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Quality and Risk Management in Projects

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FORTROLIG

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KVALITETS- OG RISIKOLEDELSE I PROSJEKTER
(Quality and risk management in projects)

Statoil er et internasjonalt energiselskap med virksomhet i 34 land. Basert på mer enn 35 års erfaring fra olje- og gassproduksjon på norsk sokkel, anvender Statoil teknologi og nyskapende forretningsløsninger for å møte verdens energibehov på en ansvarlig måte. Statoil har hovedkontor i Norge, 20.000 ansatte over hele verden og er børsnotert i New York og Oslo.

Måten Statoil arbeider på er like viktig som de målene Statoil når. Statoil tror at konkurransedyktig avkastning for sine aksjonærer best oppnås gjennom en verdibasert prestasjonskultur, strenge etiske krav og retningslinjer for atferd som fremmer personlig integritet.

Statoil setter absolutte krav til helse, miljø og sikkerhet (HMS). Statoil har som mål å dekke behovet for energi som er nødvendig for videre økonomisk og sosial utvikling, samtidig som Statoil opptrer ansvarlig overfor sine omgivelser og gjør en aktiv innsats for å bekjempe de globale klimaendringene.

En trygg og effektiv virksomhet er Statoil sin øverste prioritet. Statoil har høstet stor anerkjennelse for sine system for overvåking av teknisk sikkerhet og vårt sikkerhetsprogram. Statoil tror at alle ulykker kan unngås, og Statoil sitt mål er null skader på mennesker. Statoil tror det er viktig å arbeide kontinuerlig for å forbedre helse-, miljø- og sikkerhetsresultatene i alle våre aktiviteter.

Denne oppgaven fokuserer på kvalitetsledelse og risikostyring.

I oppgaven skal kandidaten mer spesifikt:

1. Gjennomføre et litteratursøk innen "quality management", "risk management" og "quality and risk management". I den grad det er tilgjengelig skal dette også inkludere generelle modeller for "quality and risk management".

2. Beskriv og analyser Statoil sin modell for "quality and risk management". Fokuser på relasjonen mellom quality og risk.

3. Beskriv og analyser hvordan "quality and risk management" fungerer i praksis i utvalgte prosjekt. Bruk verktøy fra quality management til å foreta analysene. Fokuser på relasjonen mellom quality og risk.

4. Basert på de tre første punktene skal kandidaten analysere styrker og forbedringsområder i Statoil sin modell for "quality and risk management". Basert på denne analysen skal kandidaten foreslå forbedringer i Statoil sin modell for "quality and risk management".

Oppgaveløsningen skal basere seg på eventuelle standarder og praktiske retningslinjer som foreligger og anbefales. Dette skal skje i nært samarbeid med veiledere og fagansvarlig. For øvrig skal det være et aktivt samspill med veiledere.

Innen tre uker etter at oppgaveteksten er utlevert, skal det leveres en forstudierapport som skal inneholde følgende:

- En analyse av oppgavens problemstillinger.
- En beskrivelse av de arbeidsoppgaver som skal gjennomføres for løsning av oppgaven. Denne beskrivelsen skal munne ut i en klar definisjon av arbeidsoppgavenes innhold og omfang.
- En tidsplan for fremdriften av prosjektet. Planen skal utformes som et Gantt-skjema med angivelse av de enkelte arbeidsoppgavenes terminer, samt med angivelse av milepæler i arbeidet.

Forstudierapporten er en del av oppgavebesvarelsen og skal innarbeides i denne. Det samme skal senere fremdrifts- og avviksrapporter. Ved bedømmelsen av arbeidet legges det vekt på at gjennomføringen er godt dokumentert.

Besvarelsen redigeres mest mulig som en forskningsrapport med et sammendrag både på norsk og engelsk, konklusjon, litteraturliste, innholdsfortegnelse etc. Ved utarbeidelsen av teksten skal kandidaten legge vekt på å gjøre teksten oversiktlig og velskrevet. Med henblikk på lesning av besvarelsen er det viktig at de nødvendige henvisninger for korresponderende steder i tekst, tabeller og figurer anføres på begge steder. Ved bedømmelsen legges det stor vekt på at resultatene er grundig bearbeidet, at de oppstilles tabellarisk og/eller grafisk på en oversiktlig måte og diskuteres utførlig.

Materiell som er utviklet i forbindelse med oppgaven, så som programvare eller fysisk utstyr er en del av besvarelsen. Dokumentasjon for korrekt bruk av dette skal så langt som mulig også vedlegges besvarelsen.

Kandidaten skal rette seg etter arbeidsreglementet ved bedriften samt etter eventuelle andre pålegg fra bedriftsledelsen. Det tillates ikke at kandidaten griper inn i betjeningen av produksjons-maskineriet, idet alle ordrer skal formidles på vanlig måte gjennom fabrikkens bedriftsledelse.

Eventuelle reiseutgifter, kopierings- og telefonutgifter må bære av studenten selv med mindre andre avtaler foreligger.

Masteroppgave våren 2012 for stud. techn. Marte Mikalsen

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Hvis kandidaten under arbeidet med oppgaven støter på vanskeligheter, som ikke var forutsett ved oppgavens utforming og som eventuelt vil kunne kreve endringer i eller utelatelse av enkelte spørsmål fra oppgaven, skal dette straks tas opp med instituttet.

Oppgaveteksten skal vedlegges besvarelsen og plasseres umiddelbart etter tittelsiden.

Besvarelsen skal innleveres i 1 elektronisk eksemplar (pdf-format) og 2 eksemplar (innbundet).

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PREFACE

This report is written by stud.techn. Marte Mikalsen and it is the result of the master thesis – *Quality and Risk Management in projects* given by Department of Production and Quality Engineering at Norwegian University of Science and Technology (NTNU). The work related to this master thesis have been performed on a fulltime basis from January 2012 to June 2012. This master thesis is a compulsory activity as part of a Master of Science at NTNU.

The thesis' aim is to perform a literature study and use this study and experiences gathered through project follow-up and interviews from Statoil ASA projects in order to identify strengths and weaknesses of the existing QRM model.

This thesis' topic is initiated by Tom Fagerhaug and Terje Fjerdingen, both Quality and Risk Manager at Statoil ASA. I would like to thank them for this opportunity and making me feel like a part of the Quality and Risk Management department Statoil ASA, Stjørdal, Norway.

I would like to address a special thanks to Tom Fagerhaug, for guiding me through the complex world of Statoil ASA.

I would also like to thank my anonymous interviewees, you know how you are. Thank you for good insight to the challenges that you face on a daily basis.

My advisor at NTNU, Bjørn Andersen, has supervised me through this project. I would like to thank him for assuring that this project has a strong theoretical background.

I have gotten some useful help in finding interesting literature from Erik Jersin, Researcher at SINTEF Technology and Society, and Daryl John Powell, PhD Candidate Department of Production and Quality Engineering at NTNU.

Trondheim, Norway, 11th of June 2012

Marte Mikalsen

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SUMMARY

This master thesis main topic is *Quality and risk management in projects.* It is written in close collaboration with the Quality and Risk Management (QRM) department at Statoil ASA (Statoil), department unit Stjørdal. The main purpose of this master thesis is to make some suggestion to a real case problem that the QRM managers struggle with on a daily basis.

Statoil is an international energy company with more than 40 years of experience from the oil and gas production on the Norwegian continental shelf. Many projects in Statoil are investment projects, moreover big and complex projects are handled by Statoil's Project department (PRO). One of the roles in the PRO is the QRM manager. The QRM managers responsibilities is to provide an objective view on projects quality and risk management processes, by providing support for risk analysis and decision making in the investment projects. The role was introduced to Statoil after the StatoilHydro ASA (StatoilHydro) merge in November 2007.

This thesis consist of six parts, namely Literature review, Method, Management System, Results, Strengths and Areas of Improvement.

In the literature review the following themes where studied; *quality management (QM), risk management (RM)* and *quality and risk management (QRM)*. In the section about quality management – management for quality, including relevant tools were discussed. Furthermore, process orientation to quality management and planning for quality were discussed. The quality section ends with a section on lean. Through this section the implementation of several of the tools and quality philosophies have been introduced to project management and the benefit of these tools and philosophies are discussed. The overall trend is that many of the ideas from quality management can be advantageously adapted into project management, such as lean philosophy.

In the next section some of the risk management techniques used in Statoil are presented. Moreover the different types of risks, principles for reducing these and ways of interpretation are addressed. In addition some tools for establishing a risk picture in a project, namely the information processing perspective, the decision making perspective and decision tree, is discussed. This section concludes that risk analyses provides a good foundation for the decision makers.

The QRM literature section aim to identify areas where RM and QM can learn from each other. The areas where RM can learn from QM is identified to be the following three 1) Being able to differentiate between which risks can be handled with a statistical approach and which cannot 2)To focus on key processes and 3) Implementation of both organisational and cultural changes. The section also address how QM can learn to prioritise their work through a risk analyses and identification of likelihood and consequence of risk. By having a risk based approach to QM the allocation of recourses can be optimised.

The method chapter set the structure of the data collection of this thesis. Based on a review of governing documents and relevant literature, informal and formal interviews, personal experiences and observations – the strengths and weaknesses of the current QRM model is identified.

