Risk and Financial Management in Construction

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GOWER
Introduction

Book Format

Whilst there are natural overlaps between the two topic areas of Project Management, for ease of use this book is divided into two parts: Part 1 dealing with Construction Risk Management, and Part 2 with its corresponding Financial Management. This introduction provides an overview of the construction industry and also introduces the main themes of these two interrelated construction management topics. It closes with an overview of the forthcoming chapters.

An Overview of the Construction Industry – Setting the Scene...

The construction activity involves assembling materials and components designed and produced by a multitude of suppliers, working in a diversity of disciplines and technologies, in order to create what is regarded as ‘the built environment’. Such activities can include the planning, regulation, design, manufacture, construction, maintenance and eventual decommissioning of buildings and other structures. Their scale, complexity and intricacy varies enormously, ranging from work undertaken by small ‘jobbing’ builders, to international construction companies undertaking long-term, high-cost, complex and sometimes high-risk projects such as single or multiple major civil construction, with obvious examples being the Channel Tunnel, nuclear power station construction and, of course for the UK, its showcase sporting venues for the London 2012 Olympic Games.

From a ‘value chain’ viewpoint, new construction can be regarded as:

- a means of production or provision of services (a factory or office block);
• an addition to, or improvement of, the infrastructure of the economy (railway or roads);
• a social investment (hospitals); or
• provision to meet a direct need (housing).

Construction then is a major national investment, accounting for half of the UK’s annual fixed capital formation. As such, it plays a vital role in the competitive delivery of goods and services by the rest of the economy. In addition the house-building industry also stimulates other services (estate agents, solicitors) and associated industries for example suppliers of carpets, curtains, furniture, white goods and so on. The construction industry as a whole presents many employment opportunities in the fields of building, civil engineering, offshore structures and the process-plant industry. It embraces the efforts of contracting firms, specialist contractors, consulting architects and engineers, professionals such as architects and quantity surveyors, suppliers of building materials and manufacturers of equipment.

Construction, by its nature as a system integrator and a stimulus for other parts of the economy, can therefore be regarded as a basic economic multiplier. From a macroeconomic perspective the industry requires the three classic ‘factors of inputs’ of land, labour and capital, all of which can be affected by government policy. The UK is neither a state-controlled economy, nor is it at the other end of the continuum of being a free economy of no state intervention. Indeed the UK operates by a compromise of mixed economy with a certain amount of government intervention. At the national government level this can be seen in the form of taxes, Health and Safety legislation, Construction Management legislation and general employment law. At the local government level this is exemplified by control of planning approval and development schemes, adherence to local requirements and bye-laws and cognisance of local pressure groups.

Looking broader, the construction industry is not only of major national importance but may also feature as an international industry as UK construction companies may also be responsible for a significant amount of work undertaken overseas, which typically represents between 10 to 15 per cent of the annual turnover of the major British construction contractors. UK companies working overseas require an understanding of, firstly, how to find and undertake construction work in different countries; secondly, the level of competition, tendering and procurement activities; and thirdly, how to comply with new
local and national government controls such as employment law, health and safety requirements and so on.

An examination of the various sectors within the construction industry reveals that this may be seen as a temporary activity as it is normally carried out at the client’s premises and is viewed as an enabling activity to allow the client organization to conduct its business; be this retail, manufacturing or service related. However, because of these reasons, the industry has a number of problems such as low and discontinuous demand, low productivity compared to other industries and low profitability. There is no imposed or self-regulation of the industry and there are so many companies that the industry can be regarded as (and is often criticized for) being fragmented.

Historically the factors which influence the location of a particular industry have typically included the accessibility of raw materials, power supply (for example, coal and water), transport, market access and so on. However, examining the construction industry against such criteria reveals that the industry is not itself influenced by such location factors but by the locations of its client’s base and, without a long-term commitment, construction work becomes a mobile service industry. Indeed, in the vast majority of cases it is not only undertaken at the client’s site but, importantly, only when other industrial or commercial sectors are flourishing, allowing it to concentrate on the building of factories, houses or service buildings.

