Chapter 1

Introduction

1.1 The Book's Focus and Objectives

I feel obliged to make it clear, right from the outset, exactly what this book is about and, just as importantly, what it is not about. My primary focus is on how best to deal effectively with the risks to a Contractor's profitability that sit within the various departments engaged on 'EPC Projects' for major construction work (where EPC stands for 'Engineering, Procurement and Construction'). My usage of the term 'construction work' in the previous sentence is intended to cover building, civil engineering and industrial engineering work of every kind, as envisaged in the ICMSC's 'Global Consistency in Presenting Construction Costs'.[1] However, I have not attempted to distinguish in this book between different types of construction work or industries, since I consider that the same basic risks apply to all EPC Projects (and also to Design-Build Projects).

Within this book I set down where I have observed poor management or outright mismanagement occurs at the manager and department levels on lump-sum EPC and Design-Build overseas projects (i.e. construction work outside the home country of the Contractors involved). Such poor performance results in large financial losses for the Contractors and, sometimes, embarrassing consequences (such as loss of reputation). This book also deals with major risks that can be imposed on projects that originate from outside the Contractor's own Project Management Team, such as the acceptance by the Contractor of onerous contractual provisions that really should have been avoided.

As the sub-title of this book indicates, my focus is very much about how Contractors can manage risks better and thereby stop certain types of losses occurring on their EPC/Design-Build Projects. I am fully aware that the materialisation of a major risk can have other dire consequences for a Contractor that go beyond money, but most other risks can be insured against or overcome by the application of good public relations efforts. The one risk that cannot be insured against in the contracting business is going bankrupt because of financial mismanagement. Of course, insurance coverage for a company's management personnel is readily available to protect them against

1 International Construction Measurement Standards Coalition (2017). *International Construction Measurement Standards – Global Consistency in Presenting Construction Costs*, 1e. International Construction Measurement Standards Coalition, p. 7.

Practical Risk Management for EPC/Design-Build Projects: Manage Risks Effectively – Stop the Losses, First Edition. Walter A. Salmon.

allegations of mismanagement (through Director and Officers Liability Insurance, for example, as explained by Construction Executive).[2] However, such insurance does not offer compensation to the Contractor for the company's losses that occur through financial mismanagement.

In the course of writing this book, I received a few negative comments from some people about the 'secondary' subject matter (managing risks effectively to stop losses). They mainly agreed with the concept of advising Contractors as to how best to deal with the risks attaching to construction projects, but thought that my focus on ensuring profitability was too commercial in today's climate. I even received one comment that 'business is about much more than just making a profit', which was said as if making losses was a virtue. However, I make no excuses whatsoever for concentrating on how Contractors should make more money and ensure their profitability by managing risks better. If anybody does not believe that making a profit is critical to businesses, they should try asking the views of the stakeholders of Carillion plc, including the tens of thousands of workers who lost their jobs when Carillion's business folded. It seems that close on 30 000 suppliers and subcontractors were still owed roughly £2 billion by Carillion at the time of its collapse.[3]

I have deliberately not attempted in this book to cover the risks inherent in 'reimbursable' construction contracts (sometimes referred to as 'cost-plus' contracts). Had I not adopted that path, I believe it would very much have confused my message as to where losses occur on lump-sum EPC/Design-Build Projects. The simple fact is that many of the risks that could lead to substantial losses on lump-sum contracts are usually opportunities to make more money under the reimbursable contract situation.

I have also not attempted to deal with too many other aspects beyond managing the major *project* risks encountered by construction companies when undertaking EPC/Design-Build Projects (i.e. I have as much as possible avoided dealing with the *corporate* risks). Most certainly therefore, this book does not attempt to provide advice as to 'How Best To Run Your Construction Company'. Instead, my primary objectives in writing this book were simply to show:

(i) what I have found to be the major loss-making risks for lump-sum EPC/Design-Build Projects;

(ii) whose responsibility I consider it is for preventing those risks from materialising into problems; and

(iii) the best mitigation methods I suggest should be adopted to prevent those risks materialising.

