as examining in more detail the Functional Analysis Phase (Figure 6.6). Value management has its roots in the manufacturing sector where it has been around for many years and there can be problems applying the approach to the construction of a new building. Nevertheless, valuable insights into the functions behind the need for a new building and what is needed to fulfil these functions can flow from a value engineering workshop, even if it is not as lengthy and detailed as the traditional 40 hours programme used in the so-called North American approach. If nothing else, it may be the only time in the planning and construction of a project when all the parties, client, end user, architect, quantity surveyor, sit down together to discuss the project in detail.

For example, let's look at a hypothetical project where a value engineering workshop is used, the construction of a new clinic for the treatment of cancer. There are numerous variations and adaptations of, not only the approach to conducting a value engineering workshop, but also the preparation of items like the Functional Analysis System Technique (FAST) diagram in Figure 6.6. The FAST model works both vertically and horizontally by first determining the highest order function, called the task or mission, that is positioned to the left of the vertical scope line.

To illustrate the procedure, the following example is based on a classic, 40-hour, five-day, value engineering workshop, as this presents a more proven

and pragmatic approach than some of the latter-day variations of value engineering. The workshop team is made up of six to eight experts from various design and construction disciplines, who are not affiliated with the project, as it has been found that the process is not so vigorous if in-house personnel are used. In addition, an independent facilitator is recommended as also they have proved to be less liable to compromise on the delivery of any recommendations. The assembled team then commences the workshop, following the steps of the SAVE methodology, see Figure 6.6 on p. 214. At the start of the week, the group is briefed on the project by the clinic personnel and members of the design and construction team and the scope of the study is defined. Costs of the project are also carefully examined and analysed using a variety of techniques as well as compared with other facilities with a similar function. The first major task in the study is the Functional Analysis Phase, during which the most beneficial areas for value improvement will be identified. While unnecessary cost removal has been the traditional target for quantity surveyors, it is important to emphasise that more frequently today value studies are conducted to improve a building performance without increasing cost, or to express it more simplistically, to maximise 'bang for your buck'.

Functional analysis using a FAST model follows the following steps:

- defining function;
- classifying function;
- developing function relationships;
- assigning cost to function;
- establishing function worth.

It should be noted that the approach outlined in Figure 6.7 is the ideal; however, it does suffer from the disadvantages that it can be very resource-hungry and in practice it is often adapted in order to limited the involvement of expensive personnel. In addition, it assumes the appointment of an external/independent value engineering practitioner to run the workshops, which again may not be possible.

Function: definition

Definition of function can be problematic, experience has shown that the search for a definition can result in lengthy descriptions that do not lend themselves to analysis. In addition, the definition of function has to be measurable. Therefore, a method has been devised to keep the expression of a function as simple as possible; it is a two-word description made up from a verb and a noun. Table 6.2 shows two lists of typical verbs and nouns; more comprehensive lists are readily available.

At first sight this approach may appear to be contrived, but it has proved effective in pinpointing functions. It is not cluttered with superfluous information and

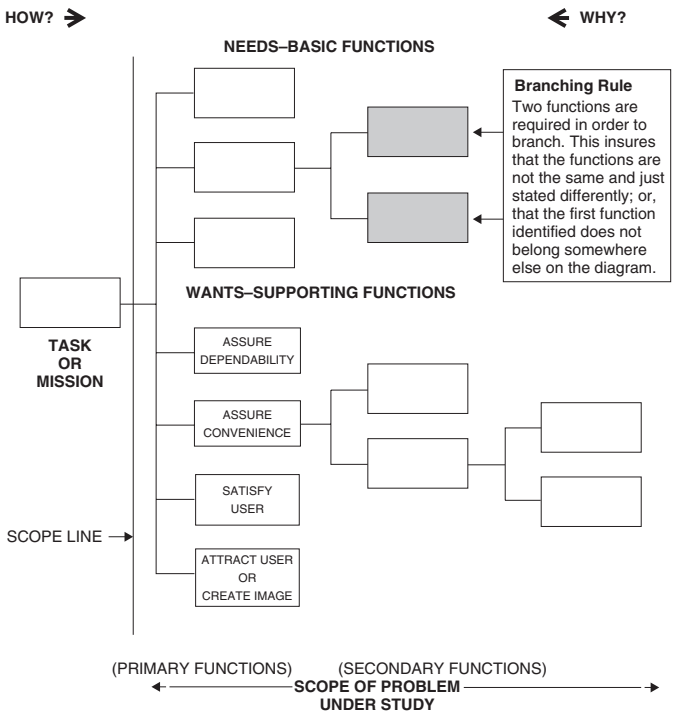


Figure 6.7 FAST diagram
Source: SAVE International.

Table 6.2 Typical verbs and nouns used in functional analysis

Verbs		*Nouns*	
Amplify	Limit	Area	Power
Attract	Locate	Corrosion	Protection
Change	Modulate	Current	Radiation
Collect	Move	Damage	Repair
Conduct	Protect	Density	Stability
Contain	Remove	Energy	Surface
Control	Rotate	Flow	Vibration
Enclose	Secure	Fluid	Voltage
Filter	Shield	Heat	Volume
Hold	Support	Insulation	Weight

promotes full understanding by all members of the team regardless of their knowledge or technical backgrounds. For example, identify treatment, assess condition, diagnose illness, see Figure 6.8.

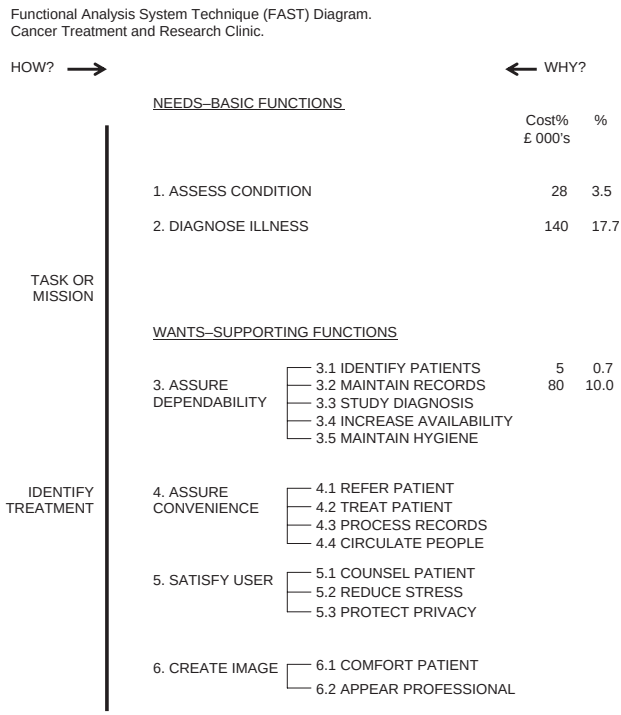


Figure 6.8 FAST diagram: Cancer treatment and research clinic

Classifying function

In order to establish some sort of hierarchy, functions are classified into primary or basic functions and supporting functions. Basic functions or needs are functions that make the project or service work, if omitted, they would impact on the effectiveness of the completed project. Out of the list of basic functions emerges the highest order function, which can be defined as the overall reason for the project and meets the overall needs of the client. This function is placed to the left of the scope line on the FAST diagram, see Figure 6.7 on p. 217. The second grouping of functions, supporting functions, may in the majority of cases contribute nothing to the value of a building. Supporting functions generally fall into the following categories:

- assure dependability;
- assure convenience;
- satisfy user;
- create image.

At first glance, these categories may seem to have little relevance to construction related activities, until it is understood that, for example, the 'create image' heading includes items such as aesthetic aspects, overall appearance, decoration and implied performance, such as reliability, safety, etc. Items that in themselves are not vital for the integrity of the project, but nevertheless may be high on the client's list of priorities.

Developing functional relationships

Functional Analysis System Technique (FAST) models are a method of depicting functional relationships, see Figure 6.7 on p. 217. The model works both vertically and horizontally by first determining the highest order function, called the task or mission, that is positioned to the left of the vertical scope line. By working from the left and asking the question HOW? and employing the verb/noun combination and working from the right asking the question WHY? the functions and their interrelationship can be mapped and their value allocated at a later phase.

Assigning cost to function

Conventionally, project costs are given in a detailed cost plan, where the actual costs of labour materials and plant are calculated and shown against an element, as in the Building Cost Information Service's standard list (Table 6.3).

Value engineering is based on the concept that clients buy functions, not materials or building components, as defined and expressed by their user requirements. Therefore, splitting costs among the identified functions, such as in a FAST diagram, shows how resources are spent in order to fulfil these functions. Costs can then be viewed from the perspective of how efficiently they deliver the function. Obviously, the cost of each element can cover several functions; for example, the element BCIS Ref 2G Internal Walls and Partitions may contribute to the delivery of several functions of the project. It is therefore necessary at the outset to study the cost plan and to allocate the costs to the appropriate function (Table 6.4).

A similar exercise is carried out until all of the project costs are allocated to functions.

Table 6.3 Elemental costs (Building Cost Information Service)

Element	*Total cost of element £*	*Cost per m² of gross floor area £*	*Element unit quantity*	*Element unit rate £*
2G Internal walls and partitions	430,283	45.00	8,025m²	53.62

Table 6.4 Example of cost allocation to function

Element: 2G Internal Walls and Partitions Elemental Cost: £430,283	
Function	*Cost £*
3.1 Indentify patients	12,000
3.2 Maintain records	30,000
3.3 Study diagnosis	25,900
3.4 Increase availability	6,900
3.5 Maintain hygiene	7,000
4.1 Refer patient	45,000
4.2 Treat patient	56,000
4.3 Process records	40,000
4.4 Circulate people	60,889
5.1 Counsel patient	26,605
5.2 Reduce stress	4,989
5.3 Protect privacy	38,000
6.1 Comfort patient	34,000
6.2 Appear professional	43,000
	£430,283

Establishing the function's worth

The next step is to identify which of the functions contains a value mismatch, or in other words seems to have a high contribution to the total project cost in relation to the function that it performs. Following on from this, the Creative Phase will concentrate on these functions. Worth is defined as 'the lowest overall cost to perform a function without regard to criteria or codes'. Having established the worth and the cost, the value index can be calculated. The formula is Value = Worth/Cost. The benchmark would be to achieve a ratio of 1.