The operation of the construction industry can be viewed against a competitive strategy model (shown as Figure I.1) developed by Harvard University Professor, Dr Michael Porter, which identified five key driving forces on a business. These being:

- Potential Entrants – the threat of new entrants;
- Industry Competitors – rivalry among existing firms;
- Substitutes – the threat of substitute products or services;
- Buyers – the bargaining power of buyers;
- Suppliers – the bargaining power of suppliers.

In looking at the first two of these key business drivers – Potential Entrants and Industry Competitors – it is recognized that the UK construction industry is, in the main, confined to competition from established UK companies. This is particularly so in the sectors of Non-residential Building and Infrastructure
because the construction industry operates differently to other industrial or economic sectors. Companies require manpower resources, plant and equipment, health and safety procedures and various insurances to be in place together with an established track record to be able to even bid for work in this important sector. Consequently, these requirements imposes significant barriers to entry to the construction market resulting in competition not from international companies or new entrants but being confined largely to existing UK companies or those international organizations with a UK subsidiary operation. In looking at the third element – the threat of substitute products or services – it is logical to assume that there is little threat of substitution of site-based infrastructure construction activities although the future may see an increase in the prefabrication of buildings or other factory-based building techniques.

The final two forces covering the bargaining power of buyers and those of suppliers can also be grouped together. Both are influenced by the same factors of the concentration of construction companies, the number of capital projects being undertaken within the UK market and the perceived importance and willingness to undertake work for a particular client. These two forces and that of competition have had an effect on client/contractor relationships over a period of many years. Indeed, the traditional modus operandi of competition with other construction companies has been driven, in the main, by the client’s desire to achieve the lowest-cost bid, not only in the private sector but also in the public sector, which has been supported by the government-inspired Compulsory Competitive Tendering process. As a result, and with very few exceptions, relationships have been adversarial with parties concerned resorting to contractual claims, which lengthen timescales and drive up costs, as a direct consequence of the behaviour of both parties. Where the client will only award work to the lowest-priced contractor, the contractor responds to this approach by submitting an uneconomic and unrealistic low price which results in time and effort being spent by the contractor in finding reasons for which additional money will be sought. In essence, this became a common contractor’s traditional strategy of submitting a low price in competition knowing that it will be supplemented by post-contract extras, variations and financial claims when delay and disruption opportunities presented themselves.

Furthermore the traditional procurement systems and the contractual and legal framework by which participants are bound together have been widely and regularly criticized as being confrontational and adversarial. This should not be too surprising as it is widely recognized that the construction industry is historically famed for its adversarial approach and the amount of time and
money spent on litigation which provides employment opportunities for a significant number of professionals including claims consultants, quantity surveyors and construction lawyers. Such recognition of the construction industry’s adversarial attitudes is not new and a number of British Governments have commissioned investigations into the industry, notably the reports of Sir Ernest Simon in 1944, Sir Harold Emmerson in 1962 and Sir Harold Banwell in 1964, all of which tell a similar tale. More recently this industry ‘norm’ so concerned the previous Government that it appointed Sir Michael Latham to carry out yet another review of the procurement and contractual arrangements in the industry. His report ‘Constructing the Team’, published in
1994, recommended change for the industry and gave a number of specific recommendations including a change in culture aiming to move away from the traditional adversarial client/supplier relationship which it noted had prevailed in the industry for many years. In particular the ‘Constructing the Team’ report saw closer collaboration and ‘partnering’ as the development of a strategic long-term commercial arrangement between a client, contractors and suppliers and went further by proposing that this was one of the techniques most likely to improve both cost efficiency and customer relationships within the construction industry. However, the traditional industry relationship between client and contractor over a period of many years had led to a set of assumptions that had become strong barriers to implementing partnering relationships in this industry.