The following chapter is a study of Statoil's management system and governing documentation relevant to the QRM role. The focus is on establishing an understanding of what is expected deliverables from the QRM manager to the project development process in Statoil. In addition the different phases of the project development process is examined. The chapter have a focus on deliverables according to the RM discipline and the QM discipline. The deliverables to the QM discipline is put into the quality cycle consisting of quality planning, quality assurance, quality control and quality improvement.

Statoil operations are global, consequently the level of uncertainty is bigger compared to having operations in only one nation. There is a growing focus on risk management in industry, a trend that Statoil also have noticed. The requirement of risk analysis from top management justifies the need for a QRM manager in projects.

The strengths of the existing QRM model is identified as it is presented in the list below.

- Courageous QRM managers will challenge the system into continuous improvement
- Good organisation of resources based on risk analysis
- Being a generalist is an advantage in facilitating risk workshops
- The QRM managers poses the ability to communicate with different levels of the organisation
- Good system understanding through being auditor certified
- Facilitation of risk workshops and use of risk analysis
- Take advantage of the relationship between risk- and quality management
- The role is integrated into several levels of the organisation
- Statoil's focus on risk management is in line with the QRM role
- QRM as foundation for passage of major decisions and mile stones

Since this model have not been in the Statoil system more than five years, there are still some areas of improvement in order to fully integrate the risk based approach to quality management in the organisation. Not only are the weaknesses of the existing QRM model identified, but also some suggestions based on literature, personal experience and discussions with the interviewees are presented.

The easiest areas of improvement identified in this thesis is better training of juniors, actions to reducing the turnover rate of QRM managers, improving quality control of the QRM managers work, more quality focus through a more cycle view on quality in the department, and at last getting the missing experiences through studies of investigation reports from the Petroleum Safety Authority Norway (Ptil).

The more challenging actions that should be focused on in order to get a more homogenous and less ambiguous mandate to the QRM role. The QRM department should focus on adapting to a set of terminology equal to the rest of the world, closer follow-up on mitigating and focus on getting the right people to participate in risk workshops in order to identify the right risk.

The findings from this thesis indicates that elements and ideas from the QRM model can be generalised and successfully implemented by other organisations. The main imitating factor of this thesis is time and experience with project execution from the author.

SAMMENDRAG

Hovedtemaet for denne masteroppgaven er *Kvalitets - og risikostyring i prosjekter*. Oppgaven er skrevet ved et nært samarbeid med Quality and Risk Management (QRM) avdeling ved Statoil ASA (Statoil), underavdeling Stjørdal. Hovedhensikten med denne masteroppgaven er å komme med noen konkrete forslag på løsninger av problemer som QRM ledelsen sliter med på en daglig basis.

Statoil er et internasjonalt energiselskap med virksomheter i over 36 land med over 40 års erfaring fra olje- og gassproduksjon på norsk sokkel. Mange Statoil prosjekter er investeringsprosjekter, og store og komplekse prosjekter blir håndtert av Statoils prosjekt avdeling (PRO). En av rollene i PRO er QRM ledelsen. Det er QRM lederens ansvar å komme med ett objektivt syn på prosjektenes kvalitet- og risiko prosesser. Dette gjøres ved å gjennomføre risikoanalyser som kan brukes som kan brukes som beslutningstøtte. QRM rollen ble introdusert i Statoil etter Statoil ASA (Statoil) og Hydro ASA (Hydro) fusjonerer i november 2007.

Denne oppgaven består av seks deler. Disse er litteratur studie, metode, Statoils styringssystem, QRM rollen i praksis, styrken til QRM modellen og områder for forbedring.

I litteratursøket ble følgende temaer studert; «quality management» (QM), «risk management» (RM) og «qualtiy and risk management»(QRM). I avsnittet om kvalitet ledelse, blir ledelse for kvalitet, og relevante verktøy diskutert. Videre ble prosessorientering til kvalitet og planlegging for kvalitet diskutert. Kvaliteten seksjonen avsluttes med et avsnitt om «lean». Gjennom hele denne seksjonen blir flere kvalitets verktøy og kvalitets filosofier prøvd overført til prosjekt ledelses kontekst. Fordelen av denne hypotetiske implementeringen av verktøyene og filosofiene blir diskutert. Basert på disse funnene kan man konkludere med at mange av idene fra kvalitetsledelse kan fordelaktig bli implementert inn i en prosjektledelse kontekst.

I det neste avsnitt ble noen av Statoils risikoanalyse teknikker presentert. Videre ble ulike typer risiko, prinsipper for å redusere disse og måter å tolke risiko adressert. I tillegg til dette ble noen verktøy for etablering av risikobilde i ett prosjekt diskutert. Disse er informasjons perspektivet, beslutnings perspektivet og beslutnings tre. Denne seksjonen avsluttes med en konklusjon om at risikoanalyser gir ett godt grunnlag for beslutningstakerne.

Avsnittet som omhandler QRM tar sikte på å identifisere områder hvor RM og QM kan lære av hverandre. Områdene hvor RM kan lære fra QM er identifisert til å være følgende tre 1) Å kunne skille mellom hvilke risikoer som kan håndteres med en statistisk tilnærming, og som ikke kan 2) Å fokusere på viktige prosesser og 3) Gjennomføring av både organisatoriske og kulturelle endringer. Avsnittet sier også hvordan QM kan lære å lage prioriterings lister basert på risikoanalyser. Ved en slik tilnærming kan QM optimaliseres sine ressurser.

Metode kapitelet forteller hvordan strukturen på datainnsamlingen er. For å identifisere styrker og svakerter ved dagens QRM modell har styrende dokumenter og relevant litteratur blitt gjennomgått. Det har i tillegg blitt gjennomført uformelle og formelle intervjuer. Personlig erfaringer og observasjoner har også vært en viktig kilde til data.

Det neste kapitelet er en studie av Statoils styringssystem og styrende dokumentasjon relevant for QRM rollen. Fokuset her er å etablere en forståelse av hva som er forventet leveranser fra QRM lederne til PRO. I tillegg er de ulike prosjekt fasene undersøkt. Kapitelet har ett fokus på

leveranser i henhold til RM- og QM disiplinene. Leveransene til QM disiplinen blir satt inn i ett kvalitets syklus perspektiv bestående av kvalitet planlegging, kvalitetssikring, kvalitetskontroll og kvalitetsutvikling.

Statoil operer i ett globalt marked, derfor er usikkerheten større her i forhold til å bare ha drift i én nasjon. Det er et økende fokus på risikostyring ute i industrien, en trend Statoil også har lagt merke til. Kravet til risikoanalyse fra toppledelsen begrunner behovet for en QRM leder i prosjekter.

Styrkene til den eksisterende QRM modellen er identifisert til å være:

- Modige QRM ledere vil kontinuerlig utfordre systemet til forbedring
- Ved å ha en risikobasert tilnærming vil man få god organisering av ressurser
- QRM lederens evne til å være generalister
- QRM lederens evne til å kommunisere med flere nivåer i organisasjonen
- God systemforståelse gjennom å være revisjons sertifisert
- Tilrettelegging av risiko seminarer og bruk av risikoanalyse
- Rollen er integrert i flere nivåer i organisasjonen
- Statoils fokus på risikostyring er i henhold til QRM rollen
- QRM analyser som innspill til beslutnings taking

Siden QRM modellen ikke har vært i Statoil systemet mer enn fem år, er det fortsatt forbedringspotensialer før en full ut integrert risikobasert tilnærming til kvalitet er en realitet i organisasjonen. Ikke bare er svakheter med eksisterende QRM modellen identifisert, men også noen forslag basert på litteratur, personlige erfaringer og diskusjoner med intervjuobjektene presenteres.

De enkleste områdene hvor forbedringer er indentifisert er bedre opplæring av juniorer, tiltak for å redusere omløpshastigheten av QRM ledere, bedre kvalitetskontroll av QRM ledelsens arbeid, mer fokus på kvalitet ved å ha et mer syklisk syn på kvalitet, og til slutt øke avdelingens erfaringer ved å studere granskningsrapportene til Petroleumstilsynet (Ptil). De litt mer utfordrende tiltakene bør være rettet mot å få ett mer homogent og mindre tvetydig QRM mandat. Tiltakene som avdelingen bør fokusere på er en tilpassing av engen terminologi med resten av verden, tettere oppfølging av begrensende tiltak og fokus på å få de riktige personene til å delta i risiko seminarene.

Funnene fra denne masteroppgaven indikerer at elementer og ideer fra den QRM modellen kan generaliseres og fordelaktig implementeres i andre organisasjoner. Den viktigste begrensende faktoren i denne masteroppgaven er tid og forfatterens manglende erfaring med prosjektgjennomføring.

1. INTRODUCTION

1.1. BACKGROUND

The business environment is constantly changing, similar to the changes that can be seen in the rest of the world. Many businesses operate in several parts of the world setting different demands for operations compared to an organisation that only operates locally. The level of business uncertainty correlates often with the size of an operation and the extensive focus on delivering what the customer wants at the same time – this leads to a demand for a smarter and more effective project development.

Statoil is a global company that have acknowledged this. In a time where time is limited, and the fight for new resources is essential the organisation have tried to find solutions to eliminate non-value adding actives. One of the most significant current discussions in a project context is regarding risk management. Statoil have adapted a risk based approach to their project development, in hope of eliminating unnecessary work. Whether or not this implementation is successful is the red thread through this master thesis. A good and structured project execution is highly important for a successful project and organisation. In the previous, Statoil have had some poor project execution incidents that have led to several CEOs resignations.

