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Project Management for the Oil and Gas Industry

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Project Management for the Oil and Gas Industry

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Learning Objectives

By the time you have completed this module, you should understand:

- the rationale for the design of the course;
- why the course is aligned with the upstream contractor perspective;
- the course structure and arrangement of modules;
- why a 'default' standard form of contract is assumed;
- why a 'default' statutory and regulatory position is assumed;
- the rationale for the longitudinal and mini case studies.

1.1 Introduction

This module acts as an introduction to the course. It provides an indication of the reasoning behind the design and structure of the course and summarises some of the assumptions and points of view adopted by the text.

1.2 Course Rationale

The international oil and gas industry is undergoing a period of fundamental and rapid change. In 2008 Brent Crude reached $140 per barrel and in 2014 it was still trading at around $110 per barrel. By January 2015, however, the price had dropped to around $45 per barrel. This sudden and significant fall has had a profound and complex effect on the entire industry. Oil production areas such as the North Sea, for example, which is a mature basin with relatively high production costs, become much less attractive to investors as oil prices fall.

There are numerous reasons for the fall in global oil prices. A substantial increase in production in the US and Canada (primarily from oil shale and oil sand reserves),

coupled with a general refusal by the established producers to cut production, has led to a huge increase in global supply. This has coincided with a long-term reduction in demand from the US and Western Europe as a consequence of energy-saving and emission control strategies. In addition, there has been slow growth in demand from the biggest emerging economies. All these factors have resulted in demand falling well behind production.

Under such circumstances the industry faces considerable challenges. Oilfields that were profitable at $100 per barrel may not be profitable at $50 per barrel. Breakeven and payback periods lengthen and business plans have to be re-evaluated. Governments, state-owned oil and gas producers, private sector producers, service companies and other players in the industry find profits squeezed because their businesses ultimately depend on the sale price of the product. As prices fall and profits diminish, everyone in the chain has to cut costs. The best way to achieve this without affecting performance is to increase efficiency, and the best way to increase efficiency in a project-based industry is to manage projects more effectively; in other words, to make effective use of project management as a discipline. In an environment of low prices, there has never been a greater need for effective project management in the oil and gas industry, whether for exploration projects, drilling projects, refining projects, or sales and marketing projects.

Additionally, in the longer term, and irrespective of short-term volatility in global oil and gas prices, it is likely that the levels of complexity and risk in all parts of the industry will increase further. The majority of the world's oil and gas fields have now been discovered, and it is unlikely that any significant new finds will ever be made. There is still a large sector based on exploration and the analysis of new fields, but as existing fields mature and are depleted there will inevitably be a growing emphasis on enhanced extraction methods, such as gas lift and horizontal drilling, and on the development of smaller and more challenging fields. In addition, an increasing proportion of the world's oil reserves will become concentrated in just a few countries, which are likely to be members of OPEC (the Organisation of Petroleum Exporting Countries), meaning the influence of that organisation will grow.

In summary, as the industry finds itself based on a diminishing number of reserves in a smaller number of countries that are part of an increasingly powerful cartel, it follows that overall levels of competition, risk and uncertainty are likely to increase. It is suggested, therefore, that effective project management in the oil and gas industry is essential in both the short and the long term. The industry is project-based, and it faces new and multifaceted challenges on an unprecedented scale. The aim of this course is to develop knowledge and understanding of the primary applied project management skills that are most likely to help practising project managers address these challenges.

1.3 Course Scope

The international oil and gas industry is huge, and the energy derived from its outputs effectively drives civilisation. It is difficult to imagine, at present, how our

society could operate in anything like its current form without these two key hydrocarbon fossil fuels. The industry includes a panorama of subindustries, from field exploration to supply of gas to domestic dwellings and supply of the petrol that a driver buys at a petrol station. The oil and gas supply chain is often considered to comprise two sectors: *upstream* and *downstream* (discussed in more detail in Section 2.2). For now we can consider the sectors as shown below. These definitions are used loosely and there are no hard-and-fast categorisations.

- **Upstream.** The processes involved in getting the oil and gas out of the ground. Example upstream projects include mapping a reservoir, drilling and completing a well, and developing an entire oilfield.
- **Downstream.** The processes involved in getting the oil and gas from the point of production to the point of use. Example downstream projects include constructing a pipeline, building a refinery, and setting up an onshore storage facility.