A large proportion of the publications I have read about how Contractors should implement sound risk management dealt predominantly with corporate risks, with the subject

2 Construction Executive (16 April 2014). *Understanding D&O liability insurance coverage*. www.constructionexec.com/article/understanding-do-liability-insurance-coverage (accessed 21 March 2018).
3 Strategic Risk (15 October 2018). *Carillion collapse: the lessons learnt in supply chain risk*. Newsquest Specialist Media Limited. www.strategic-risk-europe.com/carillion-collapse-the-lessons-learnt-in-supply-chain-risk/1428293.article (accessed 16 October 2018).

matter treated in a very generalised fashion. Most writers had not divided the subject up into digestible chunks or split the responsibilities clearly between the different Departments accountable for the required task inputs. Nearly all such publications also tended to concentrate on the various theoretical approaches available for assessing the overall risks of taking on a new Project. Very little had been written as to what the typical risks are in respect of the specific workloads of each individual Department, or how the complement of various Managers should best work together to handle those risks during Project implementation. As a result, I considered those publications were generally not specific enough to be truly useful for a Contractor's Corporate Managers, Project Managers and Department Managers. This book was therefore written in an attempt to fill the gaps and resolve the shortcomings I had observed.

It will be seen that there is a distinct lack of academic and theoretical content in this book, which was another deliberate decision I made. This was because my intent was to present a document that contained predominantly practical content that could be applied with immediate effect in the workplace on a daily basis. It is not that I object to applying academic principles to Project Risk Management – far from it. It is just that the aim of this book is to focus on practical matters. Anybody wishing to research the various theoretical approaches that can be applied to Project Risk Management can do so by following the references I have supplied within this book (and which I believe would help them to undertake further worthwhile detailed research of their own).[4]

I do not pretend that the advice in my book is intended to be a balanced document equally reflecting the interests of both parties to an EPC or Design-Build Contract (i.e. both the Employer and the Contractor). On the contrary, I have written primarily for the benefit of Contractors. I have therefore deliberately avoided mentioning situations where the Employer could take advantage of the Contractor. Having said that, nowhere do I make any suggestions that amount to the Contractor ripping off the Employer; but putting the Contractor into a legitimately stronger position, most certainly 'yes'. The purpose of my book is simply to show where managing the risks better will prevent unnecessary losses for the Contractor. Of course, nothing prevents a member of the Employer's Team from reading this book, learning where the Contractor is most likely not to be managing risks properly, and then using that knowledge to defeat the Contractor's claim for extra time and/or money. The way for Contractors to overcome that problem is for them to sharpen up their Project Risk Management capabilities.

I included the term 'Design-Build' in the title of this book, since I consider that there are only subtle differences between how EPC Projects and Design-Build Projects are set up and run. The reality is that the risks I cover in this book can apply equally to both types of Project since, under each of the different arrangements, the responsibility for the design work (as well as the procurement and construction work typical to *all* construction Projects) falls to the Contractor. I have therefore opted in later chapters not to repeat the term 'Design-Build' unless I felt it was particularly necessary to do so.

4 I consider that a good starting point would be the APM (Association for Project Management) publication 'Project Risk Analysis and Management Guide' (PRAM Guide).

In an effort to deal with most of the major problems that could be encountered, I have taken into consideration the worst-case contractual scenario I can think of in respect of the risks that a Contractor could possibly face in undertaking an EPC Project. That is where the Contractor is required to submit a lump-sum bid for an overseas Project in a developing country for a specialised process plant (such as an oil refinery), in the situation where the Invitation to Bid documentation issued by the Employer comprises only:

(i) an incomplete Conceptual Design;

(ii) an outline Functional Specification that requires finalisation during the bid negotiation phase (i.e. no detailed specifications are provided);

(iii) a preliminary Plot Plan (i.e. not a fixed layout) that likewise needs to be firmed up in the bid negotiation period;

(iv) a mixed complement of loosely coordinated technical and administrative requirements that contain many references to third-party standards that sometimes conflict with each other; and

(v) a set of contractual requirements that are heavily biased in the Employer's favour.