These adversarial attitudes resulting from traditional contractor/client relationships often concern the priorities and goals of the client which in the past have been substantially different from those of the contractor. This was also due to the involvement of the client who appointed a number of consultants on a construction project to design and supervise its construction. Often there would be several such consultants on a single project, including architects, civil and structural engineers, mechanical, electrical and services engineers and quantity surveyors with one of these consultants appointed to undertake the role of managing and coordinating the work of the others and the contract as a whole. Because of the many specialist groups often involved in a project, clients have expressed concern that they have limited communication of progress and little, or no, control over the costs of construction, nor of the time taken to complete the project. Such comments arose from the past reluctance to involve the client in the decision making process with a preference to keep any technical problems concealed from the client until the final payment demand was presented. In addition to poor communications clients had also felt that they are the victims of poor design, inadequate supervision, insufficient choice of materials and contract methods. To counter such problems major clients, including the UK Government itself, demanded a change in the construction industry’s behaviour with a change in emphasis from a ‘production-oriented’ to a ‘client-oriented’ outlook. This viewed was echoed in the major industry reviews conducted by Sir Michael Latham and Sir John Egan in 1994 and 1998 respectively where such culture change was fundamental for work being undertaken in a partnering arrangement promoted by the Latham and Egan reviews. Over the last decade some government agencies, and other clients, have had encouraging experiences in partnering, although the government still does not define the term ‘partnership’ in quite the same way as the construction industry. For them partnership means, almost entirely, getting the private sector
to employ its resources and assets to take on as much risk as possible including
the risk of cancellation or postponement, often for little financial reward.

Against this industry backdrop, construction projects require the
deployment of project managers and their professional skills and experience
to bring the project to fruition. This role involves managing the interrelated
project performance parameters of cost, time and quality and managing the
risks which may adversely affect one, two or all three of them.

**Introducing Construction Risk Management**

In life there are risks: in driving a car, crossing the road or playing various
sports. Everything we do can be associated with risk in the form of events
that might prevent the achievement of stated objectives if they occur. So too
in business although in many cases such risk uncertainties are naturally
associated with a financial risk compared to the market volatility and hence the
ability to realistically provide expectations based upon a risk versus reward
trade off. Whilst the management of corporate financial risk is undertaken
through a very specialist risk discipline, this book examines the subject of risk
management from a project, business or operational viewpoint where such
risks can be internally or externally driven and may impact on the project’s
stated scope, schedule and cost objectives.

The objectives of risk management are to ensure the rapid identification of
risks within the business and to establish a clear process of assessment, action
planning and reporting of the risks identified. In addition, it is important that
focus and attention is given to the identification of opportunities as this will
enable effective decision making to ensure that:

- Business opportunities can be quickly assessed at an appropriate
  level in order to decide whether and how it might proceed with
  such opportunities.

- Threats to the project or other parts of the company’s operations
  can be eliminated or at least reduced to an acceptable level.

- All decisions take account of contributing to sustainable shareholder
  value.

The underlying principle is that key risks and the appropriate control measures
are kept under regular review and reported to project participants, project
sponsors and key client representatives.
In focusing on typical construction projects, the topic of risk management can be seen in Figure I.2 to impact on many facets of the project. Whilst the traditional view is that risk management is a part of the project management function, carried out by the project manager or delegated project team member, an alternative view is that if there were no risks in a project there would be no need for project management and that the main purpose of project management is to manage the risks and hence the term Risk-Driven Project Management has started to come into being. From this understanding, risk management should consider all aspects of the project and begin early in the life of a construction project continuing through until project closure.

Figure I.2  Integrating risk management with other project management functions

Source: Project Management Institute, Project & Program Risk Management: A Guide to Managing Project Risks and Opportunities, Project Management Institute, Inc., 1992. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.
A project by definition is trying to introduce some form of change – a new production system or way of working, a new building, and so on. Change involves uncertainty, which in turn means that projects are more likely to be ‘blown off course’ by a potential future event. In other words, projects in themselves are inherently risky undertakings. Dennis Lock, in introducing the topic of risk management in his book, Project Management, proposes that:

‘It is not surprising that projects, which metaphorically (and sometimes literally) break new ground, attract project risk. Project risks can be predictable or completely unforeseeable. They might be caused by the physical elements or they could be political, economic, commercial, technical or operational in origin. Freak events have been known to disrupt projects, such as the unexpected discovery of important archaeological remains or the decision by a few members of a rare protected species to establish their family home on what should have been the site of the project.’

