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Master Thesis

Contractual Incentives in EPC Contracts

By
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Date: 15.06.2011

Preface

The motivation for starting this master thesis was my general interest and fascination for the EPC Contract format. It is impressive how this format is able to secure safe deliveries of major contracts in the oil industry. It is interesting how the contract format is used to align Company and Contractor into reaching a common goal. My personal interest is especially in the compensation format and how the structure, format and commercial mechanisms work in order to align the two parties into achieving the common goal.

This master thesis will have the main focus on the contractual incentives of the EPC Contract. I hope that some of the subjects discussed herein will trigger some new ideas or awareness. And who knows, maybe some of the subjects turn out to be small seeds in the process of building something new and bigger…

I would like to use the opportunity to express my gratitude to advisor in Statoil, Hilde Sandstad and to my advisor at the University in Stavanger, Petter Osmundsen. They have both contributed with their impressive knowledge on this topic and guided me through the process of making this document. I wish you both all my best!

1 Summary

The Norwegian Oil Industry has through the years utilized several different Contract models for offshore projects. In the recent years, the big oil companies are using EPC Contracts to regulate deliveries in the industry. The main focus in the master thesis was the EPC Contract for offshore deliveries and the contractual incentives built into these Contract models.

The first section presents the basics to the EPC contract format. Subjects are why the EPC Contract format is used and what consequences it has. Then the different compensation formats are introduced which set the initial incentives of the Contract. An EPC Contract is often built on several different compensation formats depending on the different phases of the project. Incentives are used to align Company and Contractors interest.

The next section digs deeper into the EPC Contract and the contractual incentives are the main focus. Important subjects being discussed are:

- Definition of success
- Incentives mechanisms and what they impose on Company and Contractor
- Incentives for Quality in Construction and Installation
- A model for analysing the incentive balance of a Contract
- An example of an analysis of a real project (anonymised).

The discussion brings up the importance of using incentives in the correct way and how the analysing model is used to get overview of how the incentives work together in the total picture of the Contract. The conclusion is that it is important to understanding the total incentive balance of a Contract in order to achieve success in a project.

2 Introduction

The purpose of this master thesis is not to give an exhaustive analysis of Offshore EPC contracts, but rather to touch on specific items that may be a trigger to improve the EPC format and how it is used and administrated today. The master thesis will focus on incentives and the Contractual success factor in a project. It will hopefully shed some light on the current practice and lead to some ideas on how to improve upon it.

The main focus will be on the deliveries of the Contractor and how these deliveries can be secured. The incentives built into the contract will be investigated and some dilemmas related to the topics will be presented and discussed. The master thesis will also try to set focus on how the incentives can represent success factors in a project if they are managed correctly and how the incentive balance of a project may be analyzed.

The items that are brought up in this chapter are a combination of theory and experience with contract management. The basis for the master thesis was initially set by Petter Osmundsen and further developed in cooperation with Hilde Sandstad. They have both contributed significantly to the final product, throughout the process of putting this master thesis together. Secondly former work experience from the Oil industry has been used and some examples are taken from a current project running the EPC contract model. Various literature and articles have been used to set a basic theoretical platform for the items discussed, but it appeared (after numerous literature searches) that relevant literature which document use and experience with utilisation of contractual incentives related to the offshore EPC Contracts was limited.

3 Definitions[1]

Bulk materials: Standard materials like steel profiles and steel pipe often purchased in big quanta

Company: Major Oil Company acting as owner and or operator for oilfield

Company Provided Items: All the material and/or services Company will deliver to Contractor and be responsible for during project execution.

Commissioning: Is the functional verification of equipment and facilities that are grouped together in systems.

Contract: Legally binding agreement between Company and Contractor

Contract Award: This is the point in time where both Contractor and Company agree upon the Conditions of Contract and the Appendices defining Scope, Compensation and Schedule and signs the Contract.

Contractor: Supplier of Engineering, Procurement and Construction services

Construction: Often comprise fabrication, installation and Mechanical Completion of the scope of work.

Design Basis: means the document in the Contract forming the basis for Detail Engineering as required to complete the work. The Design Basis is defined by the requirements as set in the Scope of Work of the Contract.

ITT: Invitation to Tender, letter sent by Company to potential Contractors in order to start the bidding process.

Mark-up: Fixed percentage add-on on the purchase price to compensate for the administration cost of purchasing a specific item.

Mechanical Completion: The checking and testing of equipment and construction to confirm that the installation is in accordance with drawings and specifications and ready for commissioning in a safe manner and in compliance with project requirements.

Punch-Points: Term used for outstanding work during the completion phase when items in the scope of work are not according to the requirements prior to handover to Company

Net Present Value: The net present value (NPV) is the total of all the cash flows, out and in, over the expected life project and its product.[2]

[1] The definition has primarily been collected from Statoil Contracts and/or written by the author of this master thesis in order to explain common oil industry terminology.
[2] The Handbook of project-based management, by J. Rodney Turner, 1999

4 Prestudy

To set the stage for this master thesis some basic theory elements related to the EPC Contract format will be presented. They will back up the discussion and the conclusion in the next chapters.

4.1 The EPC Contract

"EPC stands for Engineering, Procurement and Construction. Under an EPC contract, the Contractor will design the installation, procure the necessary materials and construct it, either through own labour or by subcontracting part of the work. The contractor carries the project risk for schedule as well as budget in return for a fixed price, called lump sum or LSTK depending on the agreed scope of work." Quote from Wikipedia[3].

Although Wikipedia is not the most reliable source of information this definition of the EPC Contract format was concise and easy. The only comment to be made is that the EPC contract often is build up by several different compensation models to best suite the different work included in the Contract. This will be more closely addressed later in the chapter.

The main functions of the Contract are as follows:

- Define the scope of work
- Define technical requirements
- Describe the conditions of the delivery
- Ensure correct payment at the correct time from Company to Contractor
- Define risk sharing
- Protect Company from a failure in delivery from Contractor
- Provide performance incentives for Contractor

The EPC Contract as used in the oil industry today is a quite complex Contract format. The format was taken into use in order to make the offshore facilities projects more time efficient. It is no secret that time plays a major role when the oil industry has decided to develop a new installation. Often the investments are in the magnitude 5 to 65 Billion NOK (ref Statoil Snøhvit Tog 2, 60BNOK and ConocoPhillips Eldfisk Sør og Eldfisk II, 65 BNOK among

[3] Wikipedia, "EPC (contract)", http://en.wikipedia.org/wiki/EPC_(contract), 2011

others) and the oil companies are in a hurry to produce oil in their new facilities in order to maximize the Net Present Value of the investments. The fact that the Norwegian continental shelf has passed its plateau production level does not help the issue. To maintain the current production levels will be one of the biggest challenges of the oil industry, moving forward.

The EPC Contract model has not always been an easy model to manage in the Norwegian oil industry. Especially in the start, when the format was new, a lot of Contractors was heavily burned[4]. Gradually the Contractors and the industry adapted the format and from that point on it has developed considerably. The industry has made common industry standard like the NF and the NTK where the balance of power between Contractor and Company has been equalized in order to make the format as fair as possible on the different parties.

The primary reasons that oil Companies use the EPC contract is:

- Contractor to take the total responsibility for the delivery
- It is time efficient due to Engineering and Construction in parallel
- Company need a smaller project team in order to control the projects (one single point of contact)
- Company is able to concentrate on the core business being production

The STACON report[5] also describes one additional advantage which is the general technology development in the industry due to the fact that Contractors' own technology concept may provide a competitive edge compared to other contractors.

An EPC contract means that the Contractor is fully responsible for the project delivery up until handover to Company.

The consequences for choosing the EPC contract model are:

- Lighter follow-up of Contractor.
- The selected Contractor needs to handle complex interfaces.
- The compensation model dictates the need for follow up.