The FAST diagram illustrated in Figure 6.7 on p. 217 is characterised by the following:

- the vertical 'scope line' which separates and identifies the highest level function – the task or mission – from the basic and supporting functions. It is pivotal to the success of a functional analysis diagram that this definition accurately reflects the mission of the project;
- the division of functions into Needs or Basic Functions – without these functions the project will not meet client requirements – and Wants or Supporting Functions; these are always usually divided into the four groups previously discussed. The project could still meet the client's functional requirements if these wants are not met or included;
- the use of verb/noun combinations to describe functions;
- reading the diagram from the left and asking the question how is the function fulfilled, provides the solution;

- reading the diagram from the right and asking the question Why? identifies the need for a particular function;
- the right-hand side of the diagram allows the opportunity to allocate the cost of fulfilling the functions in terms of cost and percentage of total cost.

Therefore, the FAST diagram in Figure 6.7 clearly shows the required identified functions of the project, together with the cost of providing those functions. What now follows is the meat of the workshop – a creative session that relies on good classic brainstorming of ideas, a process that has been compared by those who have experienced it to a group encounter session, the aim of which is to seek alternatives. The discussion may be structured or unstructured – Larry Miles was quoted as saying that the best atmosphere to conduct a study was one laced with cigarette smoke and Bourbon, but in these more politically correct times these aids to creativity are seldom employed. The rules are simple. Nobody is allowed to say, 'That won't work.' Anybody can come up with a crazy idea. These sessions can generate hundreds of ideas, of which perhaps 50 will be studied further in the workshop's Evaluation Phase. Those ideas will be revisited and some discussion will take place as to their practicality and value to the client. Every project will have a different agenda. It is suggested by the RICS Black Book guidance on value engineering and value management that the selection of the best ideas to be further developed could be based on:

- open discussion;
- open voting after a discussion;
- secret voting after a discussion.

The best of the recommendations are then fully developed by the team, typically on day four of the workshop and studies are carried out into costs and through-life costs of a proposed change before presentation to the client on the final day. It is an unfortunate fact of life of the classic five-day workshop that the team member tasked with costing the recommendations has to work into the night on the penultimate day. Finally, a draft report is approved and a final report is written by the team leader. In addition to the above procedures, a risk assessment can, or as is thought in some circles, should be introduced into the process. As the value analysts go through and develop value recommendations, they can be asked to identify risks associated with those recommendations, which can either be quantitative or qualitative. And if brainstorming sounds just a little esoteric to the quantity surveying psyche, take heart: the results of a value engineering workshop usually produce tangible results that clearly set out (see Figure 6.9) the costs and recommendations in a very precise format.

The question is often asked: are there projects that are beyond value management? The answer is most certainly – yes. There are many high-profile examples that flaunt the drive to lean construction and these mainly fall into the category of projects for which making a statement either commercially, politically or otherwise as their primary their highest order function. Flyvbjerg in his (2003) book,

PROJECT Cancer Treatment and Research Clinic			VALUE ENGINEERING PROPOSAL	
PROPOSAL Eliminate return duct to ventilation system			DATE	
			ITEM No H14	
ORIGINAL PROPOSAL: Each room has a return grille and ductwork connecting back to a return fan. PROPOSED CHANGE: Eliminate duct return system on individual floors and provide an above ceiling return plenum. ADVANTAGES: More available ceiling space Balancing of return system is simplified DISADVANTAGES: Plenum rated cable, tubing and pipe required May be acoustic transmission problems in walls				
COST SUMMARY	INITIAL COST	OPERATION & MAINTENANCE COST–15 Years		TOTAL LIFE CYCLE COST
		PER ANNUM	LIFECYCLE–PV@ 6%	
ORIGINAL PROPOSAL	£149,450	£4,000	£38,848	£188,298
VE PROPOSAL	£86,000	£2,000	£19,424	£105,424

Figure 6.9 Value engineering outcome report

Megaprojects and Risk: An Anatomy of Ambition, cites several examples of international megaprojects that have developed their own unstoppable momentum.

Managing the supply chain

The techniques described below have been included here and not in Chapter 3 as they are not strictly procurement but rather techniques for managing the supply chain.

Partnering and alliancing

The preferred approach to managing the supply chain is partnering – it has been described as welding the links of the supply chain together. Although the term partnering is relatively new, having been adopted in various guises within the UK construction industry since the late 1980s, this is not the case with the relationship itself. Some contractors had been practising what they might term collaborative contracting for many years before the term partnering was adopted with respect to a formal arrangement, for example, Bovis' relationship with Marks and Spencer.

Essentially, partnering enables organisations to develop collaborative relationships either for one-off projects (project-specific) or as long-term associations (strategic partnering). The process is used as a tool to improve performance, and may apply to two organisations (e.g. a client and a design and build contractor) or to a number of organisations within a formal or informal agreement (e.g. consultants, contractors, sub-contractors, suppliers, manufacturers, etc., with or without client participation). The partnering process is formalised within a relationship that might be defined within a charter or a contractual agreement. Partnering is seen by many as a means of avoiding risks and conflict. There is not one model partnering arrangement; it is an approach that is essentially flexible, and needs to be tailored to suit specific circumstances. In addition to partnering, another collaborative approach to project delivery is alliancing, described later in this chapter. The term partnering rather than partnerships was chosen for this procurement strategy because of the legal implications of partnerships. However, to some observers partnering is still an ambiguous term to which at least half a dozen different perspectives may be applied. Overall, partnering has received a mixed press in terms of improved performance. For instance, to some observers, partnering has been seen to try to impose a culture of win/win on top of a commercial framework which remains inherently win/lose. Studies conducted across other industries, where partnering and supply chain management are common, suggest that despite the best intentions, clients easily revert to cost-based criteria, rather than value for money, and rarely do the supply chain members share a common purpose.

By having a smaller number of firms to work with, the client gains considerable benefits. The partnering organisations may gain greater experience of the client's needs, use techniques such as standardisation of components and processes, bulk purchasing and achieve continuous improvement. Sharing lessons between organisations and applying new ideas ensures the client is getting best practice.

There is evidence, according to the Civil Engineering Contractors Association, that in the civil engineering industry, it seems that some clients have entered into partnering arrangements with contractors, or have let framework agreements without fully appreciating all that is required for these arrangements to be successful in terms of delivering better value. In particular, some clients seem not to have looked much beyond the subsidiary objective of these arrangements, which is to secure savings in costs of procurement and contract administration. There is evidence of what has been labelled 'institutional pressure', that is to say clients and contractors feeling that they must move in the directions in which the Latham and Egan Reports are pointing them, but there is a danger that they will begin to move on the basis of insufficient knowledge and understanding of what is required. According to Wood numerous authors have tried to analyse the critical success factors for successful partnering relationships; however, despite some differences from various studies, the assertion made by Bennett and Jayes (1982) that true partnering relies on co-operation and teamwork, openness and honesty, trust, equity and equality is still appropriate.

Overview: a client's perspective

Government-led initiatives have repeatedly expressed the wish to see partnering become the norm in the hope that it will promote a new way of working. It is clear that public sector clients (including local authorities) are being directed towards procurement strategies that are based on integration and collaboration. The National Audit Office's (2001) report, *Modernising Construction*, gave support for public sector clients in promoting innovation and good practice, encouraging the industry as a whole and its clients to:

- select contractors on the basis of value for money;
- develop close working relationships between clients and the entire supply chain;
- integrate the entire supply chain, including clients, professional advisors, designers, contractors, sub-contractors and suppliers.

In the private sector, many major and influential clients across all sectors have been adopting partnering in response to the proven long-term benefits that can be achieved through this approach. Companies such as Sainsbury's, BAA and Esso are reported to have reached savings of up to 40 per cent on costs and 70 per cent on time by using partnering approaches. There is, however, evidence that small, occasional clients have little to gain from the process.

Overview: a contractor's and consultant's perspective

Main contractors publicly at least, appear to have enthusiastically embraced the partnering concept, without which much of the work available from the major clients is not accessible. General and specialist sub-contractors, suppliers and manufacturers may be involved through partnering within a larger supply chain, but many claim that the only benefit for them is assured workload, although this comes at a price – lower profit margins, for example. Nevertheless, it is interesting to note the growth of networking events/marketplaces that offer manufacturers the opportunity to forge new relationships by providing a consultation service on their stands to promote their design and problem-solving skills, rather than selling products. These collaborative, solutions-driven events have been enthusiastically supported by major materials manufacturers, who recognise the contribution they are already making to design through early involvement in partnering arrangements. Many large client organisations, ProCure 22 for example, now have framework agreements with consultants as well as contractors, covering periods of time and a series of projects, and of course many consultants have been 'preferred' firms of regular clients for many years. Framework agreements often do little more than formalise long-term relationships, although some clients are becoming more demanding of their consultants in these agreements, resulting in firms being dropped and others refusing to sign up. The main attraction

for consultants, large or small, is undoubtedly the security of workload offered by long-term arrangements, but this may be at a price – financial or otherwise. Many consultants, particularly architects, have formed strong relationships with contractors to compete for design and build projects, which have been increasingly attracting many clients for some years. Some of these arrangements are now developing into the core of prime contracting alliances with are discussed later in this chapter. Besides security of workload, attractions of partnering for consultants might include the satisfaction and reputation gained from being associated with successful projects or high-profile clients. Theoretically, greater profits are achievable through sharing in savings; however, there is a lack of hard evidence that consultants benefit from this. Nevertheless, it is likely that, where consultants partner with contractors in, say, a design and build or prime contracting project, the consultants may well share some of the savings awarded to the contractor. Project-specific partnering would not appear to offer many benefits for consultants.

An RICS research report, *Beyond Partnering: Towards a New Approach in Project Management*, published in 2005, aimed to examine how the barriers to partnering success, culture and the economic reality of supply chain relationships, are being addressed in practice. In addition, the study attempted to assess the actual benefits that accrue from partnering and whether there is any real change in construction industry practice. The RICS study used a series of semi-structured interviews with a relatively small sample of senior figures within ten major construction clients, including large retailers and utilities organisations with a combined annual construction spend of approximately £2,000 million. The client sample procured between 50 and 100 per cent of their total expenditure using partnering arrangements. In addition ten national contracting organisations were selected with a combined annual turnover of approximately £4,350 million, of which £1,500 million is delivered through partnering arrangements.

Respondents were unanimous that, to be successful, partnering arrangements – which in some cases included alliancing, which is discussed later – require a culture change within the industry on both supply and demand sides. An inherent lack of trust manifested itself as a threat to successful partnering which was identified as lack of openness and honesty of clients and a 'Luddite' culture within contractors' organisations, resulting in little change of practice at site level. Interestingly the survey heard 'that it is quantity surveyors who find it most difficult to adapt, since they are used to problems being addressed in a contractual and confrontational manner, rather than by people communicating in order to find solutions'. On economic issues, clients admit to obtaining commercial leverage over their supply chains and there is evidence that the sub-contractor squeeze, described previously in this chapter, is still alive and well in supply chains. For contractors, the continuity of working repeatedly for the same clients is also thought to provide a number of benefits for contracting organisations although whether a contractor's profit margin increases on partnering projects is unclear. Both supply and demand sides agreed that partnering provided a more rewarding

environment in which to operate.

