

Chapter 1

Introduction

Modern management in construction addresses four principal areas of the industry:

- Management of the physical production phase or site construction management;
- Management of the various functions that make up and contribute to the delivery of projects, or total project and programme management;
- Management of the corporate establishments involved in the delivery of the constructed facilities and services or organisational management;
- Management of the industry to create an enabling commercial, regulatory, and conducive socio-economic environment, or sector management.

Construction Management addresses the effective planning, organising, application, coordination, monitoring, control and reporting of the core business processes of marketing, procurement, production, administration, accounts and finance necessary to achieve economic success and/or profitability for an enterprise or organisation engaged in the provision of construction facilities. The function may be performed by a client, contracting company, consultant firm, public body or combination of such stakeholders contracted to bring a project or series of projects to safe completion on time, to budget, to the set quality and expected innovative, aesthetic, socially responsible, and environmental impact.

Construction Project Management focuses on the delivery of a specific solution by contracting with stakeholders who undertake combinations of the following indicative sub-processes relating to a specific project:

- Scoping and budgeting the project;
- Design coordination/management;
- Establishing the management structure of the management team;
- Marketing and procurement;
- Defining roles and responsibilities;
- Estimating and tendering;
- Stakeholder management;
- Project and construction methods planning, coordination and control;
- Value and risk management;
- Organising, leading and implementing controls;
- Production and productivity management;

- Management of labour resources, temporary works provision, equipment, plant, subcontractors and suppliers;
- Time and subcontractor interface management;
- Cost and budgetary control, including cash flow forecasting;
- Quality management;
- Contract and progress payments administration;
- Legal issues;
- ICT management;
- Health and Safety management, education, training and welfare provision;
- Corporate Social Responsibility;
- Management of the potential environmental impacts of construction;
- Commissioning, auditing and recording of the project(s).

Also see CIOB definitions of Construction (Project) Management.

Significantly, as recent Constructing Excellence (CE) and government reports emphasise, the marked shift towards modern forms of contracting, rapid technological change, and greater environmental, social and economic accountability of construction pose ever-growing competition in a world of intensified global trading – not least the Corporate Social Responsibility (CSR) notion of ‘doing well by doing good’ to enhance competitive advantage. Hence an intelligent client will increasingly need to focus on achieving value at the operational and business levels through the appointment of a robust integrated ‘best in class’ supply chain of stakeholders, able to deliver the listed project services with the fresh, practicable, robust, measurable and auditable core competences and management processes described and explained in this seventh edition of *Modern Construction Management*.

Structure of the book

The book covers the principal responsibilities of Construction Management divided into four main sections; in addition, Chapters 1 and 2, which do not form part of the main sections, give specific consideration at the outset to the philosophy of the book as a means of explaining the succeeding chapters. In particular, Chapter 2, which covers quality management in construction, is used to illustrate how quality is intertwined as a thread running through all the subsequent sections. It also explores the emerging strategic role of quality as a driver for competitive advantage in construction.

- Section 1 deals with techniques relating to project production management, including environmental legislation guidelines.
- Section 2 treats the business aspects of management at both project and company levels.
- Section 3 addresses the executive management responsibilities for overall corporate control.
- Section 4 brings together a selection of self-learning problems complemented with complete worked solutions for use in the classroom environment, tutorial exercises and seminar discussions, which are provided on the companion website.

The reasons for this particular presentation are:

- (1) Successful construction industry executives have distinct phases in their careers: the initial period is spent on site, followed by middle-management duties at the project level, culminating in a career with executive head-office activities. The sections are intended to cater for these phases.
- (2) The construction industry is inherently uncertain as a result of the nature of the industry itself – the competitive tendering process, the company's turnover, site production rates and the weather are all features that are characterised by variability and a degree of uncertainty. To be able to cope with such uncertainty, construction executives need to be acquainted with the relevant knowledge and tools for addressing these features. The management techniques described in this book help reduce variability and thus provide the basis for sound and effective decisions by aspiring executives. For example, with proper planning, the duration of a project is not just an experienced guess. The inevitable residual variability in even the best-run company needs to be controlled by:
 - (a) Planning and setting targets
 - (b) Choosing methods to achieve such plans and targets
 - (c) Monitoring progress
 - (d) Taking corrective action when necessary.

