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construction planning, programming and control

THIRD EDITION

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Contents

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Preface

The aims of the first edition have not changed. This is a book for students of construction-related professional and degree courses – construction management, building, quantity surveying and building surveying alike. Students of all these topics need a basic understanding of planning, procurement and programming at some time in their career development.

The text of the second edition was extensively rewritten and restructured to reflect changes in the construction industry, and this edition has been updated and extended to include new contracts, legislation and working practices.

In this edition, special emphasis has been placed on practical aspects of construction planning and programming. New chapters have been included dealing with construction sequences, method statements and planning for safety. Extensive guidance has been provided on the identification of hazards, the management of risk and the thought process required for the effective planning of construction projects. There is a new chapter dealing with delay and disruption and this includes an introduction to the theory and practice of delay analysis.

The book has been updated for changes in commonly used construction contracts including the 2005 versions of the JCT family and the NEC 3rd Edition. Important changes to the Construction (Design and Management) Regulations have also been included. A brand new case study has been introduced which includes new topics such as vertical access planning and materials handling. A new section on construction waste has been included which introduces the statutory requirement for Site Waste Management Plans.

Our special thanks go to the directors and staff of Countryside Properties PLC and Alfred McAlpine Special Projects for their permission to use case study material from their sites and to the Totty Construction Group who helped us so generously with the second edition. The invaluable assistance of our friend and former colleague Paul Hodgkinson is gratefully acknowledged. Paul has again produced the excellent diagrams and managed to keep track of the 224 figures now in the book!

Introduction

1

The construction industry

1.1 Introduction

The effective planning and control of construction projects requires the application of systematic and logical methods and tried and tested techniques aimed at ensuring successful project outcomes for the client, the contractor and all other project participants. Control is not possible without a plan, and without a programme there is no effective means of exercising control.

Successful projects cannot happen in a vacuum, however, and no one can effectively plan and control a construction project without understanding the culture and methodologies of the industry that organises and carries out the work as well as the impact of the various procurement strategies open to the client.

1.2 Industry structure

Construction is a large and complex industry comprising many types and sizes of organisations and a diverse range of professional and other representative bodies. Clients, professional practices, contractors and specialist firms all have their own ‘agenda’ and allegiances; Walker (2007) explains the complexities of the interrelationships that can occur in construction projects between clients and their professional advisors and between the contractors and specialists they engage to construct the project.

The annual output of the UK construction industry is approximately £114 billion, which represents almost 9% of gross domestic product. The industry is also a large employer with around 1.9 million people, of which 0.7 million are self-employed. Construction has a unique structure with a small number of very large firms carrying out the majority of its turnover. It also has a very large number of relatively small firms with few criteria limiting entry to the industry.

There is a wide disparity in the standards of competence across the industry: a largely semi-skilled and itinerant workforce and a generally low standard of education and qualifications in the managers employed in construction.

The Department for Business, Enterprise and Regulatory Reform (BERR) (2007) reports that the industry is made up of some 186 000 firms of which:

- 1% are large firms employing over 80 people
- 6% are medium-sized employing between 14 and 79 people
- 93% are small firms employing less than 14 people

The very large contractors (1200+ employees) have considerable influence on the industry as they enjoy a large share of the construction market. Consequently, the Major Contractors Group (MCG) have lined up behind the Construction Skills Certification Scheme (CSCS) in order to help promote greater competence and attention to health and safety risks. CSCS is a voluntary registration scheme whereby trainees, workers, managers, supervisors, visiting professionals, etc., can obtain the relevant colour card which enables them to gain access to MCG sites. A health and safety awareness test must be passed in order to obtain the card.

The industry has a diverse range of suppliers as well as contractors, including manufacturers of materials and components, suppliers of quarry products and ready-mixed

concrete, builders' merchants and plant hire firms. Some of the industry's suppliers are larger than the largest contractors working in the industry and they also have considerable influence on the way the industry operates.

Morton and Ross (2007) examine the structure of the industry in detail and discuss issues such as safety, efficiency, employment and industry practices.