Key success factors

Simply adopting a policy of partnering with, and within, the supply chain will not itself ensure success. Partnering is not an easy option; a number of prerequisites, or key success factors, need to be taken on board. Some of the following are desirable for project partnering; all are essential for successful strategic partnering:

- there needs to be a commitment at all levels within an organisation to make the project or programme of work a success;
- partners must have confidence in each other's organisations, and each organisation needs to have confidence in its own team;

Clients should normally select their partners from competitive bids based on carefully set criteria aimed at getting best value for money. This initial competition should have an open and known pre-qualification system for bidders.

- partners need collectively to agree the objectives of the arrangement/project/programme of work and ensure alignment/compatibility of goals;
- to satisfy the relationship's agenda, there needs to be clarity from the client and continued client involvement;
- sharing is important. All players should share in success in line with their contribution to the value added process (which will often be difficult to assess). There also needs to be a sharing of information, which requires open book accounting and open, flexible communication between organisations/teams/people;
- it is important that all partnering arrangements incorporate effective methods of measuring performance. It has been identified that partnering should strive for continuous improvement, and this must be measurable to ascertain whether or not the process is effective;
- there will be times when partners do not agree, and it is therefore important that agreed non-adversarial conflict resolution procedures are in place to resolve problems within the relationship. The principle of trying to resolve disputes at the lowest possible level should normally be adopted to save time and cost;
- education and training are needed to ensure an understanding of partnering philosophy.

Opportunities for quantity surveyors

Collaborative integrated procurement offers opportunities for quantity surveyors, including:

- *acting as an independent client advisor*. Many clients will still look to their quantity surveyor for independent advice. This raises the question, 'where is the trust within the relationship if external advice is still needed?' Many clients will still feel that they need advice of someone without an axe to grind – for example, appointing an external quantity surveyor and audit team to ensure that its strategic partners perform. Services provided might include assessment of target costs, development of incentive schemes, measurement of performance, auditing, etc.;
- *participating as a partner in an alliance*. Quantity surveyors able to demonstrate that they have the skills and ingenuity to add value will be welcomed by most alliances. Imaginative teams will consider numerous solutions – who better to evaluate the alternatives than the quantity surveyor?
- *leading an integrated supply chain*. Many quantity surveyors have become successful project managers. There is no reason therefore that they cannot manage a supply chain. With appropriate financial resources, a quantity surveying practice can act as a prime contractor;
- *acting as a partnering advisor within PPC 2000 contracts*. The described role would seem to fit the quantity surveyor with partnering experience. This is a key role, and would suit a quantity surveyor who can demonstrate a collaborative rather than adversarial attitude.

The move towards clients partnering with integrated supply chains offers significant opportunities for consultants wishing to join alliances to share in the potential rewards. If the industry does become less adversarial, as is hoped, quantity surveyors will welcome it. They will then be able to concentrate on what they do best – adding value for clients, which coincides with the purpose of partnering! The 2015 NBS National Construction Contracts and Law Survey concluded that among the 18 per cent of organisations surveyed who used collaborative approaches to procurement on all projects, only 33 per cent used formal partnering agreements.

Alliancing

As with partnering, alliancing can be categorised as follows:

Strategic alliances can be described as two or more firms that collaborate to pursue mutually compatible goals that would be difficult to achieve alone. The firms remain independent following the formation of the alliance. Alliancing should not be confused with mergers or acquisitions.

A project alliance is where a client forms an alliance with one or more service providers – designers, contractors, suppliers, etc. – for a specific project, and this section will continue to concentrate on this aspect of alliancing.

The principal features of a project alliance are as follows:

- the project is governed by a project alliance board, that is composed from all parties to the alliance that have equal representation on the board. One outcome of this is that the client has to divulge to the other board members far more information than would, under other forms of procurement, be deemed to be prudent;
- the day-to-day management of the project is handled by an integrated project management team drawn from the expertise within the various parties on the basis of the best person for the job;
- there is a commitment to settle disputes without recourse to litigation except in the circumstance of wilful default;
- reimbursement to the non-client parties is by way of 100 per cent open book accounting.

A fundamental principle of alliances is the acceptance on the part of all the members of a share of losses, should they arise, as well as a share in rewards of the project. Risk:Reward should be linked to project outcomes which add to or detract from, the value to the client. In practice, there will be a limit to the losses that any of the alliance members, other than the client, will be willing to accept, if the project turns out badly. Unless there are good reasons to the contrary, it may be expected that the alliance will take 50 per cent of the risk and the owner/client the remaining 50 per cent.

The major differences between alliancing and project partnering are shown in Table 6.5.

In project partnering, one supplier may sink or swim without necessarily affect-

Table 6.5 The major differences between alliancing and partnering

	Partnering	*Alliances*
The form of the undertaking	Core group with no legal responsibilities	Quasi-joint venture operating at one level as a single company
	Binding/non-binding charters used in 65 per cent of partnering arrangements	
The selection process	Prime contractor responsible for choice of supply chain partners	Rigorous selection process
	Project can commence while selection continues	Alliance agreement not concluded until all members appointed
The management structure	By prime contractor	Alliance Board
	Partnering advisor	
Risk and reward mechanisms	Partners' losses not shared by other members of the supply chain	Losses by one alliance member shared by other members

ing the business position of the other suppliers. One entity may make a profit, while the other entity makes a financial loss. However, with alliancing there is a joint rather than a shared loss, therefore, if one alliance party underperforms, then all the parties are at risk of losing. NEC has announced that the NEC4 Alliance Contract (ALC) will initially be published in consultation form. It has been created to support clients wishing to fully integrate a multi-party delivery team for large complex projects.

Partnering contracts

Since the 1990s specific contracts and contractual amendments have been drafted to implement partnering as part of the formal contract process. These include:

- the ACA Standard Form of Contract for Project Partnering (PPC 2000);
- the New Engineering Contract, 4th edition (NEC4), has Option X12 set of clauses, this in effect is a Standard Form of Contract underneath a partnering agreement.

In addition, the following two alternatives are available;

- no contract but a partnering charter;
- standard form of contract (JCT 16) and partnering charter.

Project Partnering Contract 2000 (PPC 2000)

Even though partnering has been described as a state of mind rather than the opportunity to publish another new contract, there is now available a standard form of contract for using with partnering arrangements – Project Partnering Contract 2000 (PPC 2000) (Figure 6.10). PPC 2000, as amended in 2003, 2008 and 2013, was developed for individual projects that were to be procured using the partnering ethos. In 2007, an international version was released. By the nature of the contract, it is more suitable to a single project rather than an ongoing framework agreement covering many projects over a period of time, which would need a bespoke contract. PPC 2000 was developed to clarify the contractual relationship where partnerships were being entered into using amended JCT contracts and in a lot of cases this was proving to be confusing and leading to the JCT losing its familiarity. Partnering charters, while proving valuable, were not a legal basis for an agreement and did not outline the system for non-adversarial approach. Drafted by Trowers and Hamlins, a leading London law firm, PPC was launched in November 2000 by Sir John Egan and published by the Association of Consultant Architects Ltd (ACA). There is a standard adaptation for use in Scotland.

The aim of PPC 2000 is that the team members are in a contract much earlier than is traditional and for negotiations to be carried out post-contract. The contract still allows for a partnering charter and also covers consultants'

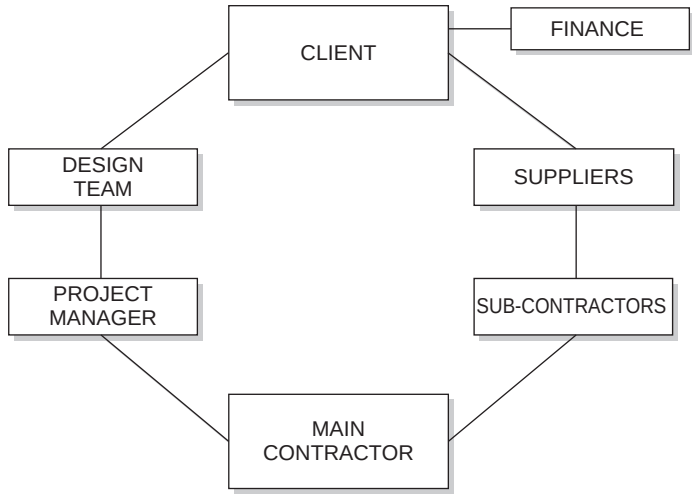


Figure 6.10 The multi-party PPC 2000 contract

appointments and agreements – one contract for the whole. It is claimed that PPC 2000 is written in straightforward language with the flexibility to allow the team to evolve as the project progresses, also that its flexibility allows for risk to be allocated as appropriate and moved as the project develops. However, because the PPC 2000 is such a departure from the more traditional contracts, it has proved a bit of a struggle for those who use it for the first time. The contract can be difficult to interpret, as key elements such as risk sharing and key performance indicators are left as headings with the detail to be completed later. To guide new users, in June 2003, a Guide to ACA Project Partnering Contracts PPC 2000 and SPC 2000 was launched.

The key features of PPC 2000 include:

- a team approach with duties of fairness, teamwork and shared financial motivation;
- stated partnering objectives – including innovation, improved efficiency through the use of key performance indicators (KPIs) and completion of the project within an agreed time and to an agreed quality;
- a price framework which sets out the contractor's profit, central office overheads and site overheads as well as an agreed maximum price;
- a procedure for dispute resolution hierarchy;
- commitment to the most advantageous approach to the analysis and the management of risk;
- the ability to take out Latent Defects and/or Project Insurance (see Chapter 1).

Some aspects may cause difficulties, for example, Section 3 of the contract gives

the client representative the ability to inspect the financial records of any member of the team at any time subject to reasonable notice and access to members' computer networks and data by each member.

The SPC 2000 for Specialist Contractors (amended 2008)

A further development is the publication of a sub-contract to complement PPC 2000 by the ACA. The specialist contract is intended to provide a standard document so that parties entering into PPC 2000 can have back-to-back arrangements with their sub-contractors or specialists, to use the contract terminology. The SPC 2000 has the same basic structure as PPC 2000, but includes a Specialist Agreement to which the specialist terms are appended. The specialist contract endeavours to ensure that the constructor and the specialist work more effectively together than is perceived to be the case under the traditional forms of contract.