There is widespread agreement within the project management community that a project risk is any event or series of events, whether internally or externally driven, that on occurring will have negative consequences on the project or business opportunity in terms of performance, functionality, time of delivery, acceptance or cost. There are, however, strong views that project risks are always those risks that impact on one or more of the project baseline elements – time, cost or quality (note that quality is sometimes referred to as technical).

The British Standard on Project Management (EN BS 6079-3:2000) defines risk as:

‘An uncertainty inherent in plans and the possibility of something happening (i.e. a contingency) that can affect the prospect of achieving business or project goals.’

In the Vocabulary of this Standard a further definition is also provided as a:

‘Combination of the probability or frequency of occurrence of a defined threat or opportunity and the magnitude of the consequences of the occurrence.’
Another common definition of risk and one frequently used is:

‘the threat or possibility that an action or event will adversely or beneficially affect an organization’s ability to achieve its objectives.’

There are many potential benefits to the effective use of risk management techniques, the most significant are shown in Figure I.3 below.

**Introduction to Finance and Investment of Construction Projects**

Whilst the first part of the book deals with project delivery risks there are also many risks associated with financing of large-scale investments, both by private and public organizations. Every project requires financial means, regardless of whether it is a public, public-private or a privately-funded venture and investors are often afraid of making decisions due to lack of full knowledge in the field of financing methods and their associated risks. As such, the second part of this book will deal with the methods of financing, assessment of effectiveness and identification and management of risks while undertaking construction investment projects.

![Figure I.3 Benefits of risk management](image)

**Potential benefits of Risk Management**

- Provides a vehicle for communication with stakeholders, investors and other interested parties
- Promotes continual improvement for current and future projects
- Reassures stakeholders that project is being professionally managed
- Supports decision making on effective use of resources
- Encourages positive attitude to management of project risks
- Ability to grasp new opportunities
- Reduces shocks and unwelcome surprises
- Provides mechanism to review risks and changes in status or impact or potential risks
- Captures project teams concerns on risk identification
- Enhances communication between main contractor, sub-contractors, suppliers and client
- Systematic approach to strategic and business planning
- Provides ability to allocate risk to the most appropriate party
- Encourages risk reduction rather than risk recovery
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- Provides a focus to internal audit programmes
All organizations will expect the potential investor to consider risks inherent in large-scale ventures, both those risks associated with the construction and operation and those pertaining to the mode of financing of the project. Many projects undertaken in developing countries are financed by multilateral, bilateral or special purpose financial organizations. In most cases, however, a lack of developed financial markets often limits financing to only a few limited sources. In countries characterized by a highly developed market economy, both the state and private companies can be seen to finance numerous undertakings. Here the sources of private finance have traditionally come from pension funds, insurance companies, commercial banks, niche investment banks, large corporations, stock exchanges, assistance agencies, investors and property (real estate) developers.

The sources of finance from the public sectors almost wholly arise from taxation or subventions to provide the required level of financing of the project. In regression periods only urgent projects may be financed this way since income from taxation is likely to be limited and subventions, often in form of interest-free loans, are then the only option.

Modern economic analysis and finance management methods provide numerous solutions that allow investors to make the right decisions throughout all phases and stages of the investment process. Specific groups of methods also allow for management of uncertainty and risk while making investment decisions. In the case of construction projects, the main problems are in the estimates of their profitability and ensuring the proper modes of financing. After securing the project from a client where funded by internal, external or the client, project cost control and financial performance will be key areas to be managed.