1.2. PROBLEM DESCRIPTION AND PURPOSE

It is becoming increasingly difficult to ignore the fact that the week does not have enough hours or the that companies do not have unlimited resources that can be sent on actives. However, the QRM model discussed in this thesis present a way for organisations to prioritise the right actions that will eliminate threats and realise opportunities. In order to have a good quality culture in Statoil's project organisation, the QRM role was introduced together with the merge between Statoil and Hydro in 2007. This approach is not well integrated into Statoil yet, and the challenges that the role faces in the different settings will be identified. Both strengths of the model and areas of improvement is discussed. In other words, the problem to be addressed are:

1) What are the strengths and weaknesses of the existing QRM model?
2) How can this model be improved?
3) What are the differences between the deliverables of the QRM manager to the different project phases?

The aim of this thesis is to map challenges linked to the implementation of the QRM model, followed by proposed solutions. In addition the strengths of the current model will be identified and discussed.

1.3. STATOIL ASA[1]

Statoil is an international energy company with operations in 36 countries with headquarters in Norway, employing over 21 000 worldwide. With more than 40 years of experience from the oil

[1] www.nav.no:Ledige stillinger – stillingsannonse (accesed on 21.05.12). https://www.nav.no/stillinger/stilling?sort=akt&rpp=50&q=quality&p=0&ID=2774964&l1=62872&rv=al

and gas production on the Norwegian continental shelf, Statoil are using new technology and innovation to meet the needs for energy in the world.

Technology, Projects and Drilling (TPD) department delivers projects to Statoil. Its mandate is to provide excellent projects through close follow-up from early phase to completion. Many projects in Statoil are investment projects, from small research projects to building new platforms. Big and complex projects are handled by Statoil's Project department (PRO). PRO's aim is to deliver world-class execution of business cases when it comes to project delivery time, with the right quality and cost limitations, with a high degree of HSE and CSR standards. One of the roles in PRO is the Quality and Risk Management (QRM) manager. The QRM managers' responsibilities are linked to the projects quality and risk management processes, by providing support for risk analysis and decision making to the investment projects.

1.4. STRUCTURE

This thesis have been divided into seven parts. The first part, chapter 2, gives a brief overview of the recent and classical literature relevant to the topic, before the chosen method for this study is presented in chapter 3. In the next chapter Statoil's governing documentation relevant to this thesis is discussed. The aim of this chapter is to give readers with a "non-Statoil" background an introduction to the Statoil management system. Chapter 5 begins by laying out how the QRM role is carried out in some Statoil project. The thesis will then go on to identify the strengths of the current model in chapter 6, before the current model is evaluated and areas of improvement is described in the next chapter. The areas of improvement are based on discussion with members of the Quality and risk management (QRM) department, as well as own experiences and the relevant literature. The last chapter sums up the previous chapters in a conclusion before a limitation to work is presented.

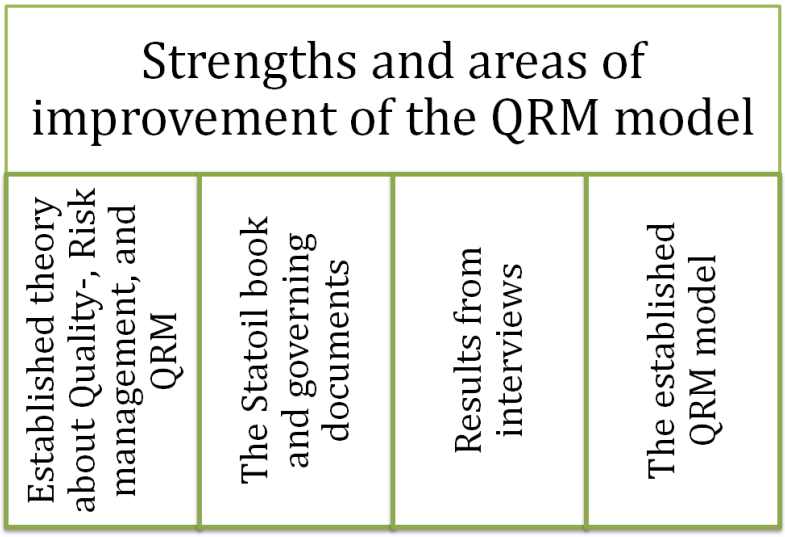


Figure 1: Structure model

The background for this master thesis topic is a summer internship at the Quality and Risk Management department at Statoil ASA, Stjørdal and a project assignment collaboration the following fall of 2011. In the project assignment *Supplier Quality Management* (Mikalsen, 2011), many of the key words of the literature study is identical to the ones found in this maser thesis. In addition, many of the same topics discussed in *4.Management System* were also discussed in

the project assignment. Consequently some of the sections are identical to sections in the project assignment *Supplier Quality Management*. These sections will be referred to using the original references. In addition there are some sections that are highly influenced by topics discussed in the project assignment. These sections have been altered to some extent to fit the context of this thesis. The sections also have the original set of references. Furthermore, there are some findings made by the author of *Supplier Quality Management* that is relevant for this thesis – relevant references are made accordingly. The relevant chapters for this are *Literature Review* and *Management System*

1.5. LIMITATION

Two out of the three topics discussed on the literature chapter are wide-ranging and well developed. The time limitation for this master thesis is set to be 960 hours, resulting in clear limitations what can be included in the literature search.

This master thesis is written by a production and quality engineering student with little project execution experience, therefore the focus of this report is to identify strengths and weaknesses of the QRM model based on an engineering perspective, and not a project management perspective.

Please take note that in this master thesis the words *organisation* and *business* are used to describe the same entity, this is done to create a more dynamic language. The same situation applies for the words *project* and *business case,* this is because it is common internally in Statoil to refer to a project as the business case. The same apply for the expression *To realise the business case,* which is interchangeably used with *to carry out a project.*

The expressions *QRM manager* and *QRM role* are also used interchangeably. However there are some differences to these terms. The QRM manager indicates that there is talk of a person, which fulfils the requirements of the QRM role.

2. Literature Review

In this literature study there are three topics that have been reviewed and linked to together. Namely quality management (QM), risk management (RM) and quality and risk management (QRM). The relationship between these disciplines is shown in Figure 2. Both RM and QM are well established disciplines in literature, QRM on the other hand have not been given much focus in litterateur.

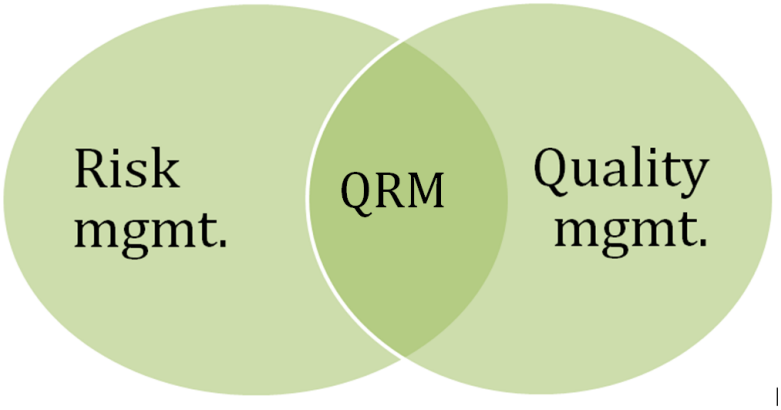


Figure 2: Relationship between the different disciplines

This chapter starts with a general introduction of QM, before RM is discussed. The basis for the RM section is the tools that are really used in Statoil, in addition to some extra key points. The chapter ends with a summary of the little published literature regarding QRM. The aim of this section is to summarise what both QM and RM can teach each other.

2.1. QUALITY MANAGEMENT

Quality management is a well-established engineering field. It has its origin from the manufacturing environment, but has also been adopted into fields such as service industries and project management. The historical development of quality have evolved from quality control, to quality assurance, to QM, and finally into total quality management (TQM) (Jersin, 1993).

In this chapter a study of central elements from quality management will be executed. The elements are part of classical quality management and in this thesis a discussion will be raised on whether some of these elements can be implemented into a project management setting. The discussed tools will be implemented to control a project and improving the end result.

2.1.1. MANAGEMENT FOR QUALITY

In this section the pillar in QM will be discussed. The foundation in QM is (amongst others) costumer focus and process orientation. The driving forces of all businesses are to satisfy its customers, and in this chapter the importance of customer focus is discussed. The other brick stone of QM is process orientation. Every operation is a process, and by identifying the key processes in a project or any other value chain can lead to a better understanding on improvement areas and to reduce waist.

The main input to management is facts and figures. Leadership on the other hand is a decision making process based on intuition and knowledge in addition to the facts and numbers (Aune, 2000).

2.1.2. CUSTOMER FOCUS

In a competitive business environment as the one that we see today, customers are shifting between different suppliers at high speed. How does the supplier create loyal customers that are coming back again and again? The answer to this question is to keep meeting the needs and wishes of the customers. To determine what these needs are is not an easy case in most businesses. This chapter will try to describe different methods and approaches on how a business can fulfil the needs of the customers.