The NEC4 Partnering Agreement

To compare the PPC 2000 with the NEC4 Partnering Agreement is to compare apples with oranges. Whereas PPC 2000 is a free-standing multi-party contract, governing all the parties' mutual rights and obligations in respect of a particular project, rather than being, as in the case of the NEC4 partnering agreement, an option bolted on to a series of bi-party contracts, which must each be based on the NEC4 form. When using NEC4 Option X12, each member of the partnering team has its own contract with the client, see Figure 6.11. The NEC4

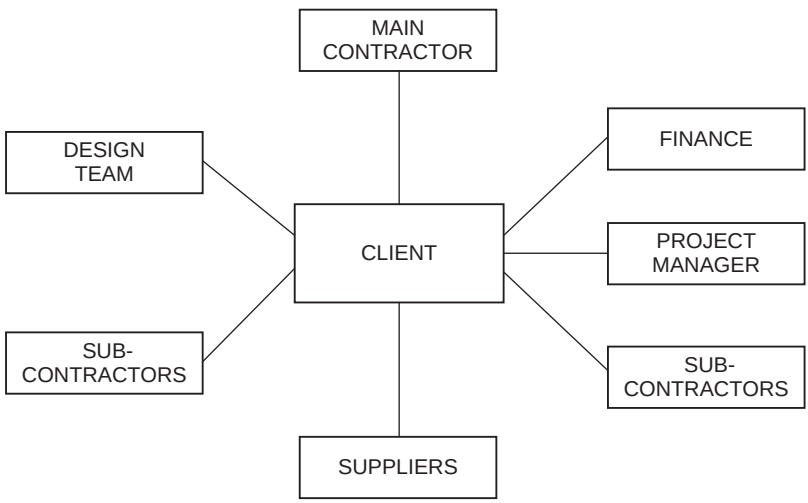


Figure 6.11 NEC4 Option X12

Partnering Agreement, which, by contrast to PPC 2000, is extremely short, acts as a framework for more detailed provisions which must be articulated by the parties themselves in the Schedule of Partners, or in the document called the Partnering Information. It is up to the parties to identify the objectives, Further provisions in the Partnering Agreement set out obligations which are an essential condition if those objectives are to be met. For example, attendance at Partners and Core Group meetings, arrangements for joint design development, risk management and liability assessments, value engineering and value management, etc.

Prime contracting

Introduced in the 1990s, prime contracting is a long-term contracting relationship, based on partnering principles and is currently being used by several large public sector agencies as well as some private sector clients. A prime contractor is defined as an entity that has the complete responsibility for the delivery and in some cases, the operation of a built asset and may be either a contractor, in the generally accepted meaning of the term, or a firm of consultants. The prime contractor needs to be an organisation with the ability to bring together all of the parties in the supply chain necessary to meet the client's requirements. There is nothing to prevent a designer, facilities manager, financier or other organisation from acting as a prime contractor. However, by their nature, prime contracting arrangements tend to require the prime contractor not only to have access to an integrated supply chain with substantial resources and skills, such as project management. To date, most prime contractors are in fact large firms of contractors, despite the concerted efforts of many agencies to emphasise the point that this role is not restricted to traditional perceptions of contracting. One of the chief advantages for public sector clients with a vast portfolio of built assets is that prime contracting offers one point of contact/responsibility, instead of a client having to engage separately with a range of different specialists.

For the client, the major attraction is that the traditional dysfunctional system is replaced by single point responsibility. The prime contractor has the responsibility for:

- total delivery of the project in line with through-life predictions, which can be up to thirty-five years from the time of delivery;
- sub-contractor/supplier selection – note there are exceptions to this rule, i.e. where a client may, because of its influence or market position, be able to procure some items more cheaply than the existing supply chain;
- procurement management;
- planning, programming and cost control;
- design co-ordination and the overall system engineering and testing.

One approach is to develop elements of the supply chain (see example in Figure 6.12) that constitute an integrated team who would work together on a

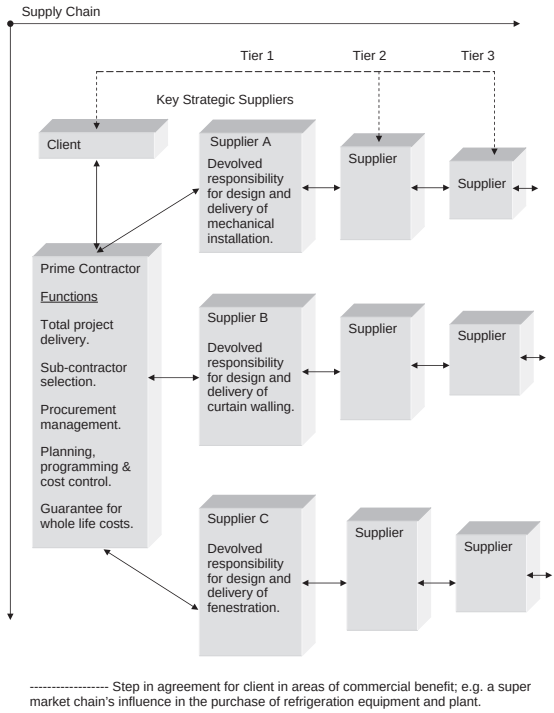


Figure 6.12 Supply chain

particular part of the works, for example:

- groundworks;
- lift installation;
- roofing.

These tiers are built outside of particular projects and there could be two or three supply chains capable of delivering an outcome for each tier. A typical tier for, say, mechanical and electrical services could include the design engineers, the contractor and the principal component manufacturers. Crucially, for the success of this approach, clusters must have the confidence to proceed in the design and production of their element in the knowledge that clashes in design or product development with other clusters are being managed and avoided by the prime contractor. Without this assurance, then this approach offers little more than the traditional supply chain management techniques where abortive and uncoordinated work is unfortunately the norm. It should be noted that the legal structure of such clusters has yet to be formalised.

The prime contractor's responsibilities might include the following:

- overall planning, programming and progressing of the work;
- overall management of the work, including risk management;
- design co-ordination, configuration control and overall system engineering and testing;
- the pricing, placing and administration of suitable sub-contractors;
- systems integration and delivering the overall requirements.

The role of the quantity surveyor in prime contracting to date has tended to be as works advisor to the client, a role which includes examination of the information produced by the prime contractor, a role, it must be said, resented by prime contractors, and as cost consultant to a prime contractor without the necessary in-house disciplines. However, there is nothing to prevent a quantity surveying consultancy from taking the prime contractor role, provided the particular requirements of the client match the outputs and that added value can be demonstrated if a consultancy could take this role.

The advantages of prime contracting are thought to be:

- removal of the need for client co-ordination of multiple supply chain contracts;
- clear lines of communication and accountability;
- improved supply chain management and collaboration;
- the potential to build up long-term relationships throughout the supply chain as well as long-term partnering and incentivisation;
- the potential for continuous improvement;
- early consideration of whole life costs.

Project management

In the opening chapter to this book, the trend for traditional quantity surveying practices to be taken over and subsumed into large multidisciplinary practices was discussed. One of the reasons for this is not just quantity surveyors' prowess in producing bills of quantities, but also their ability to effectively manage project delivery. Consequently more and more quantity surveying practices are adding project management to their services, but what is project management? The aim of project management is to ensure that projects are completed at a given cost and within a planned timescale. Before beginning to examine how a construction project manager operates, it is first necessary to take a wider look at generic project management skills and techniques. Project management has many definitions; however, for the purposes of this chapter, it may be regarded as the professional discipline that ensures that the management function of project delivery remains separate from the design/execution functions of a project, and into these generic skills have to be interwoven the specific skills required for construction projects. Traditionally the role of project manager in construction is positioned between the client and the design team as illustrated in Figure 6.13.

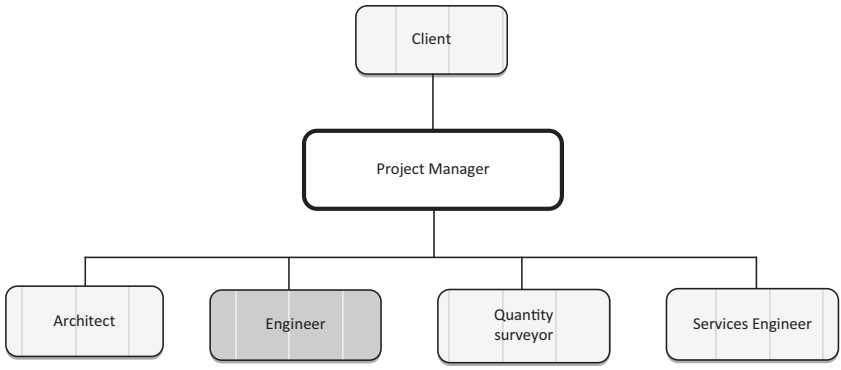


Figure 6.13 Traditional role for project manager in a construction project

Definitions

There are a number of different viewpoints of what constitutes project management which can make pinning down a precise meaning difficult. This in itself can lead to difficulties, especially when issues of roles and liability are raised. The term project manager is widely used in construction and occurs at many levels in the supply chain. In the UK, management techniques applied to construction and in particular property development first started to emerge during the 1970s when a particular approach to property development saw commercial success demanding stricter management and control of time and cost than had previously been the case. Also during this period contractors began to rebadge themselves as management contractors and some quantity surveyors added project management to their letter heading without really realising the full implications. According to the RICS, typically, project managers will be appointed at the beginning of a project and will assist the client in developing the project brief and then selecting, appointing and co-ordinating the project team. He or she will then usually represent the client throughout the full development process, managing the inputs from the client, consultants, contractors and other stakeholders.

Finding a definition of project management in construction is further complicated by the use in the industry, of a variety of similar commonly used titles such as project monitor or development manager. Project monitor is distinct from both project management and construction monitoring and the role is defined in the RICS Project monitoring guidance note as 'Protecting the client's interests by identifying and advising on the risks associated with acquiring an interest in a development that is not under the client's direct control.'

Types of project monitoring may include:

- land and property acquisition;

- statutory compliance;
- competency of the developer;
- financial appraisals;
- legal agreements;
- construction costs and programmes;
- design and construction quality.

Some or all of which are also included in the project manager's brief.

Development manager – as with project manager, there are several definitions of the term development manager as defined by:

- RICS Development Management Guidance Note
- CIOB's Code of Practice for Project Management for Construction Development
- Construction Industry Council (CIC) Scope of Services 9 (major works).

The RICS Development Management Guidance Note defines the role as 'The management of the development process, from the emergence of the initial development concept to the commencement of the tendering process for the construction of the works.'

The role of the development manager therefore, may include giving advice on:

- development appraisals;
- planning application process;
- development finance;
- selection of procurement strategy.