The characteristics of an individual oil and gas project, therefore, will depend on its position within the supply chain. A project to analyse a new oil reservoir will be very different from a project to build a new petrol station in an urban area. Although the basic project management applications of time planning and control, cost planning and control, and quality management, etc. will be standard, the characteristics of the projects will vary. It is necessary, therefore, to limit the scope of this course to one part of the supply chain. For this course the scope will be limited to *upstream projects*. This does not mean the content is not applicable to downstream projects. It simply means that the case studies and examples developed in support of the course text are based on the upstream sector. Some example oil and gas projects are considered in more detail in Section 2.2.

The industry is also populated by a number of organisation types. The upstream sector involves client governments, state-owned production companies, private sector exploration specialists, private sector oil and gas producers, supply companies, subcontractors, etc. A typical project to drill an oil well might involve a client government, a service company that drills and lines the well, subcontracted drilling and support specialists, nominated and domestic subcontractors and suppliers, and government bodies, etc. It follows that the requirements to manage the project effectively vary considerably depending upon which point of view is considered. For example, the client's risk profile will be entirely different from that of the drilling contractor. The client is likely to be very much concerned with the eventual sale price of the oil, because this will determine the economic viability of the project. The drilling contractor, however, is unlikely to share this concern: the contractor simply drills the well and then moves on to the next job. Because of the diversity of the organisations in the industry, it is necessary to further limit the scope of this course to the perspective of one of the main parties involved in upstream projects. For this course the perspective adopted will be that of the *contractor*.

In order to ensure, however, that the course is of equal interest to all parties in the supply chain, the emphasis on the *upstream contractor* is balanced by examples from the client perspective at each stage of the supply chain. Throughout the text there are Client Perspective features that develop the subject matter from the

client's point of view. This approach allows the reader to gain an understanding of both points of view in the context of a single application.

1.4 Course Structure

The course was developed in conjunction with the oil and gas industry, and the main areas covered are included in direct response to feedback from the industry. While researching the background to the course, the author spent some time visiting company offices and drilling sites and talking to people at all levels, from site operatives to senior managers. This research suggested a number of common areas in which oil and gas companies could improve their internal project management systems to maximum effect – and where a course like this could be of greatest value. These common areas for improvement are summarised here and explored in more detail in Section 2.5.

1.4.1 Possible Areas for Improvement

- **Area 1: Risk.** This includes risk interdependency, risk management and contractual risk allocation. Most people in the industry are familiar with the concept of risk and understand how to identify and respond to simple and obvious risks. The problem arises when people have to start thinking about risk interdependency (how risks interact with each other). In addition, there seems to be minimal understanding of how risks are allocated in contracts and what impact a contract has on the risk profile of the organisation.
- **Area 2: Change.** This includes the management of change and the impact of change on risk and cost. There seems to be a perception within the industry that organisations operate under such consistently high levels of change that any kind of change control system will inevitably struggle. Significant time delays and cost increases resulting from both internal change (for example, a domestic subcontractor default) and external change (for example, a change in world oil price) are perceived to be a standard consequence of working in the industry and best managed by accepting them and including them within the overall risk premium for the contract.
- **Area 3: Contracts.** This includes contracts and procurement, including standard forms and both nominated and domestic subcontracts. There is a common perception that the contracts used in the industry are unnecessarily complicated and outdated and tend to have evolved unsystematically over many years. They are often developed by individual client organisations and governments and can be inflexible and difficult to apply. There is also a lack of understanding of contracts and a lack of contract administration expertise and experience within the industry.
- **Area 4: Disputes and claims.** Disputes and how to handle them represent a common problem area. Negotiation skills and conflict resolution seem to be underdeveloped in the industry, and there appears to be a heavy imbalance of power towards the client. Claims and recoveries by contractors as a result of client-induced delays and cost increases are rare. There is also an industry-wide

attitude that prevents contractors from challenging clients in areas that require dispute resolution. If disputes do occur, there seems to be an absence of the kind of dispute resolution systems that are widely used in other industries.