It is a general saying that customers "know what they want when they see it" (Summers, 2005). The key to success lies in seeing in advance what the customer want and needs. Bergman and Klefsjö (2004) and Marosszeky and Oakland (2006) also state that there is a strong correlation between customer satisfaction and financial results.

One main goal for most business is to fulfil the needs of a customer. To have a long term focus on the customer, both internal and external , means that the main focus in to please them, rather than getting high sales numbers. The primarily customer is the external customer, the end customers, that buy the product/service. The internal customers are the secondary customer.

In this chapter the definitions of the different classes of customers' needs will be defined according to the Kano model; dissatisfies, satisfiers and delighters (Evans and Dean, 2011, p.26).

Bergman and Klefsjö (2004, p. 27) defines the customer concept as" Those we want to create value to are our customers". It is important to have in mind that the one we are trying to create value for is not always the one that is paying for it.

Not all the unsatisfied customers complain, even unsatisfied customers come back. This does not necessarily mean that they share their dissatisfaction with other potential customers, but most likely they do. A high customer-satisfaction rating in the past does not create necessarily loyal customers, but a high –value rating do (Summers, 2005). To achieve great success, information about customer-perceived value need to be linked up to information about customer satisfaction and analysed. It is important that everybody in the organisation have a well-defined customer outside the boundaries of the company and within (Marosszeky and Oakland, 2006).

2.1.2.1. QUALITY FUNCTION DEPLOYMENT (QFD)

Successful businesses listen and talk to their customers and transform what the customers said into appropriate actions (Summers, 2005). One good way of identifying what the customer wants is to talk to them, and to place oneself in their position (Nalebuff and Ayres, 2003). A key to an effective organisation might lay in the way that the organisation translates the customers need into product specification. One way of doing this is by Quality Function Deployment (QFD). By adopting this process the business is ideally able to meet the customer's need the first time around. Developed in Japan in the 1970s QFD can point out weaknesses with existing and new products (Summers, 2005).

A key element of QFD is that it uses input from the customers in the product development. This resulting in a reduced number of both engineering changes and production problems, and increases the customers' perceived value.

Areas that need to be investigated in QFD are performance, features, reliability, conformance, durability, serviceability, aesthetic and perceived quality (Summers, 2005).

The horizontal part analyses what the customer needs, while the vertical part describes how the company is going to fulfil these needs.

The steps in developing a QFD (Summers, 2005, p.68-77):

1) Determining the Voice of the Customer (VOC): What does the customer want? (making the list of potential needs of the customer)
2) Having the customer rank the relative importance of his or her wants
3) Have the customer evaluate your company against competitors
4) Determine how the wants will be meet: How will the company fulfil the wants?
5) Determine the direction of improvement for the technical requirements
6) Determine the operational goals for the technical requirements
7) Determine the relationship between each of the customers wants and the technical requirements: How does action on (a change in) a technical requirement affect customer satisfaction with the recorded want?
8) Determine the correlation between the technical requirements
9) Compare the technical performance with that of competitors
10) Determine the technical importance
11) Add regulatory and/or internal requirements if necessary
12) Analyse the matrix

On the next page there is an example of a QFD matrix.

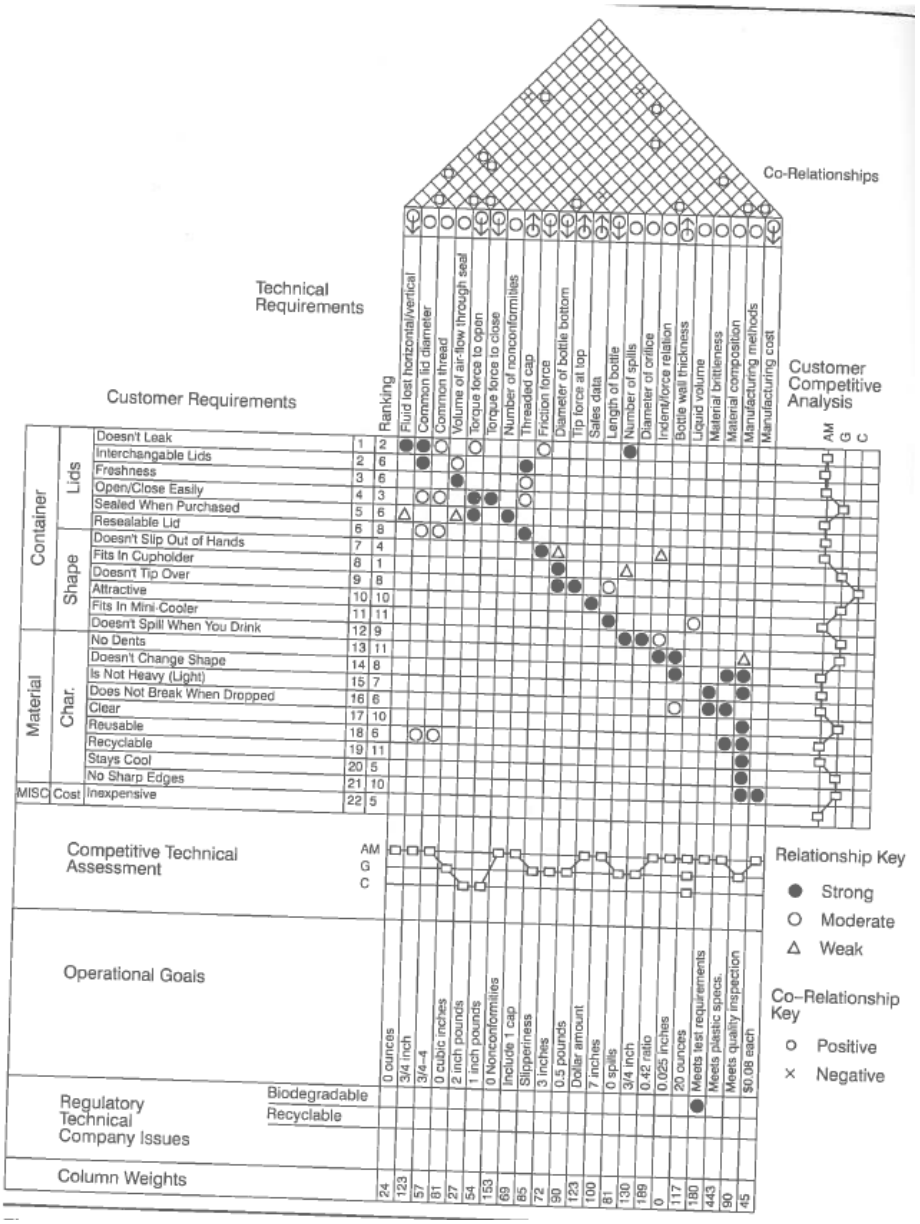


Figure 3: QFD matrix (Summers, 2005, p.76).

2.1.2.2. MALCOLM BALDERIGE CRITERIA

By the Malcolm Balderige Criteria for Performance Excellence Results (MBNQA), the categories of measure include the whole business operations (Evans and Dean, 2011). The main goal of MBNQA is to create a more efficient customer focus.

It focuses on short-and long-term requirements, expectations and preferences. The MBNQA criteria are developed to determine how effective an organisation is. These criteria are (Summers, 2005, p.78):

1) Leadership. Is the VOC implemented in the organisation's leadership?
2) Strategic Planning. Is there a plan in place that supports the company's focus?
3) Customer and Market Focus. Has the information about the customers' perception of value been shared and processed throughout the organisation?

4) Measurement, Analysis, and Knowledge Management. Is the correct information gathered?
5) Human Resource Focus. Is a customer-focused behaviour rewarded?
6) Process Management. Are there processes implemented or planned improvement projects in the organisation that supports the needs of the customer?
7) Business Results. How are the organisations methods for measuring what they planned to do, and what they actually did?

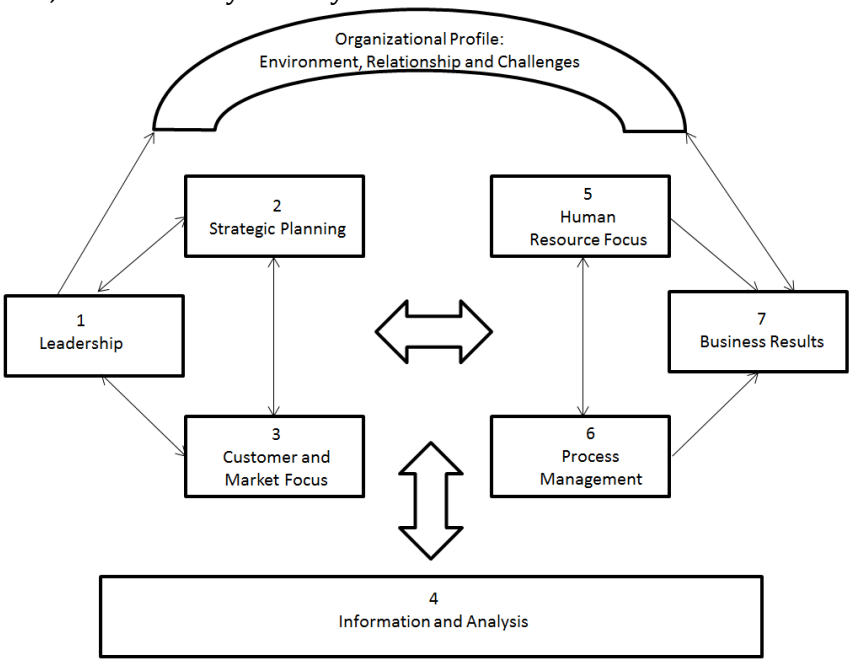


Figure 4: Malcolm Baldrige Criteria for Performance Excellence (James, 2004, p.220).