1.3 Industry culture

The scale and diversity of the clients, contractors, professionals and others who are involved in construction is enormous. A contractor may be a small 'sole trader' with an annual turnover of £100 000 or a large public company with a yearly workload of £1 billion. A client could be a domestic householder, private sector corporation or government department. The project 'architect' could be a single practitioner, a local authority or a large public company.

This means that there is nothing 'typical' about the customs and practices in construction. There is, however, one common 'cultural' feature at all levels of the industry and that is the 'project-based' nature of the industry. The whole focus is on the project; the time, cost, quality, resources, problems and solutions are all geared to the project. This brings enormous pressures on project teams, however big or small they are, to ensure that the project is completed 'on time, on budget and to the correct quality standards'. However, more or less every project has its own individuality and peculiarities depending on the site and location, the design and type of construction, the business arrangements between the parties and the hopes and expectations of all those involved; and this 'one-off' nature of construction creates additional pressures.

One of the big problems in construction is the extent to which the industry separates design from production to a far

greater extent than in other industries. This particular feature of the industry is still common despite the deficiencies of traditional procurement and the benefits offered by newer and more flexible approaches.

The industry is a highly fragmented project-based industry and leadership in construction comes largely from clients and not from the contractors and specialists who carry out the work. In 1998, the Construction Clients' Forum (now the Confederation of Construction Clients) established the Clients' Charter which sets out the minimum standards in procurement expected by clients. By registering for the charter, clients commit themselves to establishing a modern business culture with their suppliers, steady improvement of standards measured against nationally accepted criteria and the exchange of best practice experience.

Consequently, it is the clients and their professional advisors who dictate the procurement methods used in the industry and it is the contractors who have to react to the latest 'flavour of the month' in the context of the organisation and management of the project.

1.4 Construction industry reports

In order to stimulate debate about construction industry practices and procedures, a number of well-known reports have been published over the years, including those shown in Table 1.1.

Several of the reports published prior to Latham and Egan raised similar criticisms about the customs and practices of the industry. Banwell even suggested that a common form of contract should be adopted for use on all construction projects.

These problems, and many others, have been recognised since World War II but despite identifying the problems and proposing solutions, most of the reports have had little influence on either government or the industry over the years.

Murray and Langford (2003) discuss these reports in detail and the extent to which government has tried to shape the performance and attitudes of the industry. Brief summaries of some of the more influential recent reports on the construction industry are given below.

Table 1.1 Construction industry reports.

Report	Title	Year
Simon Report	The Placing and Management of Building Contracts	1944
Emmerson Report	Survey of Problems Before the Construction Industries	1962
Banwell Report	The Placing and Management of Contracts for Building and Civil Engineering Work	1964
National Economic Development Office	Action on Banwell	1967
Tavistock Report	Interdependence and Uncertainty	1966
Latham 1	Interim Report – Trust and Monies	1993
Latham 2	Final Report – Constructing the Team	1994
Levene Efficiency Scrutiny	Construction Procurement by Government	1995
Egan Report 1	Rethinking Construction	1998
National Audit Office	Modernising Construction	2001
Egan Report 2	Accelerating Change	2002
National Audit Office	Improving Public Services through better construction	2005

1.5 The Latham reports

‘Trust and Monies’

Perhaps the most influential of all the reports concerning the industry and its problems is ‘Constructing the Team’ written by Sir Michael Latham (1994) who was commissioned by both government and the industry to review the procurement and contractual arrangements in the UK construction industry.

Prior to final publication of his report in July 1994, Sir Michael produced an interim report in December 1993 called ‘Trust and Monies’. This report raised concerns about the extent of mistrust between professionals and contractors and between contractors and subcontractors in construction, and also flagged up the endemic culture of late and conditional payments operating in the industry. The prevailing atmosphere of mistrust and slow payments was reported to result in disharmony in project teams, poor standards of work and poor client satisfaction.

‘Constructing the Team’

‘Constructing the Team’ is better known as the ‘Latham Report’ and its purpose was to find ways to ‘reduce conflict and litigation and encourage the industry’s productivity and competitiveness’.