- **Area 5: Probabilistic planning and control.** A general inability to plan under conditions of change and high variability is a common problem area. Most oil and gas organisations are familiar with deterministic time planning and control but are less familiar with probabilistic time planning and control. Deterministic planning and control is appropriate for an activity such as building a supply road or laying a pipeline but is less appropriate for drilling a well. The time required to complete a well depends on so many variables that traditional deterministic approaches are inadequate. The solution is to use probabilistic tools and techniques, but many oil and gas organisations are either unaware of such tools or choose not to use them on any significant scale.
- **Area 6: Uncertainty.** This includes the range of conditions that can be classified as uncertainty, together with typical responses, such as dayworks, contingencies and general management reserves. Oil and gas projects are affected by high levels of change and risk, and as a result there can be a considerable amount of uncertainty within a company's risk profile. Organisations in the industry appear to have good control systems for uncertainty in some areas, such as health and safety, but not in others, such as cost planning and control, and time planning and control. As a result, both the identification of uncertainties and the responses put in place tend to be less than optimal.

1.4.2 The Corresponding Modules of the Course Text

The course structure is specifically designed to address these areas for improvement, as shown below. It should be noted that Module 2 (Projects and Project Management in the Oil and Gas Industry) establishes the course in the context of the industry. Module 9 (Longitudinal Case Study: Pentland Oil and Gas) develops understanding by direct application of the knowledge developed from the course. These modules, therefore, do not correspond to the individual areas for improvement listed above.

- **Module 3: Project Risk and Risk Interdependency (Area 1).** This module examines risk interdependency and introduces the idea of developing enterprise-wide systems for risk management based on full risk interdependency field analysis, whereby the impact of a change in one risk is fully modelled in terms of its effects on the overall risk profile of the organisation.
- **Module 4: Project Change Control (Area 2).** This module details the internal and external sources of change and the standard contractual provisions for change. It considers the mechanism for change notices and variation orders within contracts and examines some of the rules and procedures for recording and valuing contractual changes.
- **Module 5: Contracts and Standard Forms of Contract (Area 3).** This module summarises the contract documents likely to be encountered on large projects, from the bill of quantities to the contract specification, and discusses the structure and format of each together with its individual function. It also

introduces some basic contract theory and provides some definitions. It goes on to introduce the concept of the standard conditions of contract and then lists some example clauses and terms and conditions from standard forms to illustrate their potential application in the oil and gas industry. The module examines sample clauses on a range of issues from certification and payments to suspension of the works by the contractor or client.

- **Module 6: Claims and Claims Procedure (Area 4).** This module examines the concept of claims and establishes typical processes and procedures to be followed in the event of a claim. The module presents the likely grounds for a claim (from both the contractor and client perspective) and details force majeure, relevant events, heads of claim, and preparation and submission of a claim.
- **Module 7: Acceleration and Probabilistic Time Modelling (Area 5).** This module introduces the idea of probabilistic time estimating and trade-offs. Oil and gas projects by their nature tend to be probabilistic rather than deterministic, with any trade-off calculations based on windows of likely times rather than absolute deterministic values. The module includes a number of worked examples to illustrate the calculations.
- **Module 8: Uncertainty, Contingencies and Scenario Planning (Area 6).** This module reinforces the concept of residual risk and considers typical areas of uncertainty in oil and gas projects. It also covers some typical uncertainty responses such as scenario planning and contingency analysis and planning.

The course structure is summarised in the course process model in the next section.

1.5 Course Process Model

The course structure and rationale for the learning outcomes are summarised in the course process model, shown in Figure 1.1.

- **Module 2** establishes the unique characteristics of the oil and gas industry supply chain and describes the types of projects that exist within it and how project management operates in the industry. The module also lists some project management weaknesses observed in oil and gas companies that form the basis of the subject-specific modules that follow. In other words the course is designed to generate leaning outcomes that offer real potential for oil and gas companies to improve their project management skills in known deficit areas and thus increase competitive advantage.
- **Module 3** develops the concept of risk interdependency, which was covered in the *Project Management* course, and introduces, and emphasises the value of, enterprise-wide risk management systems in the oil and gas industry. Projects are all about change, and change generates risk. Effective change control is, therefore, a prerequisite for effective enterprise-wide risk management.