2.1.2.3. CUSTOMER FOCUS IN PROJECT MANAGEMENT

There is a saying in quality management that " If you cannot measure it, you cannot manage it". What is being measured in an organisation affects the behaviour of everybody influenced by the organisation (Kaplan and Norton, 1996). If the organisation only measures the financial status of the organisation, the mind-set of the employees will be only figures and numbers. In most cases figures and numbers are not sufficient enough in the goal in achieving the business vision and mission.

To measure success in a project there are several aspects that need to be taken into consideration. A project is defined as a process that has a set starting and end point. The simplest life cycles of a project consists of four stages: initiating, planning, executing and closing (Devine and O'clock, 2010) and a simple sketch of this can be found in Figure 5. As a comparison, a simplification of the Capital Value Process in Statoil is shown in Figure 6. This process is discussed more in depth in 4.6.3 *The Project Development Process.* At the different milestones of the project the progress should be measured.

Benefits of monitoring a project (Devine and O'clock, 2010)

- Enables the project manager and sponsor to be informed of the project's progress and be able to take action to keep the project on track
- Gives the opportunity for project members and organisation to learn and grow from lessons learned while executing the project

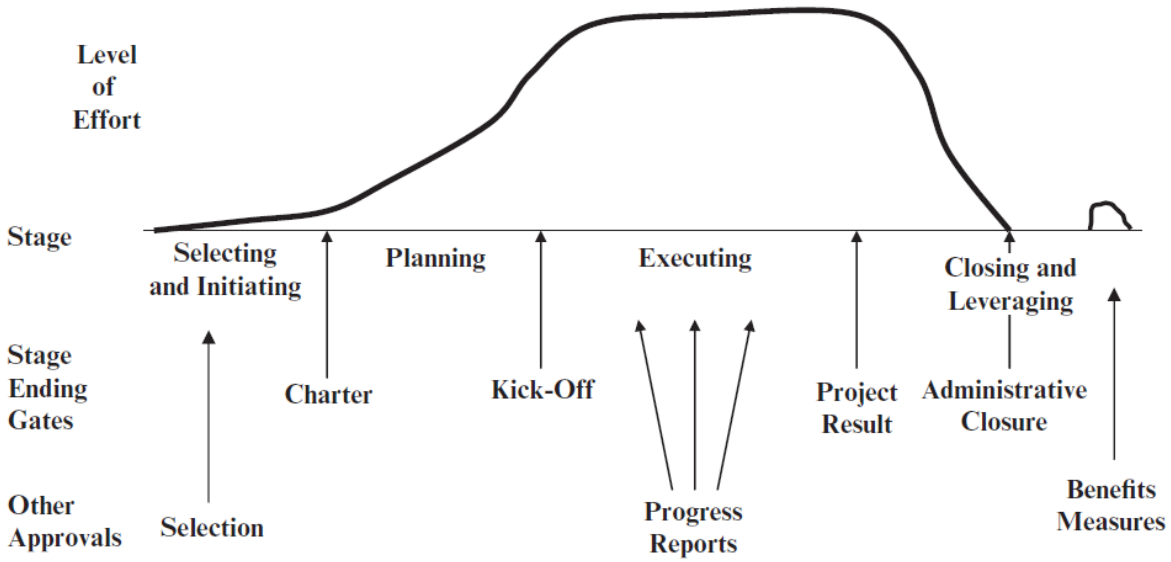


Figure 5: Project Life Cycle with Measurement Points (Devine and O'clock, 2010, p.39).

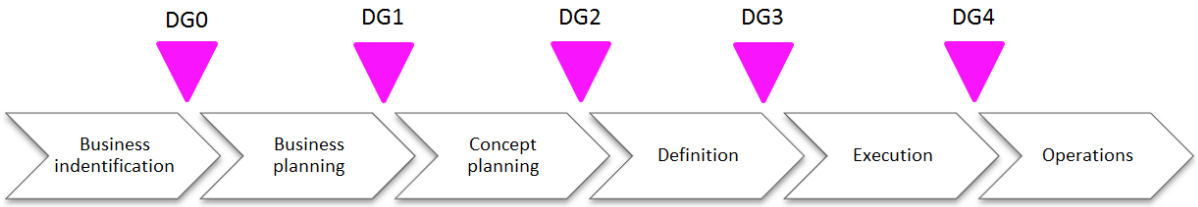


Figure 6: Project process in Statoil (Statoil. 2011, p.36).

Poorly defined requirements for quality can in many cases lead to a dispute amongst the parties. Arguments with the quality manager and the supervisor of a project is not uncommon, as there often is a conflict of interest. The managers' main goal is that the operation runs as smooth as possible and according to time schedule, because it is the criterion for payment. The quality managers agenda is to make the product correct every time, and will be rewarded accordingly to these present values (Marosszeky and Oakland, 2006).

2.1.3. Process Orientation in Quality Management

To be able to meet the customers requirements, a plan for meeting those requirements need to be implemented into the business process. Everything that we do is a process, and being able to identify the key business processes is crucial in pleasing the customers. The customer values a process that is seamless, flawless, and easy to understand as these processes saves money and time for the customer (Summers, 2005).

By not doing the right actions the first time at every step of a process, a lot of waste will be produced. How come we accept failures in some contents (artefacts and electronics), and not in other areas such as healthcare. In all different settings there is a range of suppliers. One example of supplier relationship is a secretary is a supplier to his or hers boss. If the requirements are not meet by the supplier, that supplier bond will be cut off, in this case the secretary might get laid

off. Throughout an organisation, there are a series of *quality chains* of suppliers and customers (Marosszeky and Oakland, 2006). This chain might be broken down into customers on individual level or piece of excitement that need to meet the requirements of an internal or an external customer. This failure can be found in the interface between the organisation and its outside customers.

A process takes input and transforms it through a value-adding process and create an output. Business key processes are the core business processes that have a great impact on customer's value perceptions (Summers, 2005).

2.1.3.1. PROCESS ORIENTATION IN PROJECT MANAGEMENT

In project management there are two main structures of organisations: functional structured organisations and process structured organisations.

In a functional organisation each person completes its function. People are teamed together based on what kind of activities they do. This way of organising nourish an organisation with a lot of specialised individuals and management boundaries are clear (Summers, 2005).

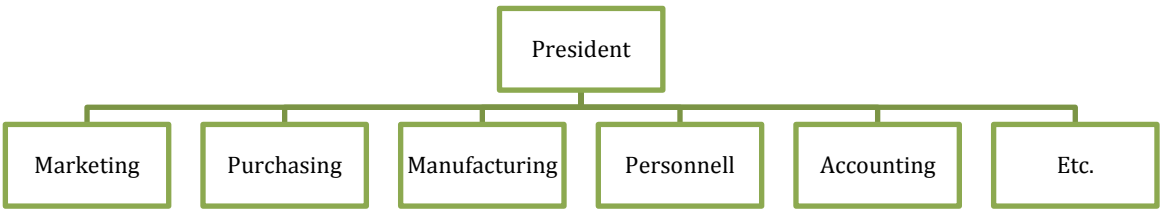


Figure 7 : Functional organisation (Summers, 2005, p.204)

A process structured organisation on the other hand is organised according to the key processes needed to satisfy the customers. Boundaries between the departments and the management are blurry. This organisation structure focuses on the overall process rather than a specific task. Having cross-trained employees gives the opportunity to place people and resources where there is a need for it, resulting in a flexible organisation. The lower part of the project organisation structure resembles to Kerzner's (2008) matrix organisation. The strength and weaknesses of this structure is discussed in 7.1.6 *Work Load.*

In a functional organisational structure, the focus is internal rather than external. Internal focus invites the departments to perform well on the task in that department, but performing well internal in a department might not benefit the organisation as a whole. When the people in an organisational structure cannot see a clear link between the day-to-day operations and how this contributes to achieving the organisations mission and vision the organisation is not fully optimised. A functional organisational structure might be highly productive focusing on internal productivity, but not focusing on the external customer, the organisation as a whole might lose market shares. As the employees in a functional organisational structure is highly specialised in what they do, results in the organisational structure not being able to adapt to changes in the business environment (Summers, 2005). Functional organisation might resemble Kerzner's (2008) line-staff organisation. Kerzner (2008) introduced some negative consequences of this

organisation, such as complex authority relationships, as the functional manager is forced to share their responsibility with the project manager.