The foregoing list of inadequate documentation is a far cry from that which the International Federation of Consulting Engineers (more commonly referred to as 'FIDIC') envisages for EPC Projects (i.e. detailed, specific Employer's Requirements are expected as a norm).[5] However, I have personally experienced working on and resolving the problems for Projects where one or more of the above inadequacies occurred (and one Project where they all occurred), although I am not at liberty to identify those Projects here. I am, however, certain that such unfairly and awkwardly constructed Projects will keep appearing, just as long as there are Contractors around who are desperate for whatever work they can get their hands on in the location they wish to build their future in.

I have had a number of people who have read some of my observations of where things went wrong on construction projects say words to the effect of 'it's just bad management', as if telling people to employ 'good management' would have miraculously cured the problems I encountered. My stance is that the many people I observed suffering the negative effects of their own poor management were usually completely unaware of what they had done wrong (or had failed to do correctly). Knowing that you have to employ good management is very different from knowing what good management is. The purpose of this book is therefore to divulge what I myself have seen go wrong, and to offer my advice as to how such situations could have been handled better. My hope is that this will lead to sound Project Risk Management being put into practice more often.

1.2 The Book's Content and Structure

I wish to stress that the core content of this book is to be found in Chapter 6 (Project Roles, Functions and Responsibilities), which sets out, over the course of 26 sections,

5 Fédération Internationale des Ingénieurs-Conseils (FIDIC) (2017). *Conditions of Contract for EPC Turnkey Projects,* 2e. Fédération Internationale des Ingénieurs-Conseils/International Federation of Consulting Engineers.

what I consider the Contractor's key management personnel must do (or avoid doing) in order to ensure the success of a Project. However, before launching into the detailed nitty-gritty of Project Risk Management for EPC Projects at a practical level, I feel that there are a number of important matters that need to be aired and/or straightened out first. This is largely because I have received a lot of negative comments over the years from people in the construction industry about the EPC/Design-Build concept of Project implementation. Very often, such comments came from those who had little or no experience of what is involved, so their negative comments were perhaps not surprising.

The principal negative comments against the EPC approach I received were as follows:

1. Too many Contractors working on EPC Projects have failed miserably to achieve the time and cost objectives. As McKinsey & Company found in 2017, Project durations have often been horribly extended and the final costs have quite regularly far exceeded the original budgets.[6]

   (This does not appear to be as big an issue for Design-Build Projects, perhaps because their application is often to much smaller undertakings (private residences being an example). Such Projects are also often carried out by highly specialised teams with tried-and-tested technology [for example, cold storage building contractors, swimming pool installers and prefabricated building suppliers]. In such cases, the risk sharing between the Contractor and the Employer seems to be much more evenly balanced than on EPC Projects [especially when compared to the fixed-price, major turnkey ones], as was observed by Banik and Hannan.[7]*)*

2. The Contractor is responsible for and has complete control over at least the detailed design work, and may therefore be tempted to skimp on the quality of the finished facility wherever it seems possible to get away with doing that.

3. The Employer is not able to exercise control as to which Subcontractors or Vendors are selected for the Project. This is contrary to what is often done under the Traditional Contracting approach, where it is very common for the Employer to appoint such third parties and directly contract with them (thus giving the Employer a great deal of control over those entities).

I have to say that the foregoing concerns are not unrealistic. However, there are ways in which an Employer can exercise control over each of those issues to get what every Employer requires from a completed construction development of *any* size, namely:

(i) safe completion of the Project on time and within budget, and

(ii) a first-class facility that fully meets the functional, operational, performance, reliability, availability, maintainability, and safety requirements.