[4] Tidsskrift; "Kostnadsoverskridelser på sokkelen; noen betraktninger ut i fra kontrakts- og insentivteori" av Petter Osmundsen, 1999.
[5] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

A typical EPC Contract has the following structure:

- Conditions of Contract
- Appendix A: Scope of Work
- Appendix B: Compensation
- Appendix C: Schedule
- Appendix D: Administration requirements
- Appendix E: Company's Documents
- Appendix F: Company's Deliverables
- Appendix G: Company's Insurances
- Appendix H: Subcontractors
- Appendix I: Contractor's Specification
- Appendix J: Standard Forms of Guarantees

4.1.1 EPC Contract types and alternative

EPC Contracts is commonly extended to include other work element, as we have seen earlier in this chapter. This development is due to the oil industry wish of minimizing the involvement in building new facilities and doing modification. In the ideal world the oil companies would only care for oil and gas production. The continuous increase in Contractor competence and experience is also making the industry capable of handling total deliveries. The result is more letters to the EPC Contract. The most common models are:

- EPCI – Engineering, Procurement, Construction and Installation
- EPCH - Engineering, Procurement, Construction and Hook-up (same as above, but the "H" emphasis the operation of joining the jacket of a platform with the topside offshore.
- EPCIc - Engineering, Procurement, Construction and Installation with Commissioning assistance

There are also alternatives to the EPC contract. The most commonly used format is to divide the engineering and procurement elements and the Construction and Installation elements. The engineering contract is then called an EPCA which means an Engineering, Procurement and Construction Assistant Contract. The Construction and Installation Contracts are called Fabrication Contracts (FC). The advantage with this model is that Company are more deeply

involved in the project, where this may be required. The obvious disadvantage is that this model needs a heavy follow up organisation from Company.

4.1.2 EPC Contract disadvantages

EPC Contract disadvantages will not be focused in this master thesis, but the major disadvantages should be listed. These are (as listed in the STACON report[6]):

- The requirement on Contractor to accept major risk
- Few big Contractor makes the market segment vulnerable to capacity problems and insufficient competition
- High risk adverse behaviour, resulting in high risk premiums being included in tender prices.

4.1.3 Administration of the EPC Contract

Does the EPC contract succeed in limiting the Company administration? It may be true for certain EPC contracts, but others still have a demand for a close Company follow up. Company administration is reliant on the compensation format of the contract which again is reliant on technical maturity and market capability. But the EPC contract format certainly has the potential of a limited Company administration team, given the reduction in external interfaces, but the balance will always be on how much risk you reasonably can put on the Contractor.

In most oilfield facility projects, a fast implementation is of great importance to maximise the Net Present Value of the project. In other industries where schedule is of minor importance it is possible to have a more mature technical solution prior to start of Construction. In oilfield facilities projects, using the EPC model, the completion of the project is a very important milestone and should not be jeopardised. This is the basis for the early phase strategy. Then during execution it is important to maintain that focus. Often the isolated cost of the project steals the focus in the execution phase. Worst case is that, in order to save money, the completion date is not met and the production start-up is postponed. Then the serious money is lost due to lack of production. The message is that, as a Company project manager, it is important to keep the bird perspective and not be blinded by solely looking into reducing the project cost. There may be an overall better solution by incurring a higher cost at project

[6] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

execution in order to secure start up of the facility as planned. The extra resources used will then be returned and covered by the profit of the operation income so the result is a total higher Net Present Value of the project.

Another point is that the personnel in charge of the Contract administration should know the Contract mechanisms in detail, or else the Contract may be misinterpreted and the mechanisms will not be used according to the intention. The Contract administrators have to know the regulations of the Contract and the intentions behind the incentives built into the Contract. That means that the Contract administration is just as important as the actual design and writing of the Contract. It is no use having a good contract if it is not being administrated correctly. This brings up the importance of continuity in project personnel throughout the phases of the project and also having a mix of experienced and fresh personnel assigned to new projects. This is to properly secure the knowledge of how to administrate the Contracts.

4.2 Distribution of risk

Ward[7] states that risk should be borne by the party best able to:

- Estimate risk
- Control an manage the risk

Further Ward states that the risk should not be too great for one party or outside the control of either party.

The risk distribution between Company and Contractor should be on top of the list when compensation format and the incentive mechanisms of the contract are decided. The main principle is that Contractor bears the risk where he is in control. As an example:

- At Contractors own fabrication site Contractor should bear the risk.
- At Company production site Company should bear the risk for access to site.

Since risk is not the topic of this master thesis I will now conclude on the risk subject. Risk distribution should be one of the major decision drivers when choosing compensation format and building incentives.

[7] GGF Ward, Cranfield School, ”Contract Strategy”, 1998

4.3 Change management

A vital process in the project execution phase is the change management process. If a change occurs, this is formalized into a Variation Order (VO) which is an instruction to Contractor from Company. It is important that both Company and Contractor has continues focus on variations and changes in the Contract and bring them to the table as soon as possible. If the issues are not brought up immediately, they will only grow in complexity over time, and they are very hard to negotiate. The risk for a commercial dispute will increase as time pass by without a conclusion.

4.4 Compensation formats

The selection of correct Compensation Format is important in order to set the correct incentives in the EPC Contract. Dimitri, Piga and Spagnolo[8] consider the most important dimensions influencing Companies choice of procurement contract is "contract flexibility, the incentives for quality and cost reduction, and the allocation of procurement risk." The figure below gives a setup on how to choose the correct compensation format based on these project parameters. Note that what is referred to as client in the figure is named Company in this master thesis. The figure is taken from the TIKO II report[9].

[8] Nicola Dimitri, Gustavo Piga, Giancarlo Spagnolo: "Handbook of Procurement", 2006
[9] Rikard Kinn and Svein Gjeraker: "TIKO II, Contract Execution Models for Norwegian offshore development projects", 1998

Selection Criteria (simplified):

Level of technical definition	**High**	**High**	**Medium**	**Low**	**Low**	**Low**
The client's involvement	**None**	**Low**	**None**	**High**	**High**	**High**
Market capability	**High**	**High**	**High**	**Medium**	**Low**	**Low**

Compensation Format:

	Lump Sum	**Target Sum**	**Unit Rate**	**Neutral**	**Daywork**	**Reimbursable**

Effects:

The client's QxNxR risk:	**N/A**	**50% of Quantities Norms**	**Quantities**	**Quantities Norms**	**Quantities Norms**	**Quantities Norms Rates**
The contractor's QxNxR risk:	**Quantities Norms Rates**	**50% of Quantities Norms + Net Rates Profit & Overhead**	**Norms Rates**	**Net Rates Profit & Overhead**	**Rates**	**N/A**
Risk for commercial disputes	**High**	**High**	**Medium**	**Low**	**Low**	**Low**
Contractor's incentives to work efficiently	**Positive**	**Positive**	**Positive**	**Neutral**	**Negative**	**Negative**
Contractor's incentives to optimise design	**High**	**High**	**Low**	**Neutral**	**Low**	**Low**
The client's quality risk	**High**	**Medium**	**High**	**Low**	**Low**	**Low**

Figure 1: Selection of Compensation format

In order to properly explain this figure we start looking at the text box in the middle; the various compensation (payment) formats are:

- **Lump Sum (LS)** contracts have a fixed price. This way Company know how much they will pay for the product and it is up to Contractor to ensure the profit. In other word; there are no relationship between the payment received from Company and the cost incurred by the Contractor. The financial risk of performance is borne entirely by the provider of the services.[10]

[10] "Construction Contracting: Business and Legal Principles" by Stuart H. Bartholomew, 1998

- **Target Sum** contracts have a defined goal called the break even sum. At this point the result end up at a point neutral as defined at Contract Award. If the result ends up higher and lower Contractor and Company typically do a 50/50 split on the delta sum. Another target model, often used in the Engineering discipline, is a reimbursable compensation model limited upwards to a certain level. That means that in the start and up to the given target the Contractor is compensated both cost and profit. Then if contractor uses too much time and resources the profit part is greatly reduced or often removed. This way the contractor do not loose money if the target is not reach (as for the LS contract), but there is no profit on the work performed after target is reached either.
- **Unit Rate (UR)** contracts are built up of item rates. That means that the cost of producing one unit of work is fixed (often divided into cost of labour and material). These contracts have a schedule of rates and Contractor often bid on an early estimate of quantities specified in the ITT (Invitation To Tender) by Company.
- **Neutral** contracts are when *"the overhead and profit is covered by a lump sum based on the agreed target man-hours, and are adjusted only if Contractor becomes entitled to an adjustment of the target sum. Contractor is fully compensated for his actual net labour costs. The net cost is calculated based on tendered net rates – hence Contractor carries the risk for any failure in establishing these rates."* [11]
- **Daywork** contracts have a fixed rate for the different categories of personnel that perform the work. This contract form is popularly called a reimbursable contract, but this is not correct because Contractor will bear the risk of fluctuations in salaries.
- **Reimbursable** contracts are when Company compensate all costs of Contractor including profit.