Again, all or some of which are also encompassed in project management. Some sectors make a definition between the commercial management involving the setting up of the project and the actual implementation and delivery. The RICS Project Management Professional Group suggests that the most important skills required by construction project managers, as suggested by Young and Duff, Edum-Fotwe & McCaffer and Egbu are;

- the supervision of others;
- leadership;
- the motivation of others;
- organisational skills.

Project management is all about setting and achieving reasonable and attainable goals. It is the process of planning, organising, and overseeing how and when these goals are met. Unlike business managers who oversee a specific functional business area, project managers orchestrate all aspects of time-limited, discrete projects.

Project management and the project manager are not unique to the con-

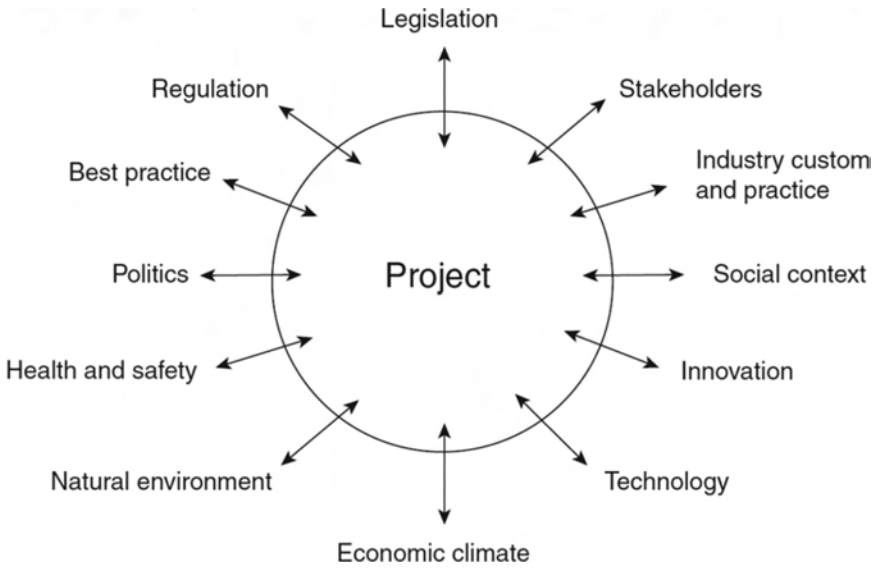


Figure 6.14 Interaction between the immediate and wider project environments based on BSI PD 6079-4:2006

struction industry and there are a number of generic project management skills common to all sectors and industries, for example:

- leadership;
- motivation;
- communication;
- budgetary control.

Construction projects, more so than projects in other sectors, take place in a wider

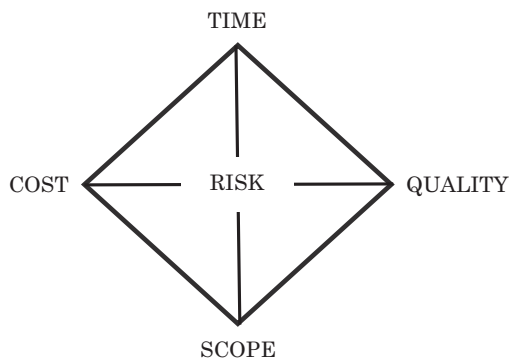


Figure 6.15 Project constraints

geographical, political and regulatory environment and these aspects of construction project management are ignored at the project manager's peril (see Figure 6.14).

Most quantity surveyors will be familiar with the triangular model of constraints, namely, time, cost and quality, that are supposed to guide surveyors when advising clients of an appropriate procurement route. At this point it should be put on record that the author has never subscribed to this approach, nevertheless project managers have added two more criteria to the quantity surveyor paradigm in order to define and manage projects as illustrated in Figure 6.15.

In addition to:

- Cost: The cost constraint could be defined in terms of the cost limit or budget for the project.
- Time: The time constraints could be defined as the time to complete the project from access to the site as entered into the contract.
- Quality: The project should result in a functionally efficient building. Quality is all about the extent that something is fit for the purpose for which it is intended. Value engineering can be used to help achieve this. A problem when defining quality is agreeing within the team what is fit for purpose as it has been known for a project manager to disagree with a client with what constitutes fit for purpose.

The following have been added:

- Scope: It is important from the outset that all members of the project team are clear about the scope of the project. It could be defined as the construction of a mixed use development comprising retail units, commercial space and residential accommodation and associated external works and parking. However, the scope can be further clarified by defining the 'what' of the project as follows
    - What will you have at the end of the project?
    - What other deliverables could sensibly be carried out at the same time?
    - What (if anything) is specifically excluded from the project?
    - What are the gaps or interaction (if any) with other projects?
    - What is the chance the scope of the project will creep?
    - What assumptions have to be made?
    - What significant difficulties have to be overcome?
    - What specific conditions or constraints have been stipulated by the client?
- Risk: Monitor the progress of the project according to the project plan and the above variables, deal with issues as they arise during the project, look for opportunities to reduce costs and speed up delivery time, and plan, delegate, monitor and control.

What is a project?

Having tried to define project management, the next task is to define what a project is, as distinct from routine day-to-day business activity. A project can be thought of as a temporary group activity designed to produce a unique product, service or result; in the case of construction, a new or refurbished construction project, a new piece of infrastructure, etc. Importantly, a project is temporary, in that it has a defined beginning and end in time, and therefore defined scope and resources. Any activities or processes outside of the project scope are deemed to be 'business as usual' and therefore not part of the project. This transient nature adds pressure on the project manager as it necessitates the development of bespoke solutions. Construction projects traditionally use a management structure known as a temporary multi-organisation, as a project team often includes people who do not usually work together – sometimes from different organisations and across multiple geographies, all must be expertly managed to deliver the on-time, on-budget results, learning and integration that organisations need. In recent times, with the publication of a number of reports and the introduction of partnering, alliancing and more collaborative working, the construction team has been encouraged to move away from the traditional fragmented approach to delivering projects but nevertheless the need for project management remains unaltered. Decades after the publication of reports mentioned previously, construction still has a tendency to operate with a silo mentality; overcoming this mentality is a major challenge for project managers.

The project manager and the contract

The role of the project manager is not referred to within JCT (16) nor is there any place within the Articles of the contract to name a project manager, instead the contract administrator is referred to as the person with the responsibility of administering, but not necessarily managing the works. On the other hand, NEC uses the term project manager to describe the employer's representative who is tasked with the responsibility of administering the works. In addition to the supervision of the works, the NEC guidance note proposes that the client/sponsor should appoint a project manager in the early stages of the design sequence to manage the procurement and pre-construction process and not for simply the construction phases and therefore it follows that NEC envisages the project manager's role extending from Stage 1 to Stage 6 in the RIBA Plan of Work 2013. Consequently, NEC4 places considerable authority in the hands of the project manager enabling him/her to take action/make decisions on behalf of the client in more than one hundred NEC4 clauses that include the following:

- carry out contract management functions;
- administer the risk register;
- approve all programmes/progress schedules submitted by the contractor;
- monitor the contractor's progress against the programme;

- approving sub-contractors;
- determine the amount due for stage payments;
- evaluate compensation events;
- determine whether acceleration of the works is required;
- deal with termination of the contract;
- certify completion.

If, as the NEC guidance note suggests, a project manager is appointed early in the design sequence, then in addition to the above list, a project manager will be involved in a much wider set of tasks and responsibilities. It is currently thought that instead of blaming the contractor for delays and cost overruns that in fact higher costs are mainly generated in the early project formulation and pre-construction, and therefore early involvement of a project manager when using the NEC4 contract could be the norm.

Project management governance and professional bodies

Project management practice, standards and education are overseen by several professional bodies including:

- Association for Project Management (APM), www.apm.org.uk. The APM is a registered charity with over 20,000 individual and 500 corporate members making it the largest professional body of its kind in Europe.
- Project Management Institute (PMI), www.pmi.org/uk. PMI is one of the world's largest associations for project managers with approximately 700,000 members and 520,000 certified practitioners worldwide. PMI is divided into 265 global Chapters over 39 industry sectors. Competency as a project manager assessed on experience, education, etc.
- The Royal Institution of Chartered Surveyors (RICS), www.rics.org. Unlike the two previous bodies who draw their membership from across a wide range of industrial sectors, the RICS Project Management Professional Group is concerned principally with construction project management. Project management has its own set of competencies and APC route. There are a number of routes to membership, including an honours degree from an RICS-accredited centre, a higher degree or via the professional experience route. A number of MSc programmes in Construction Project Management are also available worldwide.
- The Chartered Institute of Building (CIOB), www.ciob.org. An extensive debate within the Institute during the 1980s firmly established project management as a client-orientated discipline. The Code of Practice for Project Management was first published by the Institute in 1992 and is now in its 4th edition. The Code has made a significant impact on the industry, both in the UK and further afield, and is the premier guide for project management in construction.

Project management tools and techniques

The widespread use of programmes and IT packages during the past 30 years or so has revolutionised the way in which project managers work. Systems such as PRINCE2 are now widely used and the increasing adoption of BIM helps the project manager work more efficiently and effectively.

The Construction Industry Council (CIC) Scope of Services Handbook lists and defines the tasks which are, or may be, required on all projects and allows them to be tailored to specific projects.

The CIC Scope of Services is broken down into six stages as follows:

- Stage 1 – Preparation
- Stage 2 – Concept
- Stage 3 – Design development
- Stage 4 – Production Information
- Stage 5 – Manufacture, installation and construction information
- Stage 6 – Post practical completion.

There is no stage for construction/site operations and the system is used for defining and allocating personnel and roles during a project. The project lead role is one that may be undertaken by the project manager.

Project management phases

Generally, the project management process falls into five stages (Table 6.6).

Soft Landings

The term Soft Landings refers to a strategy adopted to ensure the transition from construction to occupation is as seamless as possible and that operational performance is optimised. Crucially, the quantity surveyor should be aware this transition needs to be considered throughout the development of a project, not

Table 6.6 RIBA Plan of Work 2013 mapped to classic project management stages

RIBA Plan of Work 2013	*Classic project management stages*
0 Strategic Definition	1 Initiation
1 Preparation & Brief	1 Initiation
2 Concept Design	2 Planning/organisation
3 Developed Design	2 Planning/organisation
4 Technical Design	2 Planning/organisation
5 Construction	3 Executing and controlling 4 Monitoring and controlling
6 Handover & Close Out	5 Closing/evaluation
7 In Use	5 Closing/evaluation

just at the point of handover and the client should commit to adopting a Soft Landings strategy in the very early stages in order that an appropriate budget can be allocated and appointment agreements and briefing documents can include relevant requirements. This should include agreement to provide the information required for commissioning, training, facilities management, and so on, and increasingly will include requirements for BIM. To ensure that a Soft Landings strategy is implemented properly from the outset, it may be appropriate to appoint a Soft Landings champion to oversee the strategy. Facilities managers should also be involved from the early stages. Soft Landings documentation extends the duties of the team during handover and the first three years of occupation. Soft Landings, or Government Soft Landings (GSL), is a comparatively new approach and is focused at the point in a project when the client takes possession of the facility where traditionally the project manager, design team and contractor walk away, with the exception of contractual obligations relating to the rectification period. Soft Landings is a joint initiative between BSRIA (Building Services Research and Information Association) and UBT (Usable Buildings Trust) and was devised in the late 1990s. It is an open-source framework available to use and adapt free of charge from BSRIA.