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6 Banaszak J., Palter R. and Parsons M. (March 2017). *Stopping the insanity: Three ways to improve contractor-owner relationships on capital Projects*. www.mckinsey.com/industries/capital-Projects-and-infrastructure/our-insights (accessed January 2018).

7 Banik G.C. and Hannan F. (2008). *Specialty Contractors' Perspectives on Risk Importance and Allocation of Design-Build Contracts – Abstract* (School of Architecture, CET and Construction Southern Polytechnic State University).

To demonstrate that an EPC/Design-Build approach is every bit as worthwhile and valid from an Employer's point of view as the Traditional Contracting route, I have therefore included extensive notes about the traditional procurement approach to Project implementation, and contrasted those with both the EPC and Design-Build procurement routes. These details can be found in Chapter 2 (Construction Project Implementation Routes) and Chapter 3 (EPC Project Risk Management Overview). I have also provided a substantial amount of background detail about EPC Projects in particular: both Chapter 4 (EPC Project Pre-Implementation Problems) and Chapter 5 (Overseas EPC Project Preparatory Work) deal with different aspects of this topic.

For those who consider that they fully understand the ins and outs of the different contracting arrangements covered therein, Chapter 2 may be considered to be not so useful, and some readers may even choose to skip directly to Chapter 6. Nonetheless, I venture to suggest that Chapters 3, 4 and 5 are worth a read by anybody responsible for putting bids together, or who wishes to know where things can often go very wrong before implementation of the Project begins to get underway.

My approach in Chapter 6 has been to pinpoint, from my standpoint, the appropriate Manager to whom the responsibility for identifying and managing each specific risk should rightly fall, in line with the thinking displayed by the Association for Project Management (APM).[8] I have therefore written this book as if there is only one way to organise the corporate structure and allocate Project responsibilities within a construction company. No doubt that will make my work subject to a certain amount of criticism, notwithstanding that I took that approach in full recognition of the fact that there are many different schools of thought as to how construction companies and Projects should be organised. My thinking was that, no matter how a company organises its Corporate Management Team or deals with the management of its Projects, it is not possible to remove either the corporate risks or the project risks; they will always remain, and the only things that will change from one company to another are:

(i) upon whom the responsibility for managing each risk falls,

(ii) how the importance of each risk is perceived, and

(iii) how each risk is to be handled.

I also considered that, if there is no clear organisational framework or management structure established, then the principles of Project Risk Management I mention could be deemed to apply to different roles/functions within the organisation. However, I intended to pin down with a greater degree of certainty what the risks are and which person is properly responsible for managing each risk (in my opinion, of course). Thereafter, having seen how I have applied the risk management principles to the preferred structure I have chosen to follow, others with differing views can then adapt those principles to accord with their own preferences for how their companies and Projects should be organised. In order to make it clear as to what management structure I am working to, Appendix C shows the 'EPC Project Management Team Organisation Structure' I

8 Association for Project Management. *APM PRAM Guide*. Association for Project Management, p. 98: 'Risks are more likely to be acted on if responsibility is allocated to individuals'.

have employed and Appendix D shows the 'EPC Project Departmental Organisation Structure' I have adopted.

To round out and complete the subject of Project Risk Management, I have also included three further Chapters, namely: Chapter 7 (Reducing Joint-Venture/Consortium Risks), Chapter 8 (Claims Management Risks and Problems) and Chapter 9 (Identifying Hazards and Managing the Risks).

I had intended that construction industry students/newcomers should also be able to find the content of this book useful. In view of that, I am compelled to add the caution that the management structure I have adopted herein (for both the EPC Project team and the Contractor's company) must *not* be considered to be written in stone. It simply provided a means for me to allocate roles and functions/responsibilities in a structured manner, in an effort to ensure that I did not miss out discussing any key area of management. It therefore needs to be recognised from the outset that, within different companies, some of the functions/responsibilities I have allocated to a particular Manager may well be allocated to another Manager. Nonetheless, my hope is that my approach will enable those who have not had experience occupying or dealing with certain of the various management positions to be able to appreciate more fully what it takes to run an EPC Project efficiently and effectively. Ultimately, if all this book achieves is to encourage more discussion about the practical application of Project Risk Management in the construction industry (and for EPC and Design-Build Projects in particular) then I will consider that I have done some good, regardless of any flak that may come my way.