The last box states the effects which the chose of compensation format will have.

The figure describes a set of dimensions named QxNxR. This is an abbreviation for Quantity (Q), Norm (N) and Rate (R).

- Quantity is reflecting the amount of component (steel, pipe, etc) that is needed to complete the work.

[11] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

- Norm is reflecting the productivity; how much time is used to produce one unit of work.
- Rate is reflecting the compensation; the price of producing one unit of work.

Based on the selection of compensation model Company and Contractor has different exposures:

- **The client's QxNxR risk**: This row states which of the Quantity, Norm or Rate dimensions Company is exposed to.
- **The contractor's QxNxR risk**: This row states which of the Quantity, Norm or Rate dimensions Company is exposed to.
- **Risk of commercial disputes:** What are the risk of Company and Contractor not agreeing on the compensation? In a fixed priced contract the risk is high if the project turns out to be more expensive than anticipated while if Contractor is fully reimbursed for all cost there are low risk of getting a commercial dispute.
- **Contractor's incentives to work efficiently:** In a fixed priced contract the Contractor is solely responsible for the productivity. He will then do his outmost to achieve the best productivity while in a reimbursable contract the opposite may occur. If Contractor is reimbursed for all the manhours spent on the project he may try to defend as many hours as possible. This is dependent on if the rate has a positive contribution margin, or not, and the potential next job on the list has a higher or lower margin.
- **Contractor's incentives to optimise design**: Having a reimbursable contract Contractor may try to defend as many hours as possible on the project. A good way of justifying these hours is to optimise the design of the product, especially related to end user operability. Having a fixed price the optimisation of the design has a different focus. The focus will be on constructability and installation. The more efficient the Contractor can perform the construction and the installation the more profit he gains. Looking at the figure this last optimization has to be the one treated in the figure as the incentive is set "high" on the Lump Sum Contract.
- **The client's quality risk:** Quality is often related to how much time is available to perform a task. If there are minor time constrains in the project this may result in a higher quality while if productivity is important the workers may be pushed to finish earlier and quality will suffer.

The first text box with the heading “Selection Criteria (simplified):” has three dimensions;

- Level of technical definition
- The clients’ (referred to as Company in this master thesis) involvement
- Market capability

If we take a look at the first row in the matrix the level of technical definition is referring to how well the product is matured. A good technical definition would mean detail drawings and specification on how to build it, while a premature technical definition would mean having only a description on what requirements the product are to fulfil.

The second row is how much the Company (called “client” in the model) intends to be involved in the project. The main target for Company is usually to reduce the project team as much as possible and let Contractor do the project management themselves. On the other hand Company need to have the overview to ensure that Contractor deliver according to the agreement.

The last row in the Selection Criteria box is related to market capability which is a two dimensional component. First one is a measure for the competence and experience of the market in producing the product. If the market has delivered similar or same product for several years they know the challenges and pitfalls and they are not exposed to the same risk as compared to taking on a new product. Secondly this component also relate to the degree of access to contractors. If the market is over heated due to great demand it may be possible that contractor will take on too much work and a fixed price deal may fall apart faster if the contractor starts to struggle. Another fact is that it is hard to get Contractors to commit to lump sum Contracts when the market is over heated. The risk related to lump sum contracts is often known to be higher than a unit rate or reimbursable contract so it is not ideal to take on a lump sum contract when the manoeuvrability is low due to low access on resources in a tight market.

So now, having explained all elements in the figure, the usage will be explained. At the start of the project one of the first considerations is what compensation format to use? To make that decision the above figure can be of great help to brainstorm around the pros and cons of the different formats. We start of at the top and consider the distinctive features of our project. As an example we may look at the construction of a compressor module. The compressor will

be bought from a subcontractor so the work involve builder the steel structures of the module and installing the equipment, pipes and electric control components inside the module. This is a kind of project done by several contractors on the marked before and there are no major technological challenges on the project. Looking into the figure we see that a medium level of technical definition is in the middle of the decision columns in the first "selection criteria" textbox. We also know that the marked capability is high since many subcontractors have performed this task before and the pressure on the market is at a healthy level. This indicates a Unit Rate compensation format if we look at the second textbox; "Compensation format". Before we let go of the first textbox we see that the Unit Rate contract has a very low demand on the Company (Client's) involvement.

What effect will the chose of the Unit rate contract have on our project? We now have to analyse the final textbox of the model; the "Effects". In a Unit Rate contract Company is exposed to the Quantity risk while Contractor risk is on Norms and Rates. The risk of ending up in commercial disputes is medium and Contractor's incentive for working efficient is positive. Contractor's incentive to optimize the design is low and the Company's quality risk is high. Based on this input from the figure a good foundation for a discussion around the selection of a compensation format is made.

GGF Ward at the Cranefield School of Management[12] summarizes the same theory with the use of slightly different figures, see below:

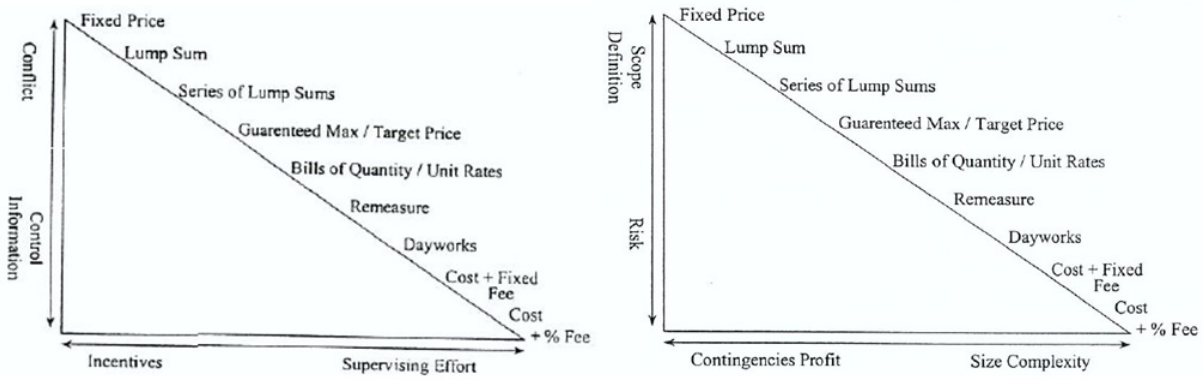

Figure 2: Contract Characteristics by GGF Ward

[12] Note prepared by GGF Ward on "Contract Strategy" at Cranefield School of Management, 1998

The figure manly show the level of supervision effort Company has to perform and the risk division between the contracting parties and how the compensation moves towards more reimbursable forms as the complexity of the project increase. Figure 2 is quite comparable to Figure 1, the difference is in the presentation.

Remember, as stated in the TIKO II report[13], none of the compensation principles as given in "Figure 1: Selection of Compensation format" is generally worse or better than others. However, each compensation principle has particular advantages depending on the contract type and other conditions under which it is to be used.

4.5 Incentives

John McMillan in "Games, Strategies, and Managers"[14] claims that contractual incentives are necessary due to two main components:

- Divergence of interests: what Company wants to do is not exactly the same as what Contractor wants to do.
- Company's inability to disentangle the effects of Contractor's effort from random factors independent of Contractor, in other words is Contractor's output an imperfect measure of his effort due to unforeseen, uncontrollable issues affecting Contractors performance.

This dilemma is also treated by Howard and Bell[15] where they describe the "assumption of Self-interested Behaviour"; Individuals and firms do only what they perceive to be in their self-interests. Based on this, the purpose of the Contract incentives is to align the Contractor reward structure as close as possible up to the interest of Company. This way both Company and Contractor has benefit in reaching the same goal; their interests are aligned.