Bibliography

Association for Project Management (2013) Value Management Specific Interest Group White Paper for Discussion. Association for Project Management.

Bennett, J. and Jayes, S. (1982) *Trusting the Team*. Thomas Telford Ltd.

BIS Research Paper No. 145 (2013) *Supply Chain Analysis into the Construction Industry: A Report for the Construction Industrial Strategy*. BIS.

Cartlidge, D. (2013) Construction sectors and roles for the surveyor, RICS Information paper QS & Construction Professional Group of the Royal Institution of Chartered Surveyors.

CIOB Code of Practice for Project Management for Construction Development.

Construction Industry Council (CIC) (n.d.) Scope of Services 9 (Major Works). CIC.

Construction Industry Council (CIC) (n.d.) Scope of Services Handbook. CIC.

Department for Business, Innovation and Skills (2013a) *Supply Chain Analysis into the UK Construction Sector*, ed. E.C. Harris LLP. HMSO.

Department for Business, Innovation and Skills (2013b) *Construction 2025: Industrial Strategy: Government and Industry in Partnership*. HMSO.

Flyvbjerg, B. (2003) *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge University Press.

Ministry of Defence (1999) *Building Down Barriers: Prime Contractor Handbook of Supply Chain Management*. HMSO.

National Audit Office (2001) *Modernising Construction*. TSO.

NBS (2016) *NBS National Construction Contracts and Law Survey*. RIBA Enterprises.

RICS (2005) *Beyond Partnering: Towards a New Approach in Project Management*. RICS.

RICS (2017) *Professional Standards and Guidance, UK Value Management and Value Engineering*, 1st edn. QS & Construction Professional Group of the Royal Institution of Chartered Surveyors.

Wood, G.D. (2005) Partnering practice in the relationships between clients and main contractors, *RICS Research paper series*, Vol.5, No.2, April.

7 Dispute resolution

Ian Trushell

Introduction

Construction is a complex process. From a client who may not know what it wants (but wants to start work tomorrow) to a design team responsible for translating those hazy ideas into contract documents, to a contractor's tender which starts out having some scientific basis until it is hacked about at the last minute to win the bid, to the construction of a one-off, high capital value asset in the open air. It is tiresome, however, to read that disputes in construction are 'inevitable'. That is not the author's experience during 40 years as a quantity surveyor in private practice with a single firm of over 100 surveyors in four offices. In all that time, disputes on its projects reached the Court of Session in Edinburgh once (we won) and arbitration only twice. All other final accounts were settled, more or less amicably.

The tragedy of construction is that we know how to do the process – it is just that we do not do it properly. We start with an ill-defined brief, give insufficient time fully to pre-plan the project, rush on to site and make a myriad of changes which disrupt the regular progress of the works. If the contractor were simply permitted to build what he tendered for, the scope for disputes would be greatly reduced. Any fool can go on to a construction site and create mayhem – many do. It takes a different personality to work harmoniously as part of a team to deliver a successful project.

When negotiations fail, parties turn to more formal dispute resolution processes as outlined below.

Arbitration

Arbitration has a long history extending back to Egyptian times. Ancient societies often had wise people who would settle disputes between parties without recourse to law, e.g. 'Birling Men' in Nordic countries who settled disputes between neighbours (Hunter, 1987: 22). The rise of merchants in the Middle Ages created disputes which had to be settled quickly and cheaply by fellow merchants, thus avoiding the rigours of court procedures (Rutherford and Sims, 1996: 3).

The object of arbitration is to obtain the fair resolution of disputes by an impartial tribunal without unnecessary delay or expense. The parties are free to

agree how their disputes are resolved, subject only to such safeguards as are necessary in the public interest, and the courts should not intervene (Arbitration Act 1996, Section 1).

The advantages of arbitration are that the parties are free to appoint the arbitrator, unlike in court proceedings. The arbitrator may well be an expert in the matter under dispute, thus obviating the need to educate the arbitrator in the technicalities of the case. The increasing use of professional arbitrators in recent years has tended to negate that advantage. Arbitration is certainly confidential and the washing of dirty linen is done in private. Even when challenges are taken to court, the parties are often anonymised. In arbitration, the parties retain control of the proceedings in accordance with their wishes. It is claimed that arbitration is both quicker and cheaper than litigation, but that is perhaps debatable. The Technology and Construction Court in England and the Commercial Courts in Scotland deal expeditiously with cases and in arbitration the disputants have to pay the arbitrator's fees and for the accommodation. The arbitrator's award is final and binding on the parties, subject only to limited grounds of appeal. The award is enforceable summarily in the courts.

The disadvantages of arbitration are that it may be both slow and expensive. The process may ape litigation and it requires a strong arbitrator as Master of the Proceedings to drive the process forward, particularly when one party may try to slow down the game.

Arbitration begins with one party serving on another a Notice of Arbitration. If the contract in dispute has an arbitration clause in it, then one party can exercise the right to arbitration and the other party must comply. The arbitrator may be appointed by a term of the contract, by agreement of the parties, by reference to a nominating body, or by the courts. The arbitrator should be knowledgeable, impartial, fair, even-handed, transparent, patient, polite, firm and understanding.

After appointment, the arbitrator may call a Preliminary Meeting to clarify the issues in dispute, confirm party representation, confirm the procedure and, most importantly, set the timetable. A Preliminary Meeting may not be required if the dispute is relatively simple, a documents-only procedure has been agreed, the parties object, or the costs outweigh any benefits.

The Interlocutory Stage sees the arbitrator issuing orders for directions regarding statements of claim and responses, statements of counter-claim and responses, and a period of adjustment leading to the definition of the dispute.

The Hearing is where the claimant must prove his case in fact and in law; 'He who alleges must prove.' The burden of proof is on the claimant and the standard of proof is the civil standard of 'on the balance of probabilities'. Witnesses of fact state what they saw, heard, touched, smelled or tasted, although hearsay evidence may be admitted. Expert evidence may be given by qualified, experienced people who, unlike witnesses of fact, give their expert opinion on matters in dispute. Experts are there to assist the tribunal and not to advocate the case for whichever party is paying them.

The procedure at the Hearing is that the claimant offers evidence (fact before opinion) which is then cross-examined by the respondent. The respondent then

offers evidence which is cross-examined by the claimant. The respondent closes and the claimant closes, thus getting the last word. The tribunal retires to consider the submissions and to write the award. This process is always difficult. If it were easy, the parties would not be at arbitration. The arbitrator must arrive at the decision without misconduct, based on questions properly submitted and based on a valid contract of submission. The award must exhaust all the questions submitted (but no more), be accurate, clear, precise, self-contained, internally consistent, unambiguous, unconditional and capable of compliance. It must state the seat of the arbitration and be signed and dated. If the parties require it, the arbitrator must give reasons and usually determines the award of expenses and interest. The award of the arbitrator is final and binding on the parties, but there is a limited right to challenge in court on the grounds of lack of substantive jurisdiction, serious irregularity or error of law. The bar is set fairly high, however, and challenges are not common.

Notwithstanding the popularity of adjudication, there is still a valid place for arbitration in construction disputes. This is particularly true of difficult technical matters where considerable sums of money are at stake. Arbitration is to Adjudication as Mrs Patrick Campbell famously opined on wedlock – 'the deep, deep peace of the double bed after the hurly-burly of the chaise-longue' (*Bloomsbury Dictionary of Quotations*, 1991: 88).

Adjudication

The Joint Contract Tribunal's sub-contract form DOM/1 of 1976 introduced a clause which permitted adjudication for the interim determination of set-off, although its binding effect was not expressly stated (Adriaanse, 2010: 356). Other contracts incorporated adjudication provisions, but the process was not widely used until the enactment on 1 May 1998 of the Housing Grants, Construction and Regeneration (HGRC) Act 1996. Since then, all construction contracts must provide for adjudication, failing which, or if the provisions do not comply with Section 108 of the Act, then the Scheme for Construction Contracts applies (Fenn, 2012: 74).

Section 108 enables a party to a construction contract to give notice at any time of intention to refer a dispute to adjudication; it provides a timetable to appoint an adjudicator and the referral of the dispute within seven days; it requires the adjudicator to reach a decision within 28 days of referral; it allows the adjudicator to extend that period by up to 14 days with the consent of the Referring Party; it permits further time for the decision to be issued with the consent of both parties; it imposes a duty on the adjudicator to act impartially; and it enables the adjudicator to take the initiative in ascertaining the facts and the law.

The adjudicator may be named in the contract, agreed by the parties, appointed by a nominating body specified in the contract, or appointed by an Adjudicator Nominating Body (ANB) on the request of the Referring Party. The ANB has five days to name an adjudicator, who has two days to confirm he can act. An adjudicator may refuse an appointment if he is too busy, the

subject matter in dispute is not within his area of competence, or he has a conflict of interest. There can be an iterative process until the adjudicator is properly appointed. The adjudicator can resign and the appointment can be revoked. The adjudicator can decide to deal with the dispute as documents-only. Only one dispute under the same contract can be dealt with, but a matter previously adjudicated upon cannot.

The adjudicator must decide all matters in dispute, he can review or revise any certificate given or decision taken, decide who pays what to whom and when, decide on interest if appropriate, and give reasons if requested by one party. The parties are jointly and severally liable for the adjudicator's fees which can be apportioned between the parties in the decision. The adjudicator cannot withhold the decision until his fees have been paid.

A party to a construction contract as defined in the Act, therefore, has a statutory right to take any dispute/difference to adjudication at any time. The adjudicator must issue a decision within 28 days of the Referral, or such extended period, and that Decision is temporarily binding on the parties until final determination by subsequent agreement, arbitration or litigation.

The courts have been consistently supportive of the adjudication process. They uphold Parliament's belief that the construction industry sought a quick decision rather than the right decision. Courts have stated that they will support an adjudicator's decision if he has asked himself the correct question, even when the answer is manifestly wrong. They support the adage, 'Pay now, argue later.' Since its enactment in 1998, the HGRC Act has spawned over 600 legal cases seeking to challenge adjudicators' decisions (Salmon, 2012). Challenges to jurisdiction, breaches of natural justice and errors of law have been addressed, but the sheer volume of appeals to court must question the efficacy of the legislation.