1.3 Generality of Contractual Advice Given

There are a number of standard forms of contract that deal specifically with lump-sum EPC/Design-Build Projects. For example:

- the FIDIC Silver Book ('Conditions of Contract for EPC/Turnkey Projects'),[9]
- the FIDIC Yellow Book ('Conditions of Contract for Plant and Design-Build'),[10]
- the 'ICE Conditions of Contract Design and Construct',[11] and
- the IChemE 'Lump Sum Contract – The Red Book'.[12]

However, International Oil and Gas Companies (such as BP, ExxonMobil, Gazprom, Lukoil, Petronas, Royal Dutch Shell and the like) commonly use (and will no doubt continue to use) bespoke contracts that have been tailored to the individual needs of each respective company. The use of such custom-compiled contracts is primarily because the standard forms of contract would need to be substantially modified to incorporate all the special requirements particular to each of those organisations.

In view of the above, the advice I give in this book has not been developed with reference to any specific standard forms of contract. In turn, that means that I have not attempted

9 FIDIC – Fédération Internationale des Ingénieurs-Conseils.
10 Ibid.
11 Published by ICE Publishing (part of the Institution of Civil Engineers).
12 Published by the Institution of Chemical Engineers.

to deal with any of the particular terms and conditions that are found in the standard forms. I prefer to leave that to lawyers and, in any case, those topics are covered more than admirably in a number of well-known books.[13] However, I have tried to identify as many as possible of the uglier (unfair/one-sided) clauses that work their way into many contracts, whether the base document is one of the standard forms of contract or a bespoke contract.

1.4 Common Elements for Construction Projects

Construction work is ever present amongst us, whichever direction you care to look, taking on many different forms. Construction activities range from major city redevelopments to petrochemical plants, and with so many things in between; the list of possible construction work seems endless. And the Construction Industry is simply huge. For infrastructure work alone, according to McKinsey & Company the value anticipated to be undertaken worldwide over the period 2018–2023 is in the order of USD 77 trillion.[14]

There are many steps that need to be taken first before even one spade can strike the ground in earnest to commence the physical on-site work for a major Project. For most Projects, a feasibility study will need to be conducted before the Employer will be prepared to commit the necessary resources to proceeding with the implementation activities. A typical feasibility study will address the questions of the legality of the proposed Project and whether its construction would be technically feasible, as well as being fully justified on economic grounds. It is not usual for a Contractor to be involved in ascertaining the viability and feasibility of a Project unless the Contractor is required to be involved in organising and/or providing the finances. This requirement can sometimes be necessary under an EPC Contract if payment to the Contractor is not due to be made until a number of years after the facility has been operating. It is most certainly required in Projects where the Build-Operate-Transfer (BOT) concept is employed.[15] BOT Projects may also be implemented under an EPC arrangement. The problems for some Projects can start with an inadequate feasibility study, which can then lead to severe cash flow problems for the Employer (and, ultimately, the Contractor). To avoid the possibly disastrous problems that an inadequate feasibility study can cause, it has been proposed by some (see Hyari and Kandil) that a series of peer reviews should be conducted of all feasibility study material.[16]

There are many different ways for an Employer who wants to have construction work carried out to arrange for the appointment of a Contractor to do the work.

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13 Such as, but by no means limited to, *Hudson's Building and Engineering Contracts* (by Hudson A.A. and Wallace I.N.D.) and also *Construction Contracts - Law and Management* (by Hughes W., Champion R. and Murdoch J.).