If we take a look at each element in the EPC contract; Engineering, Procurement and Construction they are quite different in nature. This implies that we may need different incentive models to best secure alignment of Company and Contractor interests. The example

[13] "TIKO II, Contract Execution Models for Norwegian offshore development projects". Rikard Kinn and Svein Gjeraker, 1998.
[14] "Games, Strategies, and Managers", by John McMillan, 1996
[15] "Innovative Strategies for Contractor Compensation", by William E. Howard and Lansford C. Bell, 1998

below illustrates this. It is based on an EPCIc contract, which is an extension variant of the traditional EPC model. The "I" stands for Installation and the small "c" stands for Commissioning assistance. The table illustrate the different compensation models used for the various elements.[16]

Item	***Compensation method***
Preliminaries	Project management and facilities – LS Offices etc. for Company - Unit prices Services to Company - Cost reimbursable
Engineering	Engineering and procurement personnel – Hourly rates
Procurement	Tagged equipment and materials purchased under frame agreements – Cost reimbursable, no mark-up Bulk materials – Unit prices
Construction	Prefabrication, modules - Unit prices Offshore Work - Unit prices (Compensation format can be changed to hourly rates if needed)
Commissioning assistance	Daywork (Hourly rates)

Figure 3: Example of Compensation methods of the EPCIc Contract

This structure is quite complex, considering the total EPCIc compensation model, and it is quite complex to analyse in which areas the Contractor has the biggest commercial exposure/risk. In some cases a linear compensation model is better in terms of understanding the commercial exposure in a project execution phase. On the other hand, if both Contractor and Company is familiar with the compensation model from previous projects, which often is the case in EPC contracts, this should only be an advantage. The format is developed through long experience and is adjusted to maintain good commercial incentive in order to align Company and Contractor's interests. The major offshore Contractors in Norway today is quite familiar with the EPC model and knows in which areas the focus has to be. This has been a learning process.

The main incentives in a Contract are in the compensation format of the Contract (Appendix B, Compensation). The compensation format is chosen based on technical maturity, Company

[16] Statoil procurement presentation, 2010

involvement and marked availability (as demonstrated earlier in this chapter). The figure below illustrates an example on how the commercial exposure can be distributed differently on Company and Contractor by using the different compensation model on the various disciplines:

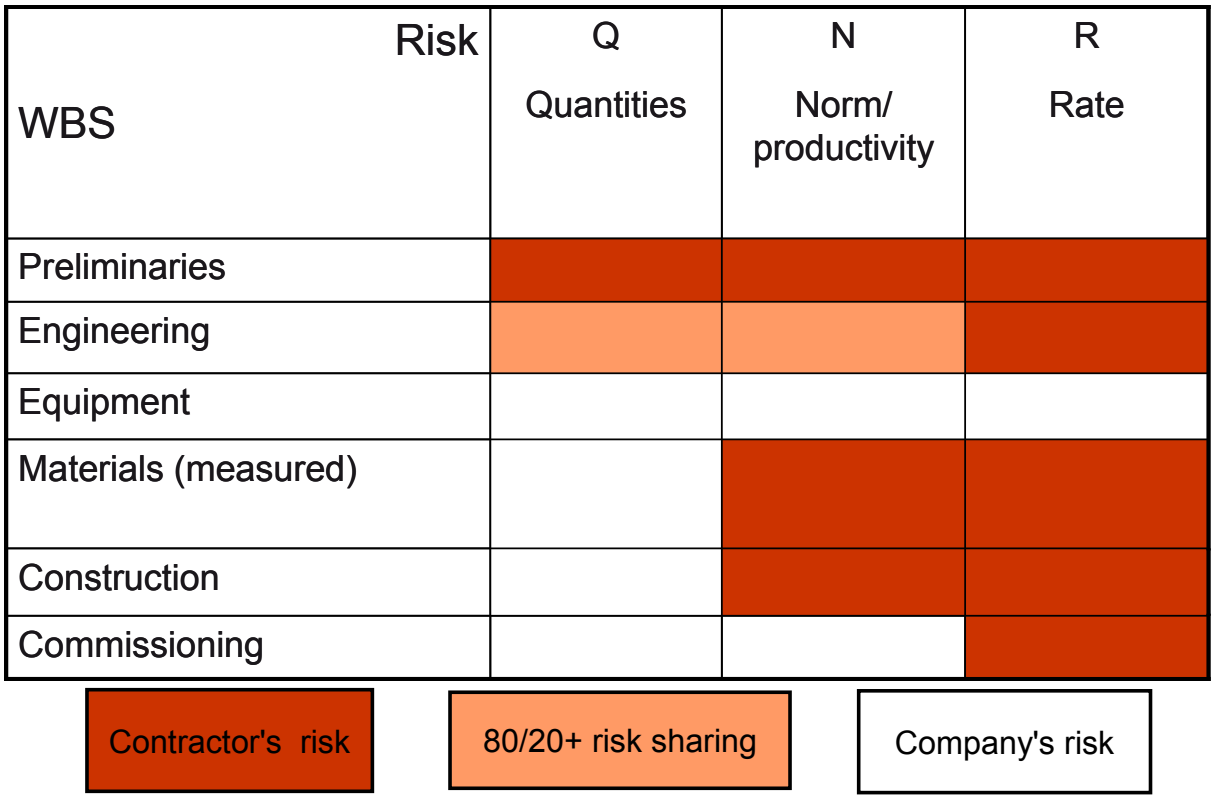

Figure 4: Distribution of commercial exposure

In addition to the "main incentives" there are incentive schemes promoting Contractor's performance with respect to compliance with his contractual obligations. These incentives should be an integral part of the compensation format.[17] An example of such an incentive scheme is a bonus milestone, where Contractor is paid a fixed amount for reaching a milestone within the deadline.

The STACON report[18] was produced to increase Contract understanding based on the last 10 years of experience and investigate how the respective parties could reach their economic goals. The introduction of incentive schemes was concluded to be one positive addition to the

[17] Statoil PME Project Assignment Report: "Utilization of incentive schemes in Kristin Semi EPCH" by Embret Johnsgaard, 2005
[18] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

Contract and would contribute to reduce the differences in the parties' objectives and contribute to limiting the challenges and problems arising from the differences. This is a subject that will be focused in this master thesis and it will be demonstrated how these incentive schemes will affect the incentive balance of the Contract.

What is later referred to as contractual incentives in this master thesis will include both the main incentives and the incentive schemes.

A common misunderstanding regarding incentives is that they are solely positive. That is not correct; all regulations that contribute to aligning the interests of both Company and Contractor are incentives. In other words, both a bonus milestone and a penalty milestone are considered to give incentives.

5 Contractual Incentives in EPC Contracts

This chapter will contain the main elements and findings of the master thesis. After defining success, some key incentive mechanisms are discussed. Then a model for analyzing the Contract incentive balance is presented and this model is demonstrated using an example.

5.1 Definition of success

Traditionally the project triangle represents the major constraints of a project. To deliver the scope on time (schedule), within the budget (cost) and with the right quality is considered a success.

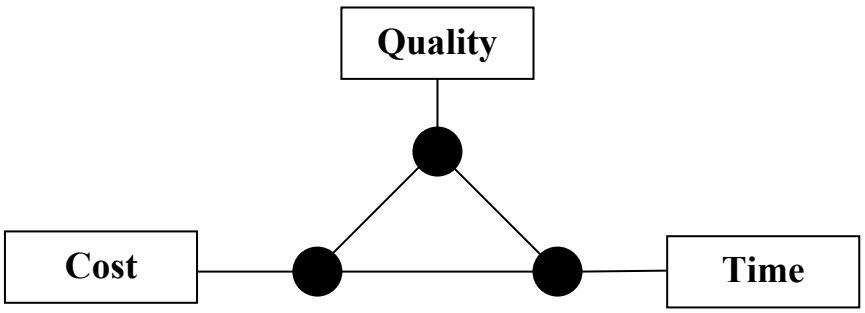

Figure 5: The time-cost-quality triangle

The figure above illustrates the time-cost-quality triangle.[19]

There are many success factors and criteria that contribute to a project being a success. The focus will be the Contract and the elements in the Contract that contributes in making a project a success. The master thesis will look into various success factors for an EPC Contract; more specifically contractual incentives and how they can contribute to a projects success. This will be recognized if:

- The contractual mechanisms, to the degree possible, have succeeded in routing both Contractor and Company into a successful project completion, achieving goals for cost, schedule and quality.
- Both Contractor and Company has accomplished what was set out at Contract Award.
- The EPC contract has been administrated as the intention was at Contract Award

[19] The handbook of Project-Based Management, Second Edition, by J. Rodney Turner, 1999

- The incentives as set down in the Contract have regulated the performance and delivery of Contractor fairly.
- The Contract is closure without any major discrepancies and without involvement from third party negotiators.