This continual monitoring and revision is ultimately the only way to cope with uncertainty and variability.

Objectives and contents

Each chapter deals with a specific topic (which could, if exhaustively treated, form the basis of a whole book; suggestions for further reading appear at the end of chapters).

The level of detail aimed at is that which will provide the reader with a basic working knowledge of the topic, rather than with specialist expertise. For example, the planning section of the book explains the major techniques available for planning both repetitive and non-repetitive works in sufficient detail to allow intelligent engineers to apply them, providing sufficient comprehension for them to converse sensibly with a specialist support group such as a planning department. Engineers and builders need enough knowledge to understand, appreciate and, where necessary, question the work of specialist support staff such as accountants, cost clerks, planners and plant managers. A grasp of the techniques described in the sections should help in achieving this skill. Specialists must not be allowed to hide safely in their own specialisms. Participation in the exercises in Section 4 provides a deeper and better understanding of the implications of the various techniques. Section 4 largely covers the numerical-based aspects of these techniques.

Chapter 2. *Quality management in construction* provides the platform for the succeeding chapters and describes the evolution of quality management from quality control through quality assurance to total quality management, as well as the current standards employed by construction organisations. It also looks at quality from the project perspective, advocates a concerted effort by both client and contractor to make any quality agenda a reality, and explores a systems approach to attaining such an agenda.

The contents of each section are now discussed briefly below.

Section 1

Section 1 relates specifically to project production management, including planning techniques, production process improvement, estimating and tendering, workforce motivation and cost control.

- Chapter 3. *Production process improvement*: covers energy use and the environment, Carbon Reduction Commitment legislation, national productivity reports, quality management, lean construction, benchmarking, stakeholder management, Corporate Social Responsibility, Six Sigma, production measurement and sampling, waste management.
- Chapter 4. *Planning techniques* deals with the principles of the techniques used in planning repetitive or non-repetitive construction work. The chapter describes bar charts, linked bar charts, network analysis and line-of-balance scheduling, PERT, space–time diagrams and The Last Planner. The role and use of computers in planning and the requirements of computer systems in exchanging data are also described. The chapter is updated with pertinent material on managing multiple projects.
- Chapter 5. *Workforce motivation* links the use of incentive schemes to motivation theory. It also presents the various payment systems for non-financial, semi-financial and purely financial incentives that can be employed to enhance worker motivation.
- Chapter 6. *Project cost control* gives guidance on the various cost control methods available, including profit-related control systems, unit and standard costing approaches, cost monitoring of subcontractors, and cost management of carbon emissions.
- Chapter 7. *Management of equipment* considers the financing of plant and gives guidance on plant selection and control of gaseous emissions. Calculating a hire rate and maintenance procedures are also covered.

Section 2

Section 2 presents business management topics and is intended to assist project-based staff to understand and appreciate the company's attitudes and activities, easing the transition from site to general management. The topics described relate to procurement, bidding, budgets and cash flow, economic assessment and plant management.

- Chapter 8. *Project procurement*: introduces the role of project management and design coordination, and reviews various forms of contract including EU regulations for public contracts. The latest developments for procuring construction and engineering embraced in the ISO and BS Procurement standards and codes of practice, design and build, early and optimised contractor involvement, modern PFI, partnering and associated funding mechanisms are also explained.
- Chapter 9. *Estimating and tendering* describes the current nature of estimating practised by main and work-package contractors. It describes parties involved in the estimating and tendering process for work packages and outlines the process, including the decisions and calculations involved, and the issues in costing materials and subcontractors. It also addresses the use of computers in estimating and the changing role of the estimator in the face of advances in information technology.
- Chapter 10. *Competitive bidding* examines the effect of estimating accuracy, which implies the need for more resources in the estimating department, reviews how to interpret the

various available items of data relating to competitors' behaviour and comments on improving estimating accuracy. It also covers electronic bidding and fundamental information on bid evaluation.