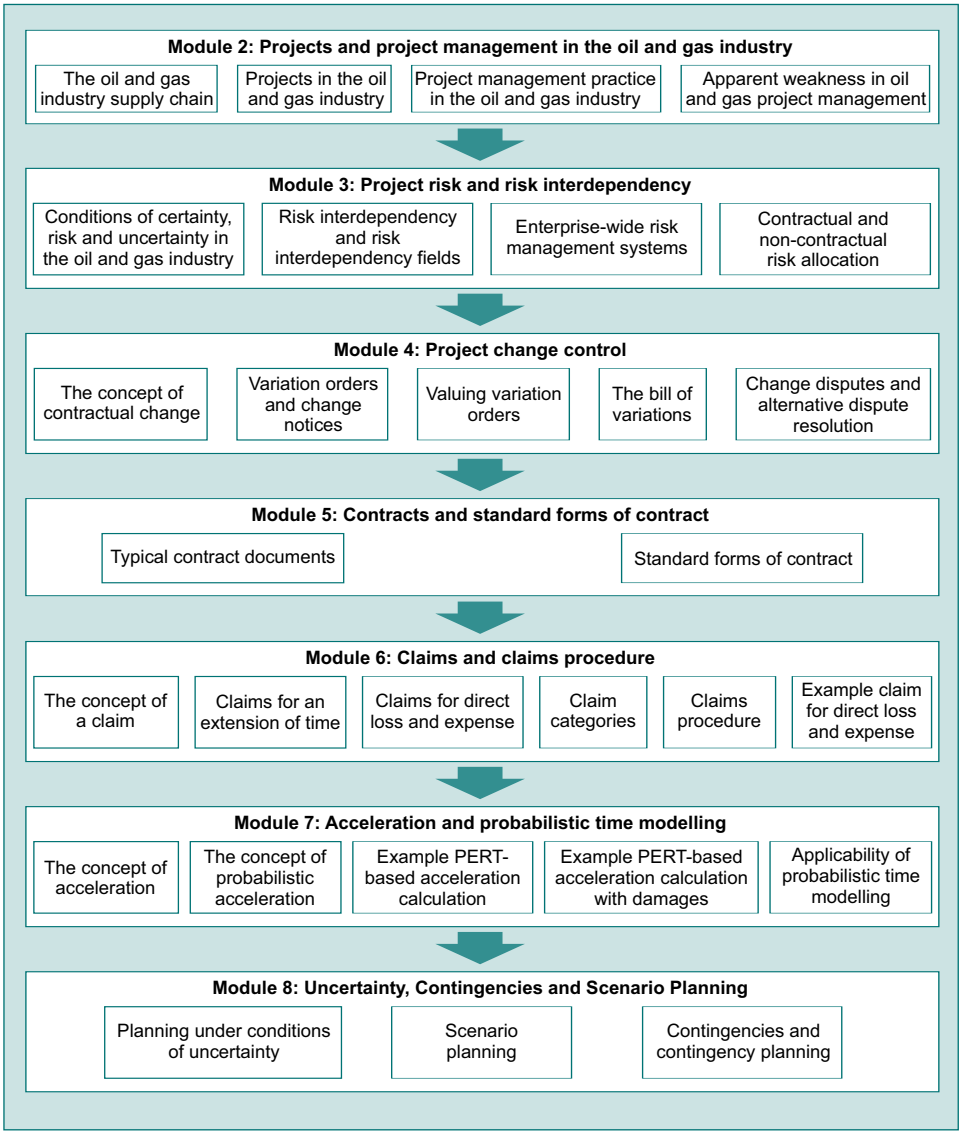

Figure 1.1 Course process model

- **Module 4** explores the various drivers of change and examines contractual options for managing change. The module develops an understanding of the standard mechanism for contractual change and how it can be managed and all associated costs recovered. The principal mechanism for recovering the costs associated with contractual change is contractual claims procedure, the application of which is controlled by rigid contractual terms and conditions.
- **Module 5** details some typical contract documents and some standard forms of contract. It considers both generic and industry-specific standard forms, especially in the context of claims and claims procedure.