It is important to emphasise that these success factors are specific to the subjects that will be discussed in this master thesis. In a total project execution strategy several other project success factors will be of importance.

A failure would be if regulations in the Contract are wrongly constructed or are being misused by either Company or Contractor in order to gain unrighteous advantages and the Contract is closed without Contractor having sufficient compensation for the work performed or Company has paid for a facility that is not built according to the requirement as set out in the Contract.

The goal defined for success is that both Company and Contractor achieve the goals set down at Contract award. At the start of a project this is in most cases achievable, given that none of the parties have a hidden agenda. The challenge is to maintain this balance as the project progress towards completion. The Contract should play the main role in regulating this balance. Then it is mandatory that the Contract mechanisms are understood by both Company and Contractor. Experience show that this is a subject that often does not have the proper focus and consequently the administration of the Contract does not reflect how the Contract was intended to be used. A strong recommendation is to use time in the start of the project to align Company and Contractor knowledge of the Contract. This will aid a successful execution and lower the risk of future contractual disputes.

The main focus in this master thesis will be how the Contract regulates the project delivers of Contractor and not so much on how the Contract protects and secure the Contractor. In order to analyse this we have to take a closer look at the incentive mechanisms in the Contract.

5.2 Incentives

In order to properly analyse the incentives of an EPC contract the master thesis will analyse an ongoing offshore project which run the EPCIc model. The project is a modification project

and involves building a compressor and installing this on an existing platform. For reference purpose I will call the project the "Bear" project. But first some general incentive mechanisms will be introduced which often are added on top of the compensation format to make project specific adjustments to the incentive balance of the project. Secondly the model to analyse the project incentive balance will be presented and explained and finally a specific example from the Bear project will be analysed.

5.2.1 Incentive schemes

The main incentives of the Contract are set when the compensation format of the Contract is decided. But it is possible to add some incentives on top of these basic ones in order to fine tune the incentive balance of the project and make a project specific model. These incentives are often referred to as "incentive schemes".

5.2.1.1 Bonus and penalty milestones[20]

There is an evergoing discussion on whether to use bonus milestone or penalty milestones or none of the two. And if it is agreed to use a bonus milestone, when should it be introduced? At the time of ITT (Invitation To Tender), after contract award or at the point when it is apparent that Contractor need some extra commercial incentives in order to complete on time?

Initially, the penalty milestone, as a term, is negative and does not support a positive environment in the relation between Company and Contractor contract administration interface, which is important in order to nourish constructive collaboration. It is much nicer to talk about bonus milestones and how to achieve them rather to be threaten with penalty milestone and discuss how to avoid them. This is a clear advantage of the bonus milestone and often brought up as the main argument for having them.

The problems with bonus milestone are that they often are included in the profit margins of the contractor when the offer is made. This is not the case for penalty milestones as the thinking is the same; we (Contractor) will manage to reach the milestone. This is an advantage with the penalty milestone because Contractor will not chase the payment, regardless of completion according to milestone or not. This way the penalty milestone is

[20] The penalty is often given as daily fees that have to be paid every day as long as the defined scope is not completed with the contractual agreed milestone. The penalty is often capped of at a certain percentage of the total Contract value. The bonus is often a one of payment made when a certain contractual defined milestone is reached within the agreed time.

easier; it will not be chased by Contractor. Given the situation where Contractor is not reaching a penalty milestone and Company collect the penalty, Contractor will often try to prove that the delay is not solely due to lack of performance from Contractor. Depending on how severe the delay is this will always be a subject of discussion. It is important that Company stick to the Contract and force the penalty through if there are no clear indication that Company has contributed to the delay.

An alternative commercial strategy for Company in this situation is to use the penalty threat to disqualify other claims brought forward by Contractor. The effect is then that Company sorts out the commercial "noise" (often in the form of fuzzy Variation Order Requests from Contractor which is stretching to reclaim lost profit) and the threat of being claimed for penalty is removed which creates a positive element. In addition to this, the incentive effect of the penalty milestone was making its contribution in order for Contractor to complete on time, while it still was valid. This variant is used, but should only be considered if it is unclear if Company has contributed to the delay or not.

Another advantage by using penalty milestones is that the reimbursement can be justified due to liquidating damages which affect Company when a delay occurs. Increase of commissioning personnel in order to make the facility ready for operation and lost operational cost due to delays can have severe cost impacts.

If the penalty milestone(s) represent a significant impact on the Contract and Contractor has limited control of the archival, they might include a contingency in the bid as a risk premium. This will result in a higher price on the Contract. This is why great care has to be taken when deciding at what level the penalty should be set.

Back to the bonus milestone; if Contractor doesn't reach their milestone why should they get paid anyway? Again, the real world is never black or white. The delay is never the cause of matters purely related to Contractor performance, Company often tend to share their part of the reason. The question is always: How much? That is never a straight answer and Company is not in control of the numbers needed to analyse the situation. That is why, unless the delay is severe, that Company is struggling to argue not to pay a bonus despite Contractors failure to complete in time. (Company has one remedy to cure this situation; use of the Variation Order system, as described in the Prestudy).

In order to prevent the Contractor to include the bonus in their bid it is possible to introduce the bonus after contract award. The apparent problem by doing this is that this undermines the evaluation process, and if this is becoming a habit, Contractor will speculate in these kinds of bonus arrangements and build in expectations of getting these bonuses in their future bids. STACON[21] point out that "*Incentives, promising a bonus over and above the contract price should only be applied for promoting a performance over and above the strict obligations of Contractor under the contract.*" Hence, Company should have something back in return (over and above the current agreement) in trade for the introduced bonus. If not this is the case the bonus deal should be avoided. The advantage by introducing the bonus after contract award is that Contractor still can meet their margins as anticipated at contract award without having the bonus paid. This may be a weak argument since Contractor will continuously update their annual forecasts, but chances are minor that the bonus is included.

Does the bonus and penalty milestone provide strong incentives? It depends on the quality of the project control and planning of the work. I guess the question is really when does Contractor know when he is not able to reach a milestone? In most cases this is surprisingly late. This is often related to the fact that the last progress is the hardest progress to earn. This fact is often related to several reasons:

- The progress that has been reported is not correct, its is over reported
- The quality of the product is not according to technical requirement and defects are discovered by Company at a time where Contractor has a few days left to complete and really no time for rework
- People are being laid of which creates a nervous and dissatisfied spirit among the workers. This affects the productivity at the end.
- The workers are under pressure to complete which is affecting the quality of the work.

So it is when the project management realize that they are not able to meet the milestone, measures are taken, and that is often too late.

There are also examples of the opposite where Contractor, often manufacturer of important equipment/parts, is in good control of the progress. The Contractor tactic is to deliberately report bad progress in order to put pressure on Company and force Company to introduce

[21] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

bonuses in order to complete on time. Then, when the bonus is introduced, Contractor loosens up and completes on time with an increased profit due to the newly introduced bonus. If such relations have been experienced, separate mechanisms should be introduced in order to control such behaviour.

Another point to make a conscious decision on is what milestone to mark as penalty milestones and what to mark as non penalty. Always keep in mind what happens if Contractor is delayed. Then the penalty milestones are prioritized and other non-penalty milestones may suffer. Make sure that this does not hurt the project and that he milestones being penalty milestone really are the main focus.

The arguments made above are not exhaustive with regards to conclude on if to use bonus or penalty bonuses. They shall be treated more like examples to illustrate that these types of incentives are not straight forward to introduce. No contract is exactly the same so it is important that separate analyse is performed in each contract scenario in order to implement the most suitable incentives for each specific Contract. Before we leave the bonus incentive two more examples will be given to illustrate the complexity.