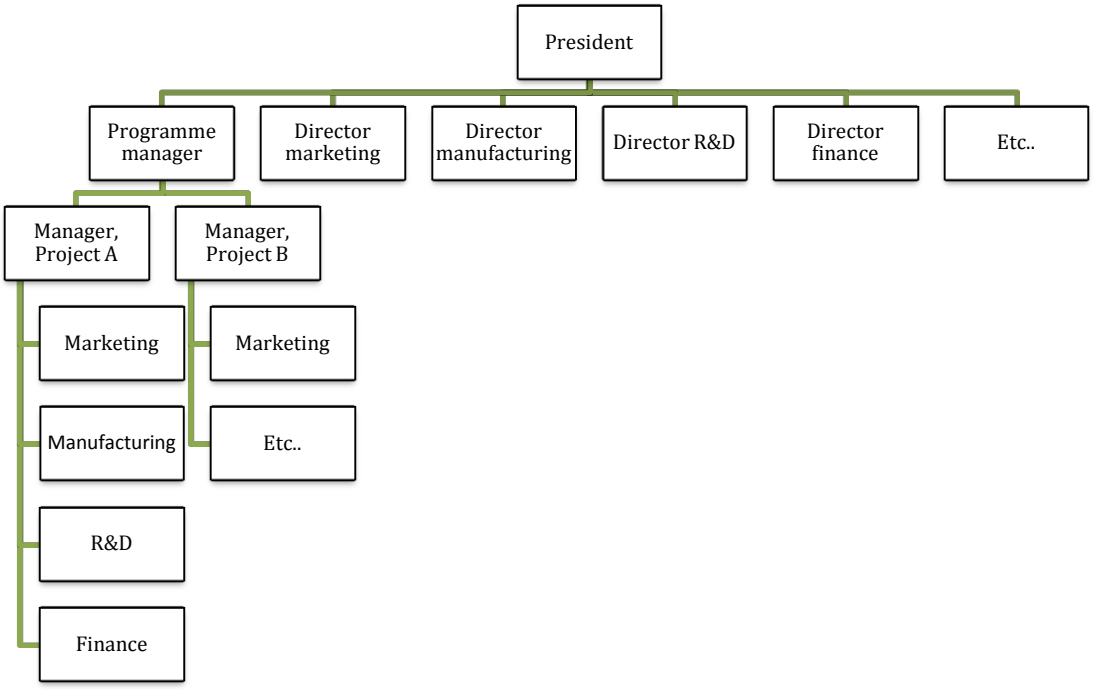


Figure 8 : Project organisation structure (Summers, 2005, p.205).

By adapting a process orientated organisation the employees in different departments are forced to see how all the different elements in an organisation need to work towards the same goal for a business to be successful. It identifies the key business processes that need to be in place, and the members of the organisation understand the whole process and are willing to work to improve the processes and the links between them. A continuous improvement culture is more easily adapted in a process organisation compared to a functional organisation. By having a good process management, non-value adding procedures and waste can be eliminated, resulting in a more profitable organisation. Processes are improved through a set of tools such as value-adding process mapping, problem isolation and root-cause analysis (Summers, 2005). «*A process map is a graphical representation of all of the steps involved in an entire process or a particular segment of a process*» (Summers, 2005,p.214). Process mapping enables persons looking at it quickly to understand the responsibilities of everyone that is taking part in the processes and what projects task is being performed at the same time, and non-value adding operations are easily identified.

2.1.4. PLANNING FOR QUALITY

In this chapter tools and methods in planning for the right quality will be presented. The Deming cycle, Loyalty Based Management and Quality Control are key elements in this chapter.

2.1.4.1. **PLAN, DO, STUDY, ACT- CYCLE**

The Plan, Do, Study, Act- circle, better known as the *Deming cycle*, is a tool for continuous improvement defined by Shewhart and developed by Deming (PMBOK,2008).

Summers (2005) describe the different stages in the cycle as:

- **Plan**: establishing performance objectives and standards
- **Do**: measure actual performance
- **Study**: compare actual performance with the objectives and standards- determine the gap
- **Act:** take the necessary action to close the gap ad make the necessary improvements

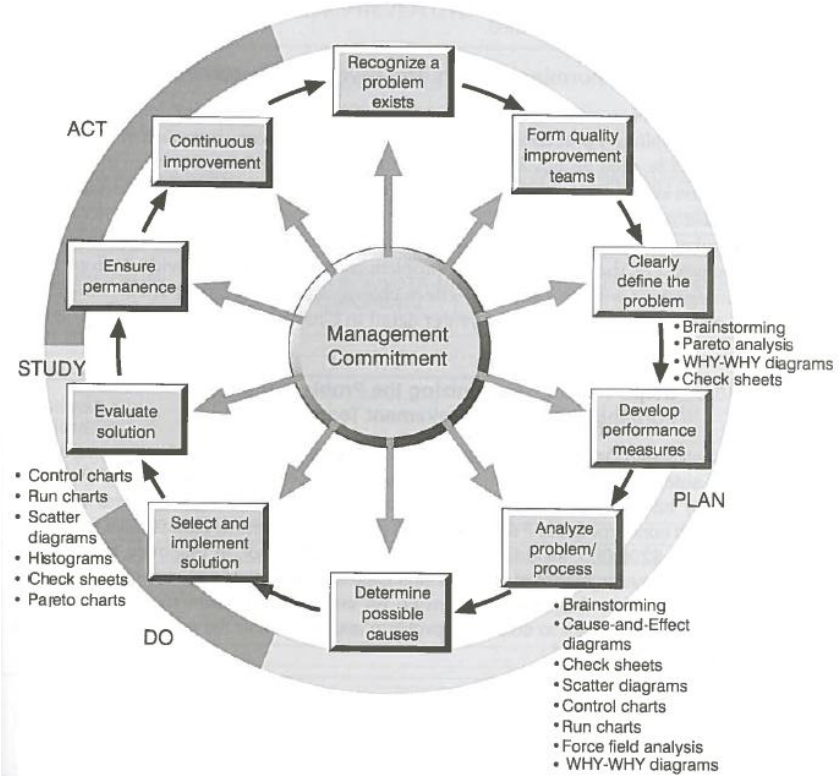


Figure 9: The Deming cycle (Summers, 2005, p.241)

Figure 9 is an illustration of the Deming cycle. By following the cycle continuous improvement can be achieved. An improved with of the Deming cycle is presented by Bergman and Klefsjö (2004) on next page. This model states that is not sufficient to only have the elements of *Plan-do-study-act.*

Process improvement models include models such as Malcolm Balderige (PMBOK, 2008), which was discussed in 2.1.2.2.

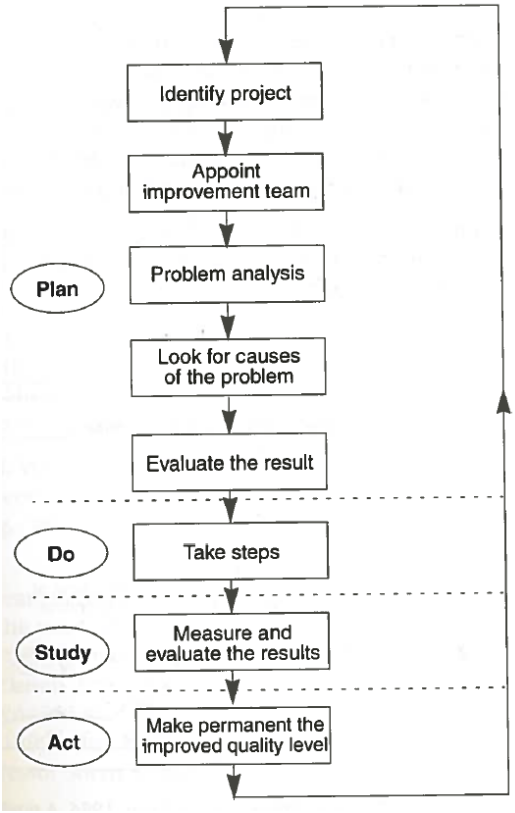


Figure 10: An improvement cycle with the Deming cycle points (Bergman and Klefsjö, 2004, p.213).

2.1.5. LEAN

Lean was introduced by Toyota after World War II, and rapidly expanded all over the world (Womack et al., 2007). It was highly welcome as the fall of the mass production- era was a fact. At first it was only adapted in the automobile industry, but in the last 30 years or so also adapted in all manufacturing and services industries (Slack et al., 2007). Lean did not only revolutionise the mass production practice, it also increased the trade-off between productivity and quality and opened people's minds to rethink the way high volume businesses were run (Holweg,2007).

The key element of lean is removing all elements of waste, get an operation that is faster, more dependable, produce high quality products and services and reduce costs (Slack et al., 2007). It is basically doing simple things well and produce goods and services only when they are needed. Before lean thinking came about unwanted inventory and late deliveries lead to an unsatisfied customer. It exists a confusion and inconsistency with the expressions used in "lean production" (Shah and Ward, 2007) but this thesis is too short to go into detailed.

The four individual aspects of lean can be identified as *product development, the chain of supply, shop floor management*, and to some extent *after-sales services* (Warnecke and Hüser, 1995).

The traditional approach to manufacturing is to produce an item and put that item into a buffer inventory before that item gets moved to the next stage in the production line. The product is pushing production in the Just in time (JIT) approach. On the other hand, the production is pulled by the demand in the next stage in production (Slack et al., 2007). Problems are more visible in the JIT approach, as the different stages will indicate if something happened in the previous stage.

Lean can be divided into the following main areas *elimination of waste, involvement of everybody* and *continuous improvement.*

2.1.5.1. ELIMINATION OF WASTE

Toyota has defined waste into seven different categories: Over-production, waiting time, transport, process, inventory, motion and defectiveness (Slack et al., 2007). Elimination of waste can be achieved by adapting tools such as the 5's and value stream mapping.