- **Module 6** develops an understanding of claims procedure under standard forms of contract and underlines the importance of claims as the main mechanism for the recovery of increased costs and time delays resulting from contractual change. It examines the processes and procedures involved in initiating, assembling and successfully concluding claims for an extension of time and direct loss and expense.
- **Module 7** builds on the PERT theory presented in *Project Management* by introducing the concept of probabilistic time estimating and trade-offs. This directly addresses a classic oil and gas company weakness: that of a lack of probabilistic time planning and control. The module demonstrates how PERT trade-offs offer an ideal solution for the probabilistic time planning and control of variable-duration activities, such as drilling oil and gas wells. Effective application of this technique can significantly reduce a number of interdependent time-based risks, such as late rig transfer damages and downtime losses.
- **Module 8** stresses that risk can be managed only within limits and that there will always be uncertainties, especially in the oil and gas industry. The module also underscores the importance of managing uncertainty within whatever control limits apply. It then develops an understanding of scenario planning, a technique used by one or two major oil and gas companies but not in use throughout the industry.

1.6 'Default' Standard Form of Contract

Most readers will be aware that the oil and gas industry is characterised by a range of contract types, from land acquisition contracts prior to exploration to long-term supply contracts for refined products. Most will also be aware that issues such as risk profiling and change control depend very much on the type of contract used. It is necessary, therefore, for the course text to focus on a single assumed or 'default' contract type. This could be any contract from a client-specific one written by a client government to a standardised nominated subcontract agreement.

It is not viable to design the course around a single bespoke or client pro forma contract. It is more appropriate to refer to a standard form of contract that is widely recognised and easily obtainable, even if it is not commonly used in the oil and gas industry. For this reason the course assumes the general approach of a practitioner working to a standard form of contract produced by the International Federation of Consulting Engineers (FIDIC).

FIDIC (www.fidic.org) was founded in 1913, and its membership has grown to cover more than 80 countries. It produces possibly the best-known and most internationally recognised set of standard forms of contract, which are widely used across a range of industries. FIDIC produces a large number of standard forms of contract in numerous formats. One of the most widely used in the construction industry is the *Conditions of Contract for Construction (First Edition 1999) for Building and Engineering Works Designed by the Employer*. This is available in hard copy or as an electronic download. The hard copy version has a white cover and features a stylised red hemisphere. For this reason it is sometimes referred to as 'the Red Book'.

Further details are available at: www.fidic.org/books/construction-1999-red-book-subcontract-1st-ed-2011.

Note: when the course text refers to 'standard forms of contract' the FIDIC Red Book is considered a typical example. There are other centralised bodies that produce standard forms of contract, and FIDIC itself produces many other forms of contract and other types of documentation. It is not necessary to read or learn any of the terms or conditions contained within any standard forms of contract for this course. It is simply necessary to read and understand the principles discussed in the text and to remain aware that these are developed along the general practice guidelines that a project manager might follow when working on a project using the FIDIC Red Book or similar as the standard form of contract to engage a contractor.

1.7 'Default' Government Policy and Regulatory Status

Most people who work in the oil and gas industry know that government policy and the actions of national and international regulators can have a considerable impact on how projects are awarded and managed. However, these influences are, by definition, specific to the countries and governments concerned. Consider the case of the UK North Sea oil and gas industry.

The relevant UK government department is the Department of Energy and Climate Change (DECC). The DECC is a ministerial department (headed by a cabinet minister) and has a number of responsibilities, including energy security, sustainability, demand reduction and waste management. The DECC has its own strategic objectives and governance policies that do not apply in other countries. More information can be found at: www.gov.uk/government/organisations/department-of-energy-climate-change.

Overall health and safety is regulated by the UK government's Health and Safety Executive (HSE) (www.hse.gov.uk). The UK also has a number of non-governmental health and safety action groups, such as the Helicopter Safety Steering Group (HSSG) (www.stepchangeinsafety.net/about-step-change-safety/steering-groups/helicopter-safety).

Emergency response coordination interests include the Operators Cooperative Emergency Services (OCES) and Emergency Preparedness Offshore Liaison (EPOL) (http://oilandgasuk.co.uk/emergencyresponse.cfm).