Example 1: When deciding on new incentives like bonus payments, during execution of the project, is important to be conscious with regards to the fact that the contract was awarded to contractor based on competition with other suppliers. It is unethical to change the agreed compensation purely based on Contractors lack of performance. Any rewards of this kind will undermine the principles of free competition and will encourage commercial strategic offers in the future. Company is not served with an attitude among Contractors that their cost will be covered regardless of their performance. On the other hand, if the new incentives are based on changes in the contract like a late delivery of CPI (Company Provided Items) it can be cleaver to agree on extra bonuses if original milestones are met as a compensation for the lost time instead of just pay directly for the unproductive time.

If bonus deals are to be made is important to insure that the extra compensation is used to cure the problem. Hence, it is important to analyse where the money will have the best effect. This will be illustrated with an example: The situation is as follows; Contract is unable to deliver on time due to bad productivity and it is agreed that a bonus payment shall be made if Contractor is able to deliver within the new agreed postponed milestone. This will increase

the incentives for working more efficient to ensure completion. Payment shall be transferred to Contractor at achieving the milestone. If milestone is not reached the payment will be reduced linearly in five days from maximum to zero. Contractor decides to use the potential payment on increasing the project profit directly without taking any further action. Contractor evaluates that the extra time given is sufficient in order to meet the deadline. The outcome is that Contractor ends up not reaching the revised milestone date and looses the bonus. What went wrong? The reason for failure is that the sharp end, the workers, was not given their part of the bonus and no other measures was taken to increase the efficiency. The workers was directly linked to the bad productivity, so by giving the workers a share of the pot , completion according to revised milestone would be more likely. In stead of having a win-win situation where milestone is reached and bonus is earned all parties loose and milestone is excided and bonus payment is lost. This example illustrates the need for using the potential incentives in a bonus payment correctly.

Are Company in a position to dictate how Contractor's use their bonus payment in such a situation? In principle, there should not be any limitations to the requirements Company can set down, in return of extra payment which is additional to the compensation already agree at the time of contract award. On the other hand, the problem was not Contractors willingness to utilize the bonus partly as payment to the workers in this situation. It was more that the situation was not properly thought through and analysed. Both Company and Contractor would probably have acted differently if someone had pointed out and suggested that parts of the bonus should be shared with the workers in order to secure their commitment to the completion date. One practical issue is how to actually perform a bonus payment like this to the workers. There will be several issues:

- How to pay workers that is only part time?
- What about workers that will be taken of the project just shortly before completion date?
- How will the union react to such a payment?
- Do you include administration personnel (directly and/or indirectly involved)?
- Often a large part of the workers are subcontractor to Contractor. How shall this be organized?

Using a payment model like this, demand that it is thoroughly considered, so it does not have the opposite effect and creates dissatisfaction and dissension among the workers. This will easily be the case if the workers find the bonus payment unfairly distributed.

Example 2: Another model that has been used where the productivity is bad is to put on a team of workers, paid reimbursable by Company, to work as a "problem solving" task force. This solution can be used by Company where Company is partially to blame for the delay. Rather than paying for the already burned hours, Company choose a more proactive solution by paying for a team which will recover the lost time and also help tackle potential new problems. The challenges are often that it takes a lot of administration to get this to work. Secondly the problem often is the number of access point to the work in a situation where a delay occurs. Putting on more people will not solve the problem, but rather increase it.
In order to choose this solution Contractor need to be well structured and have a good workforce administration, and most importantly, have available access point to do more work in parallel to what is already done.

5.2.1.2 Engineering target hours incentive

In this incentive scheme the engineering is compensated by use of target hours. That means that in the offer the Contractor estimate how much time is needed to do the engineering. This amount of hours is then set as the target number. Compensation is divided into two different parts; one lump sum payment and one provisional sum. Typically the lump sum represents 20% of the total compensation of the target hours. This lump sum will be paid regardless of how many hours the Contractor use on the engineering. So by using fewer hours than the target the 20% on the unused hours will be paid regardless. This creates a strong incentive of reducing the amount of engineering hours. If the situation is that the target hours are exceeded, the unit rate for compensation of engineering hours is cut by 20%. That means that Contractor has a major reduction in the unit rate and the remaining hour worked is probably with a very low profit or even with a loss depending on how tough the percentage level is set. This mechanism creates strong incentives for reducing the amount of engineering hour. The target hours is adjusted for variations to the work so when work is added or removed the target is adjusted accordingly.

5.2.1.3 Weight incentive scheme

On all offshore platform projects minimizing of the total weight of the installation is of great importance. Often the seabed and/or the platform jacket have limitations with regards to how much weight can be carried. When platforms are being design there is always put in a weight reserve to allow for future upgrades, but often this is limited and the upgrades are done in

several steps without knowing the total number of future steps. So the focus is to minimize the weight, especially for modification project, in order to allow for further reserves if new upgrades are needed. On the other hand the weight minimizing process must not affect the final delivery of the product; the required production output set by the Design Basis in the Contract.

In order to ensure that the EPC Contractor optimize the design to be as light as possible Company build in a weight incentive in the Contract. This is a very difficult incentive to build due to several reasons:

- On what level should the reward for reducing the weight by one tonne be set (decide the payment amount per tonne)
- Ensure that the incentive is not build too strong and jeopardize the quality of the design
- Ensure that the incentive is not too low to be attractive
- How it will affect the progress of the engineering
- Should not jeopardize other elements like technical safety, redundancy, material handling etc.

If the target hour incentive in the engineering process is used, this may result in that Contractor chooses solutions that are old and robust. That would make the engineering easier and fewer hours would be spent. The old and robust solutions are often heavier than new and lighter technology (the industry constantly strive to reduce weight of offshore production equipment), so Company would probably end up with a heavy and undesired design if this incentive was not counter regulated with the weight incentive.

Another point to be aware of is the effect the weight incentive has on the total compensation of the project. The Construction and the Installation is compensated by use of unit rates. That basically means that the lighter the solution is the less Company pays for the system. This is because the compensation is based on tonnes of installed quantity. If the installation is lighter, then the cost is smaller. If we take this into consideration, Company is able to analyse at what level the reward the tonne reduction should be set. Without the weight incentive Contractor would in theory earn more on a heavier installation given positive profit margins on the work. If we analyse how much this amounts to, the reward should be set a level that makes it desirable for Contractor to chase. If it too small Contractor may prefer to do more work and if

it is too big the design may be jeopardized or Company ends up paying more that the weight reduction is worth.

An example[22] on how things can go wrong without weight incentives are the Goliat FPSO (Floating Production, Storage, and Offloading) built on the Sevan Marine platform. The installation was in this project built too heavy and measures had to be taking in order to reduce the weight of the installation in order for the floater to accommodate it. This situation would have been avoided with the use of the weight incentive scheme.

5.2.2 Incentives for quality

Measuring quality is not always straightforward and easy due to the subjective nature of quality. The perceived quality depends on the context and the person assessing the product.[23] As pointed out by Joseph A. Huse[24], the EPC Contract model could result in a decrease of quality without the implementation of appropriate safeguards.

In an EPCI Contract Company wants to control the quality in the following main areas:

- Engineering
- Procurement
- Construction
- Installation

These areas are quite different in nature.

- The engineering work is design work where documents and drawings are produced.
- Procurement is the acquisition of goods and/or services and Contractor has to ensure that everything is delivered according to requirements.
- In the Construction and Installation phase the Contractor physically generates structures, modules which comprise the final delivery in the project.

The main safeguards of the different areas are:

[22] Eni Norge website: http://www.eninorge.no/EniNo.nsf/page/DED71D42177627E0C12574E60040DAF9?OpenDocument&Lang=norwegian

[23] Article from Wiki forum: "How to measure quality?"
[24] "Understanding and negotiating turnkey and EPC contracts", Second Edition, Joseph A. Huse, 2002

- Engineering normally has the commercial incentive of reducing the amount of engineering hours due to the target hours set (this is commonly used on EPC contracts today) and the use of weight incentives which we have seen earlier in the chapter.
- Procurement is really Contractors own interest in getting the required quality because the components purchased will be used in the Construction process to make Contractors final delivery to Company and poor quality in the purchase process means poor quality in the final product.
- Construction work is the Mechanical Completion process and the Commissioning process.

5.2.2.1 Incentive for good quality drawings

A self imposed incentive in the engineering process is the incentive for developing high quality drawings. A poor drawing would mean that Contractor will have to do the construction work twice and only get paid once.