**Book Overview: Part 1**

This book consists of two parts; in the first part are five chapters on risk management which are presented in a natural sequence of the components of the topic of risk management. These chapters are introduced below:

**CHAPTER 1: RISK MANAGEMENT IN CONSTRUCTION PROJECTS**

In introducing the topic of risk management it should be noted that whilst there will be a cost to the project in adopting a risk management process and indeed culture, this cost can also be considered with respect to the consequences of not undertaking risk management in a systematic and professional way. Clearly all risks cannot be controlled but to ignore risks and risk mitigation tools,
covered in this and the subsequent chapters, will undoubtedly lead to adverse consequences on projects. Such consequences of failing to deal effectively with risk can include significant cost overruns, schedule delays and inability to achieve desired project technical objective(s). Other important consequences may include:

- project de-scoping;
- loss of credibility;
- ultimately, project cancellation and unhappy clients; and
- personal or organizational liability and fines.

The balance between the organization’s ability to take risks for business purposes and that of risk management in the form of corporate governance and a management process is shown in Figure I.4 which illustrates the difficulty of balancing risk taking with risk management; in reality these two forces inevitably cause the project to osculate around the organization’s optimum approach.

Chapter 1 looks at the subject of risk management from a project, business or operational viewpoint. Its aim is to provide an introduction to the topic where such risks can be internally or externally driven and have the ability to impact on a project’s stated scope, schedule and cost objectives. The role of risk management and that of the project manager are discussed in this chapter,

![Figure I.4 Balancing risk control](image)

followed by an overview of the risk management process and where it is used in the project process.

This chapter also provides a risk identification checklist as an appendix.

CHAPTER 2: RISK IDENTIFICATION AND PLANNING

This chapter covers the important task of risk identification which is traditionally considered to be the first step in the risk management process and includes tools and techniques to aid this process. Once the risks have been identified then a Risk Plan can be developed and Chapter 2 discusses both the rationale and suggested contents of a typical risk plan. The chapter concludes with a look at the definitions of risk probabilities and their consequences which are key features in efficiently using resources to implement the risk plan.

CHAPTER 3: QUALITATIVE RISK ANALYSIS AND QUANTITATIVE RISK EVALUATION

Chapter 3 covers two main topics. Qualitative risk analysis covers a range of techniques for assessing the impact and likelihood of identified risks. These approaches can be used to prioritize the risks according to their potential effect on project objectives and is one way to determine the importance of addressing specific risks and guiding risk responses. The time-criticality of risk-related actions may magnify the importance of a risk and together with an evaluation of the available information also helps modify the assessment of the risk. Quantitative risk evaluation generally follows the qualitative risk analysis activity. The second part of the chapter shows that quantitative risk evaluation requires risk identification and that both qualitative and quantitative risk analysis processes may be used separately or together. There are many tools available for the identification and evaluation of risks and risk controls, ranging from experience-based judgement, checklists and risk matrices, to specialist review and analysis techniques. The most appropriate tool depends on the operation complexity and level of risk; and the ease of use and form of output. This chapter also covers the more specialist risk tool ‘Bowtie’ methodology which is used in a number of the high-risk industries and is a very popular tool in the oil and gas sector.

CHAPTER 4: RISK RESPONSE PLANNING, MONITORING AND CONTROL

Risk response planning is the process of developing options and determining actions to enhance opportunities and reduce threats to the project’s objectives.
This includes the identification and assignment of individuals and parties to take responsibility for each agreed risk response. This process ensures that identified risks are correctly addressed and that the effectiveness of response planning will directly determine whether the risk increases or decreases for the project. There are a number of factors that risk response planning must satisfy, namely:

- its appropriateness to the severity of the risk;
- that it needs to be cost effective in meeting the challenge;
- that it needs to be timely to be successful;
- that it needs to be realistic within the project context;
- that it needs to be agreed upon by all parties involved in the project; and,
- that it needs to be owned by a responsible person.