- Chapter 11. *Company budgetary control* deals with the preparation of budgets and controlling costs for a company or enterprise, including budgeting for the carbon footprint.
- Chapter 12. *Cash flow and interim valuations* illustrates company cash-flow forecasting and provides guidance on how to do this type of forecasting, the use of computers in cash-flow calculations, the process of interim valuations and the relationship between interim valuations and cash flow. It introduces the concept of invoice financing as a means for achieving positive cash flow for the construction company.
- Chapter 13. *Economic assessments* describes the principles employed in economic comparisons and in measuring rates of return, life-cycle costing, cost-benefit analysis and financial modelling. It also provides an introduction to the use of multi-criteria analysis for appraising projects.

Section 3

Section 3 presents the executive management responsibilities largely concerning head-office activities, including organisation, business development, global construction, the emerging role of information as a major construction resource and finance.

- Chapter 14. *Company organisation* contains a description and explanation of company structure, organisation and managerial responsibilities, including training and vocational qualifications.
- Chapter 15. *Market planning and business development* describes a marketing approach to construction and the benefits likely to be derived and methods of selling including modern web blogging and social networking.
- Chapter 16. *International construction logistics* provides an overview of the problems in globalisation of trade, raising finance, dealing with unfamiliar conditions of contract and legal systems, transport of goods, payment procedures and local labour, resources and security.
- Chapter 17. *Information resources and IT systems* develops an understanding of the strategic role played by information resources in managing both projects and the business for organisations in the construction industry including the cloud resources. It also addresses information systems and its associated technology embracing email, web sites, intranets, on-line information data and transfer, data exchange and integration of systems, as well as an introduction to Building Information Modelling.
- Chapter 18. *Financial management* describes the sources and means of acquiring capital funds and the use of balance sheets and profit-and-loss accounts and financial regulation.

Section 4

This section presents 87 tutorial examples with complete worked solutions for students in construction disciplines. It is separated into three chapters, with the first, Chapter 19, covering the worked examples from Chapters 3 to 18. Chapter 20 provides worked examples

on operational research techniques. Chapter 21 similarly introduces Six Sigma statistical examples supportive of Lean Sigma application to productivity improvement analysis. The solutions are available on the companion website.

Students learn by reading texts and attending lectures. However, they need to test their new-found knowledge or skill by attempting to work through example problems, and several textbooks are available that offer such examples, either with or without answers. Where an answer is provided, the student's own answer is frequently at variance and they are then faced by a dilemma: is the textbook in error or has the author made different, but valid, assumptions? In this book, a complete worked solution to each example is given so that the student has full guidance through the analysis.

The topics covered in Section 4 are those aspects of construction management that may be treated numerically:

- Production analysis;
- Planning;
- Estimating;
- Motivation schemes;
- Control of project costs;
- Budgetary control;
- Cash-flow forecasting;
- Discounted cash flow;
- Investment analysis;
- Plant management;
- Setting of plant-hire rates;
- Financial management;
- Development economics;
- Construction methods;
- Operational research;
- Six Sigma for construction.

The intention is for the students to test their knowledge by trying the examples and comparing the solutions with those offered in the book. Any differences between the student's solutions and those presented here may be discussed with the tutor, and in this way tutorial discussions may be used advantageously for resolving difficulties rather than for routine learning.

It should be remembered that these are tutorial examples and that each one deals with a limited number of variables and principles, sometimes making simplifying assumptions. Thus, students may test their understanding of the principles and ability to manipulate the variables.