5.2.2.2 Incentives for quality in Construction and Installation phase

A thorough follow up by Company personnel during the fabrication and installation phase will secure a good quality product, but what contractual mechanisms are securing the quality? Some aspects of quality can be measured and verified and thus be considered objective. For example, a project defines specific and exact requirements for the performance of the product (Design Basis). At the Mechanical Completion and Commissioning phase these requirement are checked by Company. Amounts of errors or findings are reported. Can this data be used to set contractual requirements to the quality of the product? Another measurable delivery is the ability to meet the project milestones. Can this be another metric for assessing the quality?

HSE, being a part of the quality aspect, has come a long way in approving the statistics lately. HSE has been on top of the agenda for several years now and this work is starting to pay of. Good quality indicators have been identified like the TRIF (Total Recordable Incident Frequency) and the SIF (Serious Incident Frequency). With these indicators the HSE performance can easily be monitored and communicated. Would it be possible to create a similar system for the fabrication and installation work?

The next section will suggest some methods for setting quality performance indicators.

5.2.2.3 Use Project Completion Systems to set incentives

It is getting more and more common to us project completion systems in order to track the progress and the status of the Mechanical Completion and the Commissioning phases of the project. This is electronic systems that ensure that all steps in the Completion phase are performed in the correct sequence and within the deadlines. In these systems the scope of work are divided into manageable parts relevant for the completion phase, organized in a tree structure. The main delivery packages are connected to the Contractual milestones so the system can record if all work is completed with the right quality at the right time[25].

One of the big advantages with the system is that it is used by both Company and Contractor; it is a common system where Company are deeply involved in the process and hence trust the information stored in the system. Up to now this system has been used purely to systemize the completion work and to track progress on this work. Is it possible to use Project Completion System Tools to record and track quality?

There are many reports available that record frequency of Punch-Points (segments of the work not completed according to the requirement) and closure rate. It is also possible to record if all Punch-Point connected to a milestone is completed within the deadline. If the milestone is not met, the system is able to report how many Punch-Point, the severity of them, and how long they are delayed. This data surly is a strong indicator for the quality of the work. By using this data it may be possible to make performance indicators by which it is possible to record and communicate quality.

Although this may be possible to do, it is important that these potential performance factors do not interfere with the reporting routines. An introduction of such performance indicator may create problems like under-reporting of punch points. There is also a potential source of error in the process of handing over the work to Company. The "Ratched effect" as described by Howard and Bell[26] is also something to look out for when implementing a model like this. Last projects' excellent performance becomes the next projects' expectation. Effectively, the Contractor has a long-term incentive to hold down performance level.

[25] WR2090 "Commissioning Manual", ver. 3.03, 2009-12-14, Statoil governing document
[26] "Innovative Strategies for Contractor Compensation", by William E. Howard and Lansford C. Bell, 1998

Another issue is that Contractor has a big challenge in being strict to what is part of the delivery. It is common that operation, Company personnel that will take over the work and operate the system, report nice–to–have modification on the system, which originally was not part of the work, as punch-points (error). These are often minor modifications that often can be handled in the field. It is important that Contractor is strict on what the scope of work is and if there are small modifications that Company would like to implement, this has to be handled through the management change system (Variation Order) and not reported as punch-points as this will paint the wrong picture of the quality of the delivery.

This subject will not be evaluated or investigated further in this master thesis, but it surely is an interesting subject that could be looked more thorough into.

5.2.3 Incentive for quality of project control

A measure for quality of project Control is how good Contractor is at delivering at the offered norms (at time of ITT – Invitation To Tender) and/or if the milestones are met. In an EPC Contract there often are elements of the work that is offered at Unit Rates. The norm part of the unit rate tells us how many hours Contractor uses to produce one unit of the work. At the end of the project it is possible to measure how well the Contractor was able to anticipate the work involved in producing the product by comparing the estimated hour with the actual spent hours. This will give an indicator on the quality of the project control. A bad productivity can be caused by two things; either the norms given at the ITT was too low or the efficiency has been poorer than normal. Often the truth it is a combination of the two. By making this KPI (Key Performance Indicator) known to the Contractor and communicate the result of the analysis at each project close out this would force the Contractor to focus on the delivery and create an implicit incentive for Contractor over time.

5.2.4 General reflections related to incentives

Again the STACON report[27] makes some good points which are quoted directly below.

- *"Commercial incentives in a Contract will have better effect in small organisations than large organisations, and better effects in organisations with simple structure compared with complex structures like joint ventures or alliances."*

[27] Report produced in co-operation between Statoil, AMA, KOGAS, ABB and UMOE, "The STACON report" (STAtoil and CONtractors), 1999

- *Incentives are more efficient when there is a short period of time between the action bringing the reward and the reward itself.*
- *Company can not take for granted that the individuals within Contractors' organisation will respond to an incentive well hidden amongst the paragraphs in a Contract*

These three elements are important to have in mind when the incentive model in a Contract is put together.

5.3 The Contract incentive balance analysis model

The challenge when working with incentives is to see all the incentives as a complete package and be able to analyse the effect single incentives has on the total incentive balance in a project. When putting together incentives in a contract it is important to have a clear view on the totality. This dilemma is address by Bengt Holmstrom and Paul Milgrom[28] where they "*emphasizes that incentive problems must be analyzed in totality; one cannot make correct inferences about the proper incentives for an activity by studying the attributes of that activity alone*" and by Petter Osmundsen in an article dealing with risk sharing and tender strategies for facilities projects in the North Sea.[29]
In order to accommodate this, a model to systemize and analyse the total incentives has been made. The incentives are put in a table which identify and classify the various incentives in the Contract. The classification will be divided into the following dimensions.

First the Contract is divided in to the different work elements:

- Engineering
- Procurement
- Construction
- Installation
- Commissioning Assistance

Then all incentives in the project will be presented and they will be divided based on if they provide incentives for:

[28] " Multitask Principal-Agent Analyses: Incentive Contracts", Asset Ownership, and Job Design" by Bengt Holmstrom and Paul Milgrom, 1991
[29] "Risikodeling og anbudsstrategier ved utbyggingsprosjekter i Nordsjøen; en spillteoretisk og insentivteoretisk tilnærming" av Petter Osmundsen, 1994

- Quality
- Cost
- Plan (time)

Secondly they will be classified in two major groups:

- Contractual regulated incentives that are **explicit** of nature. These are static and work in a given contractual setting.
- Self imposed incentives that are **implicit**. Often dynamic; they work over time.

When analysing incentives in a Contract it is mainly three things that are of importance:

- How the distribution between the incentives for the Quality, Cost and Time (Plan) dimensions are.
- Which incentives are the strongest and how they add up in the total picture on the incentive scale
- Are there any incentives working against each other or are all incentives pulling in the same direction within each dimension.

Previously it has been discussed how the requirement of the three dimensions Quality, Cost and Time all has to be met in order to have a successful project. How can we analyse that the explicit incentives in the contract together with the implicit incentives in the project add up to a balanced incentive model that will push the project in the desirable direction?

In order to perform such a task all the incentives acting in the project has to be identified and classified according to the system as given above. Second step is then to quantify the relevant identified incentives in a measurable unit so that they can be compared. This will never be exact science, but the whole idea is to run the analyse and familiarize oneself with the incentives working in the project. By performing the analyse and producing a incentive chart it will create awareness in the project on how the incentives work.