The specific terms of reference for the review were to consider:

- Current procurement and contractual arrangements
- Current roles, responsibilities and performance of the participants, including the client

The report took account of the structure of the industry and the need for fairness, accountability, quality and efficiency and paid particular regard to:

- Client briefing
- Procurement methods
- The design process
- The construction process

- Contractual issues
- Dispute resolution

The report runs to some 130 pages and contains 30 main observations and recommendations, with the principal emphasis being on ‘teamwork’ in order to achieve ‘win-win’ solutions.

Latham noted several issues which influence the ability of the construction industry to respond effectively to its customers’ requirements, and these can be summarised briefly as:

- Sensitivity to changes in government spending patterns
- Intense competition for work
- Inability to respond to increased demand
- Lack of competency testing of firms/workers entering the industry
- Lack of training
- Mistrust between the participants in construction projects
- Inadequate capital base (i.e. most contractors are undercapitalised)
- Adversarial attitudes
- Claims-conscious contractors
- High levels of insolvency

Some of the main points made by Latham clearly have important consequences for the planning, production and control of construction and are therefore directly relevant to this book. These include:

- The need for a set of basic principles for modern contracts
- Greater use of the New Engineering Contract, which could become a common contract for the whole industry
- Improved tendering arrangements and more advice on partnering arrangements
- Evaluation of tenders on quality as well as price

- Fairer treatment of subcontractors, with particular regard to tendering and teamwork on site
- A real cost reduction target in construction of 30% by the year 2000
- Pay when paid contract terms to be outlawed
- Adjudication to be the normal method of dispute resolution
- Fair contract terms backed up by a legislation
- Insolvency protection by means of trust funds

One of the key issues considered by Latham was the productivity of the industry, and Latham clearly considered that this is linked to the quality of design preparation and information. Inefficiency creeps in where designs are incomplete or information given to the contractor is conflicting or too late to allow proper planning of production.

An issue of major importance is conflict in the industry both between clients and contractors and between contractors and their subcontractors. Latham suggested that considerable efficiencies can be gained by making changes in 'procurement practice, contract conditions, tighter restrictions over set-off and the introduction of adjudicators as a normal procedure for settling disputes'. He also concluded that the 'most effective form of contract in modern conditions should include:

- A specific duty for all parties to deal fairly with each other, and with their subcontractors, specialists and suppliers, in an atmosphere of mutual cooperation
- Taking all reasonable steps to avoid changes to pre-planned works information. But, where variations do occur, they should be priced in advance, with provision for independent adjudication if agreement cannot be reached'

and that 'subcontractors should undertake that, in the spirit of teamwork, they will coordinate their activities effectively with each other, and thereby assist the achievement of the

main contractor's overall programme. They may need to price for such interface work.'

The conclusions of the review were clearly extensive and led to the formation of the Construction Industry Board (subsequently replaced by the Strategic Forum) and an extensive programme of initiatives including:

- Steps to improve productivity
- Better quality design and improved briefing of designers
- Changes to trade and professional training and education
- Improving the image of the industry
- Encouraging fewer disputes by encouraging partnering between contracting parties
- Improved quality of construction professionals, contractors and subcontractors
- The publication of reports from 12 working groups concerning subjects as diverse as client briefing, education and partnering

Some of the Latham recommendations were included in the Housing Grants, Construction and Regeneration Act 1996.

1.6 The Egan reports

'Rethinking Construction'

'Rethinking Construction' was published in July 1998 (Construction Task Force 1998) and represents the work of a special task force which was set up by the government to identify the scope for improving quality and efficiency in construction. The task force was chaired by Sir John Egan, hence the popular title for the report – the Egan Report.

The Egan Report at 40 pages is certainly not as comprehensive as its predecessor, the Latham Report, but is

no less searching and probably considerably more controversial. It contains many ‘home truths’ but may also be said to contain unfair criticisms, particularly with respect to comparisons with factory-based manufacturing industries, such as the motor industry.