Research by the Adjudication Reporting Centre at Glasgow Caledonian University shows that the number of Referrals in 2012 was about half what it was at the peak of 2002 (Glasgow Caledonian University Adjudication Reporting Centre, Report No. 12, October 2012). Just over 90 per cent of adjudicators were appointed by ANBs. About a third of adjudicators were quantity surveyors and another third were solicitors. Some 69 per cent of adjudications were documents-only. The majority of disputes were between main contractors and employers, and between sub-contractors and main contractors. Some 68 per cent of referring parties won and most losers accepted the decision. An astonishing 90 per cent of adjudications were initiated after Practical Completion of the Works. The dominant topics of dispute were interim payments, value of work and value of final accounts. Only 44 per cent of decisions were issued within the initial 28-day period. Adjudications were becoming more expensive with many adjudicators charging £200 per hour.

Anecdotal evidence from adjudicators suggests that the process is becoming more legalistic, more expensive, more aggressive and more often challenged. Some adjudicators believe that the process has lost its way. It was meant to be a short, sharp, rough-and-ready process dealing with specific disputes on a temporary binding basis. Instead, adjudicators are being asked to produce a final account in a limited time frame.

Despite the many criticisms, there can be no denying the popularity of adjudication in the UK construction industry.

Mediation

Mediation has been described as:

> A process by which an impartial third party helps two (or more) disputants work out how to resolve a conflict. The disputants, not the mediator, decide the terms of any agreement reached. Mediation usually focuses on future rather than past behaviour.
>
> (Liebmann, 2000: 10)

The emphasis is, therefore, on a third party neutral facilitating disputants towards the resolution of the conflict. The key principles of mediation are its voluntary nature, flexibility, impartiality and confidentiality.

In the world of conflict resolution, it is widely held that there are three theoretical models of mediation: mainstream, transformative and narrative. While it may be argued that all disputants are transformed to some extent in every mediation, it is the mainstream model that is generally used in construction mediations.

The process of mainstream mediation includes a five-stage or even a 12-stage model. Herman's five-stage model begins with party introductions and rapport building. The second stage is identifying the issues in dispute, and exploring these issues is stage three. Options are generated and considered in stage four, leading, hopefully, to crafting settlement terms in stage five. An elaborated 12-stage model is postulated by Moore (2003: 68–69).

Mainstream mediation uses a similar process as principled negotiation of identifying issues, considering the options and recording agreement. Although there is no set procedure for mainstream mediation, it generally takes the form of the parties meeting the mediator in plenary session. The mediator will describe the process of mediation which may be unfamiliar to the parties, his role in the process, the need for confidentiality, his inability to act as a witness in any future trial, and the possibility of separate meetings with each party. Each party is then invited to state its view of the dispute and its hopes and aspirations for the mediation. The mediation process may then start immediately, but in commercial mediations the parties are likely to go to separate rooms which the mediator will visit in turn using 'shuttle diplomacy' to broker a deal, a process unthinkable in arbitration (Molineaux, 1996: 221). If the parties stay together, the mediator will work with them to tease out the issues in conflict before trying to generate options for consideration by the parties towards a resolution of the conflict. It may be beneficial for each party to meet the mediator in caucus to resolve individual issues privately. When agreement is reached, the terms of settlement are drafted and signed by the parties to confirm their agreement.

The advantages of mainstream mediation include: negotiating through a third party gets a better deal; mediation is quick and cheap; settlement can go far

beyond the limited outcomes possible in litigation or arbitration; settlements are under the control of the parties and not a third party; settlements bring finality; mediation preserves/restores relationships; and mediation restores common sense to the resolution of disputes (Richbell, 2008: 29–38).

Not all disputes, however, lend themselves to settlement by mediation. Where the dispute rests on a point of law, a party may require a decision by a court in preference to compromising a firmly held belief that they are correct in law. Mediation requires disputants willing to comprise their positions to reach settlement and if one party is unwilling to compromise, then mediation is unlikely to be successful (Genn, 2007: 202).

Hibbert and Newman (1999: 81) list specific disadvantages of mediation: disclosure of parties' possible trial positions; equitable settlements depend on full discovery, which results in delay and costs; its non-binding nature; use of delaying tactics; quick resolutions are prone to error and unfairness; uncertainty as to privilege of disclosures; and inequality of bargaining position and representation.

One criticism of mediation is that it is too focused on making a deal by urging the parties to compromise (Abel, 1982: 295–296). In striving to reach a settlement, the rights and wrongs of a dispute may be overlooked just to do a deal. There may be no legal basis or foundation for the settlement at all. Abel (ibid.: 297–298) believes that informal justice, such as mediation, increases the capacity of those already advantaged. Clark maintains that: 'Mediation has often been painted as providing second class justice for the disenfranchised in society' (n.d.: 143). A central tenet of mediation is that the mediator is neutral and impartial. The neutrality of a mediator cannot be assumed. As Grillo states, 'Mediators, like all other human beings, have biases, values, and points of view' (1990–1991: 1587). Fiss (1983–1984: 1073–1090) dismisses the mediation process as mere 'settlement' and sees mediation as the civil analogue to plea-bargaining. He believes that consent to settlement is often coerced and is made by someone who lacks the authority to settle. A further criticism of mediation is that it lacks transparency. The strictures of confidentiality inhibit the accumulation of knowledge about the practice of mediation.

The facilitative approach, or interest-based approach, is generally thought to be the purest form of mediation. The mediator is interposed between the parties to explore their positions, to provide a means of communication, to enhance their common interests, and to produce an ambience conducive to the parties reaching their own solution to their dispute. The mediator would not express an opinion nor propose a settlement (Hibbert and Newman, 1999: 60).

The evaluative approach, or rights-based approach, focuses on the respective rights of the parties in dispute. The mediator attempts to evaluate the strengths and weaknesses of each party's case and indicates a view on a settlement.

Hibbert and Newman suggest that: 'Construction disputes are suitable for mediation by the evaluative approach; mediation by the facilitative approach is less attractive' (ibid.: 77).

Legal support for mediation is strong in England. Lord Woolf's Report, 'Access to Justice' not only encouraged the use of alternative dispute resolution (ADR),

but held that the court ought to take into account whether the parties have unreasonably refused to try ADR or behaved unreasonably in the course of ADR . The leading case of *Dunnett v Railtrack Plc* [2002] EWCA Civ 302; [2002] 2 All E.R. 850 held that unreasonable withdrawal from or rejection of mediation may cost the party its own legal costs.

Med-Arb

As the name suggests, Med-Arb is a fusion of the two processes of mediation followed by arbitration in an attempt to get the best of both worlds. The process is not, however, without its critics.

The process starts with the parties agreeing to undertake binding mediation. The mediation runs as previously described and if agreement is reached, then that is the end of the matter. If, however, the mediation reaches an impasse or issues remain unresolved, the parties move to arbitration. The mediator then assumes the role of arbitrator, if qualified, and issues an enforceable, binding award. Alternatively, a different arbitrator is appointed and takes over the case after consulting the mediator.

One of the benefits of Med-Arb is that the prospect of going to arbitration encourages the parties to reach agreement in mediation. It may also be a good choice of ADR process when the parties are faced with a deadline or where parties need to work together effectively in the future. The combined Med-Arb process is cost-effective if it involves a single neutral as there is no need to start again if the mediation fails.

Critics of Med-Arb claim that parties may be inhibited from sharing confidential information knowing that the mediator may become the arbitrator. If may be difficult for the mediator to distance himself from being privy to confidential information revealed during the mediation. The arbitrator may be so conflicted by such knowledge that a new arbitrator is appointed which negates the benefit of the combined process. The parties may be pressurised into reaching a less than optimal settlement in mediation simply to avoid arbitration. These and other factors may explain the limited use of Med-Arb in the UK construction industry.

Arb-Med

This process may be regarded as the opposite of Med-Arb previously described. In this process a third party neutral runs arbitration as usual and writes an enforceable Award. The award is not disclosed to the parties, however. The arbitrator then becomes the mediator and attempts to mediate the dispute to agreement. If the mediation succeeds and settlement is reached, then that agreement becomes binding on the parties. If, however, mediation fails, the arbitrator/mediator unseals the previously written Arbitration Award which is enforceable.

Arb-Med may remove concerns about issues of confidentiality which trouble the Med-Arb process, but does not remove the pressures on the parties to settle in mediation before the Award is opened. The arbitrator/mediator cannot change the Award based on any new insights gained during the mediation.

Also, the arbitrator/mediator may press the parties to settle the mediation to avoid revealing an Award with which he may now disagree. Arb-Med appears to be even less well practised than the closely related Med-Arb process.

Early neutral evaluation (ENE)

Early neutral evaluation (ENE) refers to a process in which an informal presentation is made by the parties to a dispute to a neutral with respected credentials for the purpose of obtaining an oral or written evaluation about the parties' positions. The evaluation may be binding or non-binding. The process is sometimes known as private judging. ENE may take place before the instigation of court proceedings or as part of Commercial Court Practice in England.

Parties to a dispute may seek a neutral person to provide them with a preliminary assessment of facts, evidence or legal merits which will serve as a basis for further negotiations, or help the parties avoid further unnecessary stages in litigation. The neutral brings 'a fresh pair of eyes' to the dispute and gives an indication of what would be the outcome if the dispute were taken to court. Timing of ENE is very important. If it is undertaken at too early a stage in the dispute, the parties may not have had sufficient time to exchange evidence and may even believe that their position could be improved. In contrast, if ENE is undertaken too late, there may little in the way of cost savings.

In court-based ENE, the process varies in each case, but would typically involve: the lodging of an agreed statement of issues; pleadings and defendant's responses lodged; a limited case outline lodged; ENE held in court with each side given 30 minutes to open and respond; 60 minutes for the judge to question parties; judge reflects on the dispute and then delivers assessment.

Nothing said at the ENE would be used in litigation or for any other purpose. The judge would be disqualified from any other involvement in the proceedings. Each party bears their own costs (Fenn, 2012: 107–109).

Executive tribunal

This dispute resolution technique is known as a mini-trial in the USA. Serious disputes tend to develop a life of their own. Disputants become convinced by their own rhetoric, cannot see the wood for the trees and lose sight of commercial realities. Senior executives of companies should, in contrast, have a 'helicopter view' of the whole business and should be able to keep everything in perspective. They are often appalled when they see the extent of a dispute which may have been hidden from them by subordinates.