The 5's are originally from Japanese but can be translated into; Sort (Seiri), Straighten (Seiton), Shine (Seiso), Standardize (Seiketsu) and Sustain (Shitsuke) (Slack et al., 2007). In other words; How to eliminate waste, keep your organisation clear, visual and standardized. When you know what it is coming, it is easier to keep on track.

Value stream mapping helps companies understands the flow of material and information in a process. It maps not only the physical flow of the product but also the indirect flow of the support functions to the process (Gruia, 2012). Value stream mapping is more complex than a process map, as it focuses on the value-adding activities that will benefit the bigger picture rather than sub-optimization (Shitsuke)(Slack et al., 2007). These benefits are possible to achieve because a value stream map will not only identify the value stream, but it will in addition show a "current state" map and a problems get diagnosed, giving it a basis for improvement.

According to Marosszeky and Oakland (2006) good quality will lead to an elimination of waste and the other way around.

2.1.5.2. INVOLVEMENT OF EVERYBODY

For a successful implementation of lean, a "total quality" approach to the problem is required. The key element is inviting the members of the organisation to have a team-based problem solving, job enrichment, job rotation and multi-skilled approach to projects (Slack et al., 2007). By involvement of everybody the workers will also get more ownership of the process, consequently the end product's quality will improve.

2.1.5.3. IMPLEMENTATION OF LEAN

Introducing lean philosophy is not without problems. When introducing lean to the supply chain management, more and more of the activities that previously was within the organisation have to be outsourced. Outsourcing of activities can potentially increase the vulnerability of the supply chain (Christopher, 2005). " Leaning" too much can be more devastating for an organisation, rather than not "leaning" at all. It is also discussed by Zsidisin et al. (2004) and Waters (2007) that implementation of lean in the supply chain can result in a fragile chain as even a small delay or an accident might result in turbulence later on in the chain.

According to the lean philosophy, the suppliers are to be selected at the very outset of the production development phase, (Womack et al., 2007).

2.1.5.4. LEAN IN PROJECT MANAGEMENT

Some of the categories of waste can be transformed into categories of waste in project management.

These categories are:

- Waiting time: waiting for the rest of the project participants to deliver.

- Doing the same audit twice.
- Standardisation of connections. When having a problem you should know who is responsible immediately.
- Just In Time information. The correct information at the right time.
- Face to face communication. Being present when decisions are made. This point is the QRM department good at, they are present at the contractors following the project process, making sure that everything is in order.

2.1.6. Quality Management in Project Management

PMBOK (2008) have defined that both quality management and project management share the following four main ideas.

- Customer focus
- Prevention over Inspection
- Continuous improvement
- Management responsibility

In order to have a successful project the customers' requirements need to be understood, evaluated, defined and managed. In order to do so the projects products need to be conformed whit the requirements and the projects product need to satisfy real need – it need to have fitness of use. The project also need have built in quality, in order to reduce unnecessary inspections. This is important to reduce total cost, as the cost of inspection is usually higher than the cost of preventing. A project should always seek to improve its processes, in order to continuously improve. All of the mentioned factors above require involvement of everybody in the project, however it is the management's responsibility (PMBOK, 2008).

2.2. RISK MANAGEMENT

In this section risk management (RM) will be discussed. Risk management is a key activity for every project and a minimum number of risk management actives should be performed systematically (Pritchard, 2005). It is therefore an important part of this thesis. Risk management is a large field of study, and only themes relevant for this thesis will be presented. This section will start off with a quick overview over what RM is, before different key ideas are discussed and the section will end a suggestion on how these ideas can be implemented into a project setting.

There are a numerous risk analyses that can be adapted to a certain problem to help identify potential risks. They all have strengths and weaknesses depending on the application (Black, 2008). A comprehensive list of different risk tools and its applications can be found in Appendix 7 – Risk Techniques. The table shows the different techniques, their demands to resources, area of application and outputs.

2.2.1. RISK MANAGEMENT PROCEDURES

Risk is linked to potential losses of assets. These assets are human life and health, materials, production, information, reputation and the environment. The term potential loss of assets state that there is an uncertainty associated to whether the losses will become a reality and the scale of severity (ROSS, 1997).

In our day to day life, the words risk and uncertainty is used randomly. According to ROSS (1997) the difference between these terms is that uncertainty includes both potential losses (threats) and potential positive outcomes (opportunities) , while risks on the other hand only includes potential losses.

Direct causes of these losses might be errors in design, the wrong equipment is used, errors made by the operator or lack of/wrong maintenance. The latent causes are often insufficiency in the requirements, lack of procedures or violation of procedures, poor maintenance culture or poor training (ROSS, 1997). The direct causes are the easiest to control and fix, while the latent causes are more complex as the relationship between cause and effect is not always straightforward.

These losses can occur sudden, with some delay after the initiating event, or lay latent within the system. Since the losses does not necessarily occur at the same time as the initiating event, some complications linked to the registration of the event, control and the implemented risk reducing measures is present (ROSS, 1997). When losses have occurred, they need to be investigated both the direct and latent causes need to be identified so that to prevent reappearance.

There is a trend in industry of blaming the people that is the triggering factor of an event, rather than the latent causes. Proactive actions should be introduced to reduce the latent causes, which will in the long run be more efficient that to “blame” the nearest person (Based on lecture made by Jon Espen Skogdalen, Statoil, March 2012). By not blaming the workers and having a more open discussion about finding the right causes of an incident the work environment will become more positive. Hence reporting of incidents will go up as the persons reporting it will not be scared they will be blamed for it. By having more available data, the incidents databases will

become better, and trend analyses will also improve. Runciman et al. (2006) indicates this not the case at the moment, and that the databases are not good enough.

2.2.2. RISK MATRIX

The risk matrix is a tool for visualizing the severity of a risk. The matrix consists of a vertical axis(y) with an consequence scale, and a horizontal axis with a frequency axis(x). The higher the number of (x, y) the more severe the risk is. There is no standard for the size of the matrix, usually the matrix is somewhere between 3×3 – 6×6. In this example the matrix is 5×5.

The risks are categorized in frequency classes (Table 2) and consequence classes (Table 1).

Category	Consequence types		
	People	Environment	Property
5.Catastrophic	Several fatalities	Time for restitution of ecological resources ≥ 5 years	Total loss of system and major damage outside systems area
4.Severe loss	One fatality	Time for restitution of ecological resources = 2-5 years	Loss of main part of systems; production interrupted for months
3.Major damage	Permanent disability, prolonged hospital treatment	Time for restitution of ecological resources ≤ 2 years	Considerable system damage; production interrupted for weeks
2.Damage	Medical treatment and lost-time injury	Local environmental damage of short duration (≤ 1 month)	Minor system damage; minor production influence
1.Minor damage	Minor injury, annoyance, disturbance	Minor environmental damage	Minor property damage

Table 1 : Classification of consequences according to their severity (Rausand, 2011, p.102)

It is important to note that these tables are only suggestions, because there is no standard for the size of the matrix and classifications of the different categories

Category	Frequency pr. Year	Description
5.Fairly normal	10 – 1	Event that is expected to occur frequently
4. Occasionally	1 – 0.1	Event that happens now and then will normally be experienced by the personnel
3.Possible	10^{-1} – 10^{-3}	Rare event, but will possibly be experienced by the personnel
2.Remote	10^{-3} – 10^{-5}	Very rare event that will not necessarily be experienced in any similar plant
1.Improbale	0 – 10^{-5}	Extremely rare event

Table 2 : Frequency classes (Rausand, 2011, p.100)

Below is an example of a 5×5-risk matrix. Each cell in the matrix corresponds to a combination of a frequency and a consequence. The red areas are non-acceptance areas where risk reducing measures need to be implemented. The yellow are is in the tolerable area, where the "As Low As Reasonably Practicable" (ALARP) principle need to be implemented, and further analysis will be based on the APLARP analysis (The ALARP principle will be discussed in 2.2.4). The green areas are acceptable areas where only ALARP actions should be considered (Rausand, 2011). The number in the cells are the risk index.

Probability/ Consequence	1.Improbable	2.Remote	3.Possible	4.Occational	5.Fairly normal
5.Castrophic	6	7	8	9	10
4.Sever loss	5	6	7	8	9
3.Major damage	4	5	6	7	8
2.Damage	3	4	5	6	7
1.Minor damage	2	3	4	5	6

Table 3 : Risk matrix (Rausand, 2011, p.101)

This tool is commonly used because of its benefits. It is easy to use and understand, a good basis for discussion and gives a ranking of the hazards. On the other hand, this matrix does not work well when it comes to assessing multiple hazards and comparison of hazards are difficult as the scales are yours to set.

2.2.3. Risk Index

The risk R can be calculated by (Rausand and Utne, 2009)

$$R = C \times p \qquad (2.1)$$

Where the risk R is the product of consequence C and frequency p. It is common to create the risk matrix as a logarithmic scale. This making the frequency/consequence of one class 10 times higher than the previous class (Rausand, 2011). By adapting the logarithmic scale C_1 is 1, making $C_2 = \log(10 \times C_1) = 2$.

$$\text{Log}\, R = \log C + \log p \qquad (2.2)$$

2.2.4. Risk Acceptance Criteria

There has been developed many different methods for determining whether or not a risk is acceptable or not. The most commonly used is the ALARP. According to Rausand (2011) risk using the ALARP divides into three regions:

1) *Unacceptable region*. A region where the risk cannot be justified unless there are extraordinary circumstances. Risks in this area need risk reduction measures.
2) *ALARP region.* Risks in this region is below the unacceptable region, but they need to be monitored.
3) *Broadly acceptable region.* Risks in this region are acceptable, and no future risk reducing measures are needed.