Latham looked at designing an infrastructure for the industry aimed at removing the inefficiencies and inconsistencies, especially in terms of client briefing, better design management and more coherent project strategies. In ‘Rethinking Construction’, there is no industry ‘blueprint’ for change but the Construction Task Force, which produced the report, took the lead on a number of new initiatives including:

- Movement for Innovation (known as m4i) – aboard of members whose task is to coordinate a number of demonstration projects, to disseminate best practice information and to oversee industry-wide benchmarking
- The Construction Best Practice Programme provides information for firms wanting to improve their performance
- The idea behind Inside UK Enterprise was for top-performing companies to have an ‘open day’ where other firms could visit and find out how things are done by the ‘host’ company

The Egan Report has probably had more publicity than the Latham Report and certainly there has been plenty of action as a result of the report, including the introduction of key performance indicators and demonstration projects exemplifying best practice.

The Egan Report undoubtedly recognises both the good and bad in construction and seeks to build on those aspects of the industry which are excellent in a worldwide context. However, on balance, the conclusion of the report is that the industry as a whole is underachieving and that there should be radical change in key areas of its performance. These

include quality, productivity, cost and time certainty, and health and safety.

In the Executive Summary, the Egan Report makes the following observations:

- The UK construction industry at its best is excellent. Its capability to deliver the most difficult and innovative projects matches that of any other construction industry in the world.
- Nonetheless, there is deep concern that the industry as a whole is underachieving. It has low profitability and invests too little in capital, research and development and training. Too many of the industry's clients are dissatisfied with its overall performance.
- If the industry is to achieve its full potential, substantial changes in its culture and structure are also required to support improvement. The industry must provide 'decent and safe working conditions and improve management and supervisory skills' at all levels. The industry must design projects for ease of construction, making maximum use of standard components and processes.
- The industry must replace competitive tendering with 'long-term relationships based on clear measurement of performance and sustained improvements in quality and efficiency'.

The Egan Report identified five key drivers of change needed to set the agenda for the industry:

(1) Committed leadership

(2) A focus on the customer

(3) Integrated processes and teams

(4) A quality-driven agenda

(5) Commitment to people

Among the year-on-year targets proposed by Egan were:

- 10% reduction in construction time from client approval to practical completion
- 10% increase in productivity
- 20% reduction in the number of reportable accidents
- 10% increase in turnover and profits of construction firms

One of the problems with the Egan Report is that the emphasis is placed on the ‘top-end’ of the industry, whereas Latham looked at the fundamental problems of the entire industry. So while Egan has led to the development of several good ideas and worthwhile aims, the concepts may take some time to filter down to the lower echelons of the industry.

‘Accelerating Change’

This report – the second Egan Report – presents the first year’s work of the Strategic Forum for Construction (2002), which replaced the now defunct Construction Industry Board that was set up following the Latham Report.

‘Accelerating Change’ identifies ways of increasing the pace of change following the recommendations in ‘Rethinking Construction’, reports on the progress made to date and sets out a strategic direction with targets. The report identifies three main drivers to accelerate change in construction and introduce a culture of continuous improvement in the industry:

- The need for client leadership
- The need for integrated teams and supply chains
- The need to address ‘people issues’, especially health and safety

The vision and aspirations set out in ‘Accelerating Change’ emphasise the need for collaboration between the whole supply team, including clients and manufacturers. The report represents a ‘manifesto for change’ for all involved in

construction, including government, schools and further/higher education and professional bodies.

The strategic targets identified in ‘Accelerating Change’ include:

- By the end of 2004
  - 20% of construction projects by value to be undertaken by integrated teams and supply chains
  - 20% of clients to adopt the principles of the Clients’ Charter
  - 10% annual improvement by adopting the Clients’ Charter
- By the end of 2007
  - These figures rising to 50%
- By the end of 2006
  - 300 000 qualified people to be recruited to the industry
- By 2007
  - 50% increase in applications for built environment courses
- No later than 2010
  - A certificated fully trained, qualified and competent workforce

The report suggests six key steps that clients must consider when considering whether or not to build:

(1) Verification of need
(2) Assessment of options
(3) Develop procurement strategy
(4) Implement procurement strategy
(5) Project delivery
(6) Post-project review

The effectiveness of post-Egan initiatives is examined by Morton and Ross (2007).