The process starts with lawyers from each side of the dispute making a presentation to senior executives of the disputant companies who have the authority to settle. The executives then meet together to discuss the dispute moderated by a neutral facilitator. The facilitator works towards a settlement, similar to mediation, but may in the absence of agreement ultimately offer a binding or non-binding opinion. Thus, an agreement is reached.

The major benefits of this process are claimed to be that: senior executives become involved and realise the nature and severity of the dispute; they are given the opportunity to hear the arguments from both sides; they are able to meet and to discuss settlement; and they are not constrained by legal win/lose remedies. Creative solutions are possible in this process.

There are few reported examples of Executive Tribunals having been held in the UK.

Expert determination

There are situations where parties cannot agree on a particular matter but are prepared to accept the decision of a neutral third party acting as an expert and not as an arbitrator. Examples include the valuation of shares in a private company whose shares are not traded on the stock market, the determination of a fair rent on commercial premises and the valuation of a pension scheme.

The parties enter into a contract with the expert determiner to decide the matter in dispute. The expert is selected for his particular expertise and so is likely to be an active practitioner in the field. The expert makes a decision based on his knowledge, expertise and investigations, and is not bound to receive evidence or submissions. He must, however, comply with the terms of the contract with the parties from which his authority is derived. The expert is not, therefore, in full control of the process. He is not bound to act judicially, but must avoid fraud or collusion. The expert may be liable for negligence and so may seek a waiver from such liability before proceeding. He does not act as an arbitrator and is not bound by the Arbitration Act 1996. There is no right of appeal from his decision or a determination by the court on a preliminary point of law. The determination is not enforceable as a judgement like an Arbitrator's Award, but it will be upheld by the court unless the expert has departed from the parties' instructions in a material way. The courts are generally reluctant to interfere except where the expert has answered the wrong question put to him by the parties (ibid.: 109–112).

Dispute Resolution Adviser

The role of a Dispute Resolution Adviser (DRA) has been used by the Hong Kong Government's Architectural Services Department since 1991. The first project was the difficult refurbishment of the 56-year-old Queen Mary Hospital in Hong Kong.

The process is founded on the belief that disagreements should be resolved by the parties themselves at site level within a very short time frame before they turn into full-blown disputes which affect the parties' working relationships. The Dispute Resolution Adviser's role borrows elements from dispute boards, mini-trials, informed partnering, step negotiations and project arbitration, as used in the USA. The process includes a pre-contract element to maximise dispute prevention attributes by an independent review of the proposed risk allocation within the construction contract.

Post-contract activities include informal dispute avoidance and resolution by the Dispute Resolution Adviser during regular site visits and familiarisation meetings, formal resolution of disputes through a variety of techniques, with each step becoming more interventionist, culminating in final resolution by short-form arbitration. The DRA's fees are shared equally between the parties.

Parties agree the appointment of an individual as the DRA, failing which, a ranking system is used, failing which, an Appointing Body appoints the DRA who should be familiar with construction, have mediation skills and preferably some knowledge of arbitration.

Once appointed, the DRA familiarises himself with all contract documentation and with the project by making monthly site visits. Parties may sign a non-contractual Charter embodying the principles of co-operation to be displayed on site.

Parties have 28 days to challenge any decision, certificate or evaluation made under the contract, although this period may vary. Failure to challenge means that the decision, etc. is binding. Site Representatives of the parties then have 28 days to resolve the matter in dispute by negotiation which may be assisted by the DRA. Failing agreement, the aggrieved party gives formal, written Notice of Dispute. Failure to issue such Notice means that the dispute is deemed waived. The Site Representatives and the DRA have a further 14 days to attempt to resolve the dispute. The DRA is free to choose the most appropriate ADR technique which may be facilitative mediation, mini-trial, expert fact-finding, expert opinion, etc. If formal, evaluative mediation is chosen, it is likely to be carried out by another neutral, not the DRA, and the time frame may be extended to suit the neutral.

If the dispute is still not resolved, the DRA produces a Report analysing the dispute and this is given to senior members of the parties to advise them of the true nature of the dispute. The Report may contain non-binding recommendations or a non-binding evaluation, similar to a mini-trial. A period of 14 days is given to reach agreement, failing which, the dispute is referred to Short-Form Arbitration. This is limited to a single issue claim or issue, or a limited number of issues. The Arbitration is limited to one day and each party presents its case to the arbitrator in the form of written or oral evidence, affidavits or documents-only. The arbitrator then has 7 days to make a written award with reasons which is final and binding. If quantum in the form of time or money is in dispute, then final offer arbitration is invoked by both parties (Wall, 2012).

It is important to note that Dispute Resolution Adviser is not a one-person Dispute Board. The DRA usually makes no evaluation of the dispute. It is claimed that the DRA System has a 99.4 per cent success rate in avoiding the time and expense of full blown Arbitration. Although well used in Hong Kong, it cannot be said to be a popular dispute resolution technique in the UK.

Dispute Boards

The history of Dispute Boards extends back to the 1960s when a Joint Consulting Board to make decisions regarding conflicts and other related matters was

established for the Boundary Dam project in Washington, USA. Its success led to the creation of a Dispute Review Board in 1975 for the Eisenhower Tunnel in Colorado. Further Boards were used on many large-scale construction projects across the world, including Hong Kong Airport (US$15 billion), the Docklands Light Railway (US$500 million) and Eurotunnel (US$14 billion). The London Olympic Games had both a Dispute Advisory Panel and a Dispute Adjudication Panel. All but one of these projects had either no disputes or very few disputes, of which only one was taken to arbitration. The new Forth Crossing bridge in Scotland has a Dispute Board, but its activities remain commercially confidential to date.

Dispute Boards operate a 'job-site' dispute adjudication system comprising one, three or five independent and impartial members who are appointed at the start of a project before any disputes have arisen. Members make regular site visits and become part of the project team. They are 'hands-on' and are trusted to be fair and impartial. This early involvement in nascent disputes usually prevents escalation into arbitration or even litigation.

The Dispute Board may make non-binding recommendations to the disputants or interim, binding decisions depending on the type of Board. The Board may call a Hearing which is a less formal event than that in arbitration. Position papers may be submitted by the parties and discussed by the Board. Further enquiries may be made before a written decision is issued. Decisions may be a majority, although unanimity is much preferred. Dispute Boards tend not to be passive onlookers in the dispute, but are more inquisitorial in outlook. Lawyers and experts may even be excluded from Hearings.

Dispute Boards are usually established in one of three formats: Dispute Review Boards make non-binding decisions. If a party does not intimate dissatisfaction with the decision within a specified period, then both parties comply and implement the decision. If dissatisfaction is intimated, then the dispute escalates to arbitration or litigation. Dispute Adjudication Boards make binding decisions which must be complied with without delay. Dissatisfaction again escalates the dispute to arbitration or litigation. Combined Dispute Boards make recommendations but also decisions if requested to do so by one party and the other does not object.

A Dispute Board's determination is admissible in further proceedings which may be a deterrent to proceeding to arbitration or litigation.

Other variants to Dispute Boards are Dispute Advisory Boards and Dispute Mediation Boards whose roles are self-evident (Chern, 2008: 1–27).

Dispute Boards are expensive as the members are paid a retainer and so it is generally only sufficiently large projects that can bear the costs incurred. Experience shows, however, that it can be money well spent.

Conclusion

In the light of the foregoing, it is clear that there are many dispute resolution processes available. The selection of the most appropriate method is, however, more difficult and may even involve a hierarchy of techniques to reach agreement.

A contingent approach is probably best. If a dispute turns on a point of law, then litigation may be best. If the parties are willing to compromise, then mediation should be considered. If the parties are willing to tolerate a rough-and-ready approach with a temporary binding decision, then adjudication may be used. Arbitration is perhaps more considered and more appropriate in settling major, difficult, high-value disputes. Expert determination certainly has its attractions, although has been little used to date.

Most disputes are the result of failed negotiations. Who among us has actually studied negotiation? Who has been educated in the process? There is more to it than simply reading *Getting to Yes* (Fisher *et al.*, 2012). We appear to have lost the art of negotiation but Churchill was surely right when he said, 'To jaw-jaw is better than to war-war' (*Bloomsbury Book of Quotations*, 1991: 106).

Bibliography

Abel, R. (1982) *The Politics of Informal Justice*. Academic Press.

Adriaanse, J. (2010) *Construction Contract Law*. Palgrave Macmillan.

Arbitration Act (1996), Section 1, HMSO.

Bloomsbury Dictionary of Quotations (1991) Bloomsbury Publishing Ltd.

Chern, C. (2008) *Chern on Dispute Boards*. Blackwell Publishing Ltd.

Clark, B. (n.d.) The fusing of mediation, lawyers and legal systems. Available at: https://link.springer.com/chapter/10.1007/978-3-642-23474-3_5 (accessed 2 August 2013).

Fenn, P. (2012) *Commercial Conflict Management and Dispute Resolution*. Spon Press.

Fisher, R., Ury, W. and Patton, B. (2012) *Getting to Yes*. Random House Business.

Fiss, O. M. (1983–1984) Against settlement. *Yale Law Journal*, 93.

Genn, H. (2007) *Twisting Arms: Court Referral and Court Linked Mediation Under Judicial Pressure*. Ministry of Justice Research Series 1/07.

Glasgow Caledonian University (2012). Adjudication Reporting Centre, Report No. 12.

Grillo, T. (1990–1991) The mediation alternative: process dangers for women. *Yale Law Journal*, 100: 1545.

Hibbert, P. and Newman, P. (1999) *ADR and Adjudication in Construction Disputes*. Blackwell Science.

Hunter, R. L. C. (1987) *The Law of Arbitration in Scotland*. T&T Clark Ltd.

Liebmann, M. (2000) *Mediation in Context*. Jessica Kingsley Publishers.

Molineaux, C. B. (1996) The role and development of alternative dispute resolution in the United States', in A. M. Odams and J. Higgins (eds), *Commercial Dispute Resolution*. Construction Law Press.

Moore, C. W. (2003) *The Mediation Process: Practical Strategies for Resolving Conflict*. Jossey-Bass.

Richbell, D. (2008) *Mediation of Construction Disputes*. Blackwell Publishing.

Rutherford, M. and Sims, J. (1996) *Arbitration Act 1996: A Practical Guide*. FT Law & Tax.

Salmon, K. T. (2012) *Cases on the Enforcement of Construction Adjudication Award*. AuthorHouse UK Ltd.

Wall, C. J. (2012) The Dispute Resolution Adviser system, paper presented at 12th Annual Conference of The Dispute Resolution Board Federation.

Index

Please note that page references to Figures will be in **bold** and page references to Tables will be in *italics*.