In addition, government policy and regulatory controls tend to change over time. For example, in February 2014 the UK government announced plans to establish a new North Sea oil and gas regulator to promote the full exploitation of North Sea oil and gas reserves over the coming decades. The strategic objectives are to ensure that producers are encouraged to access as many hard-to-reach reserves as possible and to ensure that all existing production reserves are depleted as much as possible before the fields are decommissioned. The decision was made in response to the recommendations of the Wood Review, commissioned by the UK government in 2013 and released in February 2014 (www.gov.uk/government/groups/wood-review-implementation-team).

Other future developments could include new EU controls on the regulation of offshore safety, although there is opposition to this proposal from parts of the UK

oil and gas industry because of concern it may undermine the UK-specific approaches that have evolved over years of hard-won experience.

These government bodies, regulators, regulations and policies are all UK-specific and are not relevant to operations in other countries. A detailed understanding of UK North Sea government policy would be of little interest or relevance to a practitioner in, say, Trinidad and Tobago, where entirely different government and regulatory policies and procedures apply. This course, therefore, does not consider government or regulator policy and procedures in the context of oil and gas project management. The primary reasons are that (a) these influences are country-specific and of limited value or relevance to those working in other countries and (b) in many countries they are constantly changing. It is accepted that government and regulator influences on oil and gas project management are considerable and important, but for the reasons given above they are not considered in any detail in this course. The course does, however, assume a general 'default' position on general government policy and regulatory status based on the UK North Sea industry. This default position is assumed as a basis for some of the case studies for illustrative purposes only.

1.8 The Longitudinal Case Study and the Mini Case Studies

The course contains a longitudinal case study and a number of mini case studies. The case studies are designed to help students develop a greater understanding of the theory covered in the text. As with *Project Management*, this course attempts to develop both knowledge (theory) and understanding (application). The case studies are designed to give an idea of how some of the theory in the course text might be applied in real life.

1.8.1 The Longitudinal Case Study

The longitudinal case study occupies a full module in the text and is based on a real-world project. It is designed to develop detailed applied understanding of the theory developed in the course text.

The longitudinal case study (Module 9) concerns an international company that starts out as a field exploration and development specialist and eventually makes the transition to producer. The case study presents the various stages of the transition process, which is, in effect, a strategic project. The case study develops an understanding of the phases of the transition and of how a project might be managed in a similar scenario in the real world.

1.8.2 The Mini Case Studies

The mini case studies are interspersed throughout the course so as to be relevant to the adjacent text. They are designed to encourage the reader to think about the theory and especially about its real-world application.

The mini case studies are designed to develop background applied thought and consideration rather than detailed applied understanding. They all feature one or

two short questions on the case study text. The reader needs to think about the content of the mini case study only in the context of the rest of the course text to be able to answer the questions. There is no need for additional background reading.

Learning Summary

This module has introduced the course and established the rationale for the course content and structure. The module has made it clear that the course was developed systematically following a period of research within the oil and gas industry. The course structure reflects the areas for improvement that were identified during that research.

- Given recent and longer-term changes in the oil and gas industry, there is an increasing need for effective project management.
- Given the size and complexity of the oil and gas supply chain, the course focuses primarily on (a) the upstream sector and (b) the contractor's perspective.
- This focus is balanced by the use of Client Perspective features where appropriate and by the use of downstream examples and case studies.
- The structure of the course reflects the main areas of concern identified by the industry during the background research.
- The course assumes a 'default' standard form of contract, which is the FIDIC *Conditions of Contract for Construction (First Edition) 1999 for Building and Engineering Works Designed by the Employer*.
- For illustrative purposes the course assumes a 'default' position on government policy and regulatory status based on the UK North Sea industry.
- The course contains a number of mini case studies and one longitudinal case study. These are designed to facilitate application and to allow the reader to develop both knowledge and understanding of the subject areas covered within the course text.

It should be noted that other perspectives, sectors of the supply chain, standard forms of contract and default government positions could have been adopted. The development of the course would be different in each case, but the general principles would be largely unchanged.

Module 2 considers the oil and gas industry supply chain and some of the many project types that exist within it, ranging from reservoir survey projects to petrol station site acquisition projects. It goes on to consider the nature of project management in the oil and gas industry and discusses some of the outcomes of the background research carried out as part of the development of this course. Some areas in which oil and gas companies could improve their approach to project management are discussed.