14 Billows J., Kroll K., Pikul P. et al. (August 2018). *Capital Project value improvement in the 21st century: Trillions of dollars in the offing*. www.mckinsey.com/industries/capital-Projects-and-infrastructure/our-insights/capital-Project-value-improvement-in-the-21st-century-trillions-of-dollars-in-the-offing (accessed 05 September 2018).

15 MBA Knowledge Base (5 March 2012). *Build Operate Transfer (BOT) Model*. www.mbaknol.com/Project-management/build-operate-transfer-bot-model (accessed 31 July 2018).

16 Hyari K. and Kandil A (2009). *Validity of Feasibility Studies for Infrastructure Construction Projects. Jordan Journal of Civil Engineering*, 3(1).

However, whether the work is let under a Traditional Contracting arrangement or an EPC/Design-Build arrangement, the Contractor's work will almost certainly involve both procurement and installation/construction work. It will therefore be of no surprise that a great deal of what I have written will quite obviously also apply equally well to non-EPC/Design-Build Contractors, despite the intended focus of this book being on EPC/Design-Build Projects.

Whether or not a Project is conducted under an EPC or Design-Build arrangement, failure to manage the implementation risks properly for a major Project can lead not only to huge financial losses but also to bankruptcy for the Contractor's entire business. Mismanaging a major Project's risk portfolio should therefore be viewed as a gamble too far for most Contractors, and advance planning is therefore vital. Consequently, no matter what type of contractual arrangement the successful bidder will eventually be working under (whether the Traditional Contracting approach or an EPC/Design-Build route), there are certain basic preparatory bidding steps that need to be taken. The following sets out what those steps are, and which are essential if the bid pricing is to stand a good chance of adequately covering all the costs involved for undertaking all the work necessary to complete the Project successfully:

1. Planning how the work will be done through the development of a comprehensive Work Breakdown Structure (WBS) for the Project. Sometimes the starting point might be an outline WBS required/prepared by the Employer's Team and issued with the Invitation to Bid documentation. No matter, the WBS needs to be worked up into a truly meaningful list of all the work activities/elements involved and, under an EPC or Design-Build Project, the Engineering, Procurement and Construction components should each have their own list of work activities/elements clearly identified under those specific headings.

2. Using the completed WBS, the Contractor must then establish the sequence of undertaking the work activities/elements involved, and also determine the length of time needed to deliver the completed work for the entire Project (the Project Schedule). If it is also possible to establish the labour and construction equipment resources required reasonably accurately, then that would be of great benefit, since it would help to give more confidence in both the anticipated Project completion time and the Contractor's bid pricing. However, that is more often than not very difficult to achieve under an EPC/Design-Build Project, due primarily to the lack of detailed design information available from which to measure the physical work quantities that will be required for the completed Project.

3. Having prepared the WBS and established what the Project Schedule looks like, the Contractor must then conduct a preliminary risk analysis. The aim should be to establish what the major risks are that, if not controlled adequately, would have the potential to cause major problems and thereby stop the Project from being as successful as it could be. Those risks should then be set down in a preliminary Project Main Risks Register, alongside which suitable risk mitigation measures should be included (wherever it is considered possible/feasible to achieve that), aimed at preventing those risks from materialising.

4. The final essential ingredient in submitting a worthwhile, comprehensive bid is for the Contractor to prepare an outline Project Execution Plan (PEP) that incorporates all the findings from the WBS, the Project Schedule and the Project Main Risks Register. A properly prepared and well thought out PEP is, in essence, the storyline for how the Project will be undertaken. If written competently, the PEP would allow the Contractor's Project Implementation Team to form a very clear picture as to what the most effective management set-up ought to be. That too would give the Contractor added confidence about the adequacy of the bid pricing.

All of the above topics, common to all construction Projects (EPC/Design-Build or otherwise), are dealt with in far more detail in the following chapters of this book, along with advice as to (i) what to look out for when compiling the necessary information and documentation, (ii) what things can go wrong, and (iii) how to avoid such problems occurring.