The general idea behind the method is that this type of analyse will produce a chart or model to which it is possible to conclude on if the project has a healthy incentive model or not. Healthy means an appropriate model that steers the project in the right direction. A general model will look typical like one of the figures below (Q: Quality, C: Cost and T: Time):

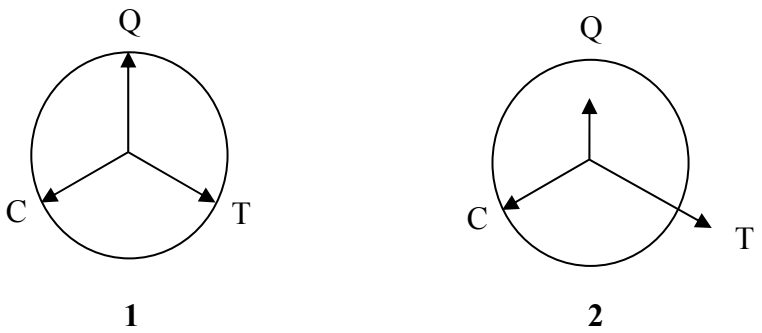

Figure 6: Incentive balance chart

The model to the left (Model 1) illustrate a model where the total incentives are in balance and this may be the desired model in most cases, but in some situation the model to the right (Model 2) may be more desirable. This model has more power on the Time dimension and a weaker power on the Quality dimension. All variants of constellations are here possible. One typical project that would fit the Model 2, and where this type of dimension constellation may be beneficial, is if the completion data of the project is important. The scope may be low technology and built on standard components. This way poor quality will not be at high risk and the project can be run without strong quality incentives. It is important to remember that although incentives for one of the three dimensions are weak it does not mean that Contractor will deliver poor in that dimension. It is just that the project strategy has chosen to secure and emphasize on the delivery of another dimension. The most important point is that this fact is known by the project administration team and that there is a conscious awareness of the incentive model power distribution and that this matches the project strategy.

5.4 The Bear project engineering incentives

In order to illustrate how the model can be utilizes on a project I will use the model on a current ongoing modification project, the “Bear” project. The first step is to analyse the Contract and identify the contractual incentives. In this example, only the incentives of the engineering phase are analysed. Normally this analysis should be performed on the Contract in its totality in order to show the complete picture from start until completion.

Identification of the strongest incentives of the Bear project is shown in the table below.

Dimension	Type	Insentive	Result	Power (1-5)
Quality	Self implied	Avoid rework in Construction and Installation phase	High quality of the IFC drawings	3
Quality	Contract regulated	Target on Engineering Hours	Contractor will need highly skilled engineers in order to reach the target	2
Time	Contract regulated	Target on Engineering Hours	The efficiency of engineering work	3
Cost	Contract regulated	Target on Engineering Hours	The engineering hours is kept to an minimum	2
Time	Contract regulated	Penalty milestone	Incentive to deliver on time	4
Quality	Contract regulated	Weight Reward	Optimization of design	4
Cost	Contract regulated	Weight Reward	Reduction in cost	4

Figure 7: The Bear Project Incentive

The above table is then summarized based on the dimension powers Quality, Time and Cost of the Bear project to display the engineering incentive balance:

Quality	9
Time	7
Cost	6

Figure 8: Summarized dimension powers

This can be visualized in a chart displaying engineering dimension power of the Bear project:

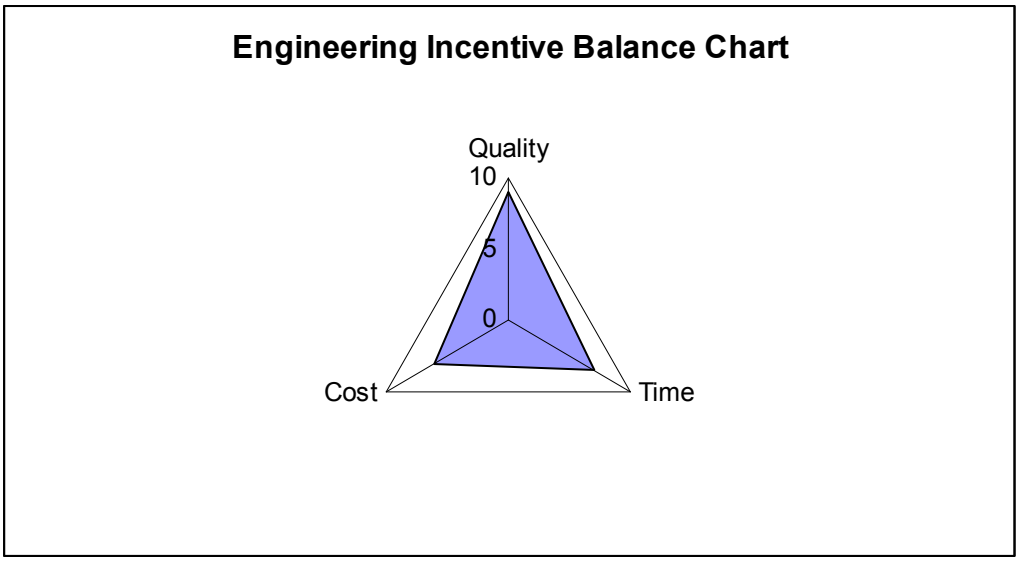

Figure 9: The Bear project Incentive Balance

This chart show that the Incentive balance of the Bear Project stretches towards the quality dimension. This proves to be in line with the contractual strategy set down by the project management. If this chart had displayed another result, more resources should by used to find the reason behind the different result between the incentive balance of the Contract and the Contract strategy.

As mentioned before; this is not exact science and the analysis will have many potential sources of errors. The obvious ones are:

- Not being able to identify all incentives within an discipline
- Finding the right balance (power) between explicit and implicit incentives
- Using the wrong power on single incentives

The clear advantage with the model is that it creates awareness and forces the project team to identify and evaluate each of the incentives in the Contract. The method has a result, summarized in an easy to understand chart which gives a picture of the balance of the Quality, Time and Cost dimensions in the project. The chart can be used to verify the contractual strategy and to communicate the incentive balance to internal stakeholders. It will help the project management to keep focus on the total picture of the incentives which has been identified in this master thesis to be an important success factor during project execution.

6 Discussion

The main focus of this master thesis has been to identify some interesting elements within the EPC Contract related to contractual incentives. Some of the element have been highlighted and discussed. Among these are the most commonly used incentives.

First the different compensation formats, which set the main commercial incentives in the contract, were introduced based on the selection table of the TIKO II report[30]. The table is a good model when choosing compensation format, but it is a very general and rough model and should only be used as a guideline and as a starting point for a discussion to highlight the main characteristics of the various compensation formats.

Then, in the next chapter, some commonly used incentives schemes, like bonus and penalty milestone and the weight incentive was discussed. These are incentive that are a bit hard to use as they require a lot of thinking and analyse to introduce into the Contract. If they are used wrongly the effect might be that the incentive model of the contract does not align with the intended focus and attention of the Contract. It is important to always have focus on the total incentive balance of the Contract. Hence, all the incentives in the Contract have to be analysed and seen in relation to each other. It is also important to asses closely which of the additional incentive schemes are need in the Contract to accompanying the main incentives set by the compensation format. Examples show that the failure of including good incentives schemes may end up in an undesired product.

To accommodate this last issue, a model for analysing the total incentives in a Contract was discussed. Although this model does not represent exact science, it is a good model to help organize the incentives, consider and analyse them and then finally giving them a power based on the perception on how much impact they will have in the total picture. All identified incentives are then summarised based on the categorization and the score they where given. This finally kicks out a chart that show the Quality, Cost and Time balance of the incentives in the Contract. This chart can then be used to asses if the balance of the total incentives in the Contract matches the real execution strategy of the project. A powerful tool to any Contract

[30] Rikard Kinn and Svein Gjeraker: "TIKO II, Contract Execution Models for Norwegian offshore development projects", 1998

Manager at the time when the Contract strategy is made and the Contract document is being put together.

The model is very edgy and rough at the moment, but the idea of having a system were the incentive balance of the contract can be analysed may prove to be an important tool to the project management. The model has a big potential for further development and should be considered as a subject for similar assignments in the future.

7 Conclusion

The master thesis look into the different compensation formats of the EPC Contract and analyse which incentives they set. Incentives that are used in addition to the incentives given by the compensation format are discussed and pros and cons are listed. The importance of understanding the total incentive balance of a Contract is mandatory. This is reflected both in experience from the industry and available literature.

To improve on the visibility and awareness on this subject, the master thesis suggests a system where all incentives are systemized and analysed. The system creates a chart from which the total incentive balance of the Contract, based on Quality, Cost and Time, is displayed.

To demonstrate the utilisation of this system an example from an ongoing project was used. The model gave an overview chart of the incentive balance of the engineering discipline of the project. The system might prove to be an important tool to analyse the EPC Contract and help project management at the time when the Contract strategy is made and the Contract document is put together. The model will reveal if the incentive balance of the Contract match the Contract strategy of the project.

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