Selecting the best risk response from several options is often required and these are discussed in Chapter 4 together with risk monitoring and control in order to keep track of the identified risks, monitoring residual risks and identifying any new risks as they emerge during the life of the project. The chapter covers a typical project control system to ensure the execution of the risk plan and evaluating the plan’s effectiveness in reducing risk. Risk response planning also needs to be monitored against the risk plan and may involve choosing alternative strategies, implementing a contingency plan, taking corrective action(s), or, at worst, replanning the project.

CHAPTER 5: CONSTRUCTION PRIME CONTRACTING AND THE IMPORTANCE OF RISK MANAGEMENT IN INTERNATIONAL PROJECTS

Having examined risk management for all construction projects, this final chapter on risk management commences by considering risk management applied to large-scale projects. It also introduces the topic of Prime Contracting and goes on to conclude with an examination of the risks likely to be prevalent in international construction projects.

Book Overview: Part 2

The second part of the book covers four chapters on financial management commencing at the strategic financial level of raising project funding, through to project performance contract strategy and on to project financial aspects of
estimating, budgeting and cost control. These financial chapters are introduced below:

CHAPTER 6: FINANCING OF CONSTRUCTION PROJECTS

The first chapter of the second part of the book now represents a move to financial management with a good starting point being to look at how investment in construction projects is undertaken at various stages of the project. The chapter then goes on to discuss the influences on, and the criteria for, making such investments together with some reference to risk and uncertainty of project investment.

Whilst some construction clients may look to external investors to provide funds for the construction of their business facilities, they are also likely to use their own funds in addition to such externally raised capital. Where the client company does not have enough immediate funds from either its normal business income activities, or even by raiding its ‘piggy-bank’ of retained profits it is unable to provide sufficient funding for large-scale investment, the options to raise and/or increase initial project funding for construction projects in both the long and short term are explored in this chapter.

CHAPTER 7: FINANCIAL ASSESSMENT AND PERFORMANCE OF PROJECTS

Following on from Chapter 6 and the project performance criteria of cost, time and quality is the financial assessment of the project investment and a number of techniques for examining the financial performance of projects including Value Management.

CHAPTER 8: ADVANCES IN CONTRACT STRATEGY

This chapter examines construction contract strategy with a focus on risk and insurance providing a link back to the earlier chapters of the book. This chapter ends with a look at the financial aspects of Public-Private Partnerships – a contract strategy growing in popularity especially for large-scale infrastructure projects.

CHAPTER 9: ESTIMATING, BUDGETING AND COST CONTROL

The final chapter covers the main financial functions of project delivery. Project management requires accurate cost estimates; if the project information used is detailed and precise, the resulting cost estimate will be also. Indeed during the duration of the project, as the project technical scope of work becomes defined
so the precision of the estimate will improve. Although individual companies
will use their own estimating processes usually these will follow a typical
approach, such as:

- Obtaining specific technical and operational concept definition to
  understand what the project's objectives are and how will they be
  accomplished.
- Developing the Work Breakdown Structure (WBS) and input on
  how the project be organized.
- Building a structured cost chart of accounts to allow the costs to be
categorized.
- Building a data collation plan and identifying what data is needed,
  and how it will be collected.
- Data collection: obtaining and recording the required information.
- Structuring the cost database with consideration on how the data is
to be organized for best developing cost estimates.
- Data analysis to understand what the data indicates about the
  project costs.
- Developing a cost estimating relationship to determine if certain
costs can be forecast as a function of the project's parameters.
- Building an interactive cost model to represent the project costs
  which will demonstrate how overall project costs change as various
  conditions change.
- Making an estimate of the costs based on expectations and project
  conditions.
- Analyzing the results to ensure that the cost estimate reflects any
  changes in the project conditions.

The chapter details these necessary cost control functions and provides
guidance on the three main areas of the chapter title.

REFERENCES

Where material has been taken from other publications this is detailed in the
references section to assist readers if further detail is required.
GLOSSARY

It is considered useful to include a glossary covering terms used in the topics from both parts of this book.