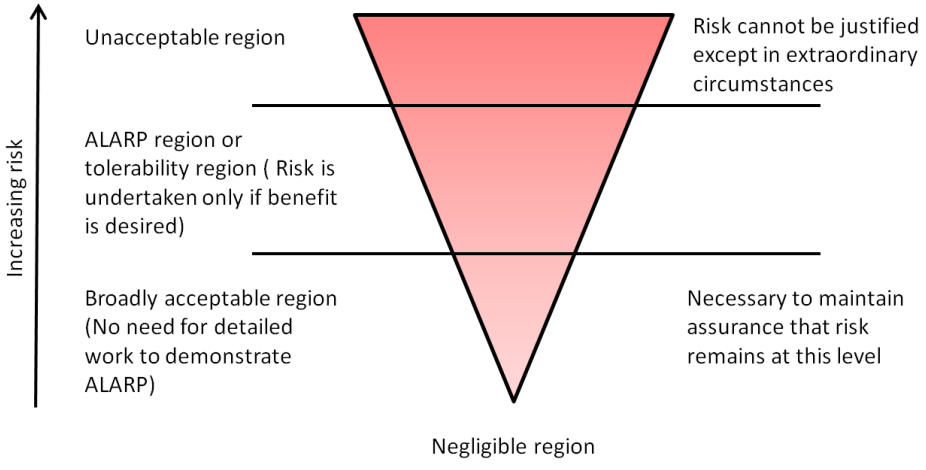


Figure 11 : The ALARP principle (Rausand, 2011, p.111)

2.2.5. *Risk Matrix in Projects*

The risk matrix presented in this chapter is a tool that is already used in many organisations. Because qualitative risk analyses, such as this, is a rapid and cost-effective way of making list of priorities (PMBOK, 2008). Since the scope is often immature in the early phases, running complex quantitative risk analyses will not be beneficial, as qualitative risk analyses is sufficient (Husby et al., 1999). The risk matrix also used in Statoil as an important part of the QRM tool-kit. Hazards are identified in risk analysis done in risk meetings and risk seminars. How this is carried out in Statoil is discussed under 4.7.1*Risk Management in Statoil and PRO.*

2.2.6. *Risk Management Framework*

Williams et al.'s (2006) risk model have the following three main steps:

1) Risk recognition
2) Risk prioritisation
3) Risk management

The figure below shows these three steps.

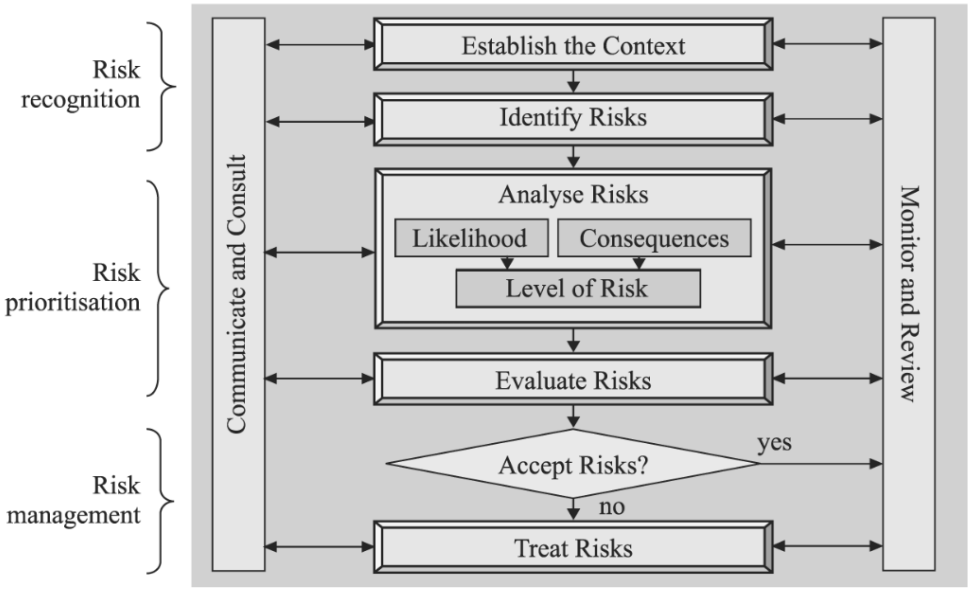


Figure 12 : Risk model (Williams et al. 2006. P.70)

After the risks have been identified, the next step is to understand the nature of the risks and how it will affect the project and at what scale. When this is identified, a strategy to eliminate these risk must be established.

2.2.7. *Types of Risks*

According to Pritchard (2005) risks can be classified into the following five groups:

- Technical risks (performance related)
- Programmatic (performance related)

- Supportability (environment related)
- Cost
- Schedule

Technical risks are risks that are associated with developing new designs or method. Programmatic risks on the contrary are risk linked to the use of resources and activities that can affect the outcome of a project, which may or may not be controllable by the project manager. The business environment will often shape these risks. Risks that are associated with creation and maintaining systems or processes are categorised as supportability risks. This category consists of both technical- and programmatic risks, and highlights the fact that a risk might belong to more than one category. The last categories, cost and schedule, have had the project manager's attention for a long time, and numerous of processes have been developed to control both cost and schedule risks (Pritchard, 2005).

The relationship between these types of risk is illustrated in the figure below.

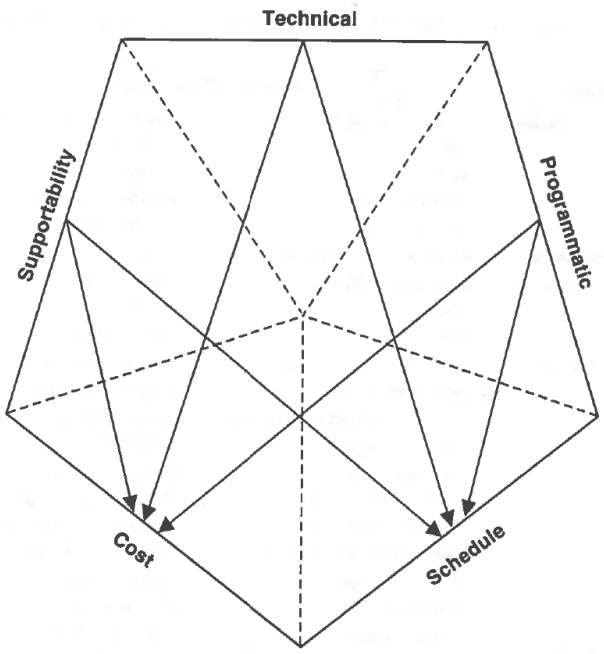


Figure13 : Relationship amongst the five risk categories (Pritchard, 2005, p.17).

2.2.8. PRINCIPLE FOR RISK REDUCTION

The principles that create the foundation for the risk reducing measures should reflect a community's, of a relevant area, view on risk, and how this view interacts with that population's ambitions and ethics (Sten and Jersin, 1997). According to Sten and Jersin (1997), there are three main principles for risk reducing:

Equality – no members of society should have a higher risk than others, resulting that the ones with the highest risk in the society should be reduced first. A maximum limit of risk should be established, and nobody in the community shall be exposed to a higher level of risk than this limit.

Utility- measure risk reduction against cost and the resources should be uses as efficiently as possible. The value of a risk reducing measure should be taken into consideration with the cost of introducing them.

Technology- if the latest technology is applied, risk will automatically be reduced down to the acceptable level. This statement is based on the idea that the acceptable level of risk is achieved by applying "state of the art" technology.

An alternative to this risk reduction philosophy is the four T's. The four T's describes four ways of dealing with unacceptable risk (Williams et al. 2006):

1) *Terminate* – avoid or eliminate exposure
2) *Treat* – adding measures to control the activity
3) *Tolerate* – accept the risk and live with it
4) *Transfer* – move the impact of the risk over to other areas

The four T's are similar to PMBOK's (2008) four risk reducing actions, namely avoid, transfer, mitigate and accept.

Both Williams et al. (2006), PMBOK (2008) and Sten and Jersin (1997) points out how risk can be reduced, their approach is different. Sten and Jersin (1997) focus on arguments for reducing the risks, while Williams et al.'s (2006) and PMBOK's (2008) approach is linked to the ALARP principle, where the four actions can be seen in in relationship with the different areas in the triangle.

The risks reducing actions discussed above are linked only to threats. PMBOK (2008) have also a list of how to treat opportunities, namely exploit, share, enhance and accept.

2.2.9. Risk Perception

There are many factors that influence our risk acceptance. The level off acceptance might vary for each individual. A person might be risk seeking or risk adverse; one example of this is bungee jumping. A risk seeking person seeks the adrenaline kick that the risk off bungee jumping gives, while a risk adverse person will avoid those situations. When determine whether a risk is acceptable or not, the benefits of taking that risk and the ability of controlling the risk need to be taken into consideration. The phenomenon of risk aversion, the outcome of a catastrophe is worse than many small accidents, also need to be taken into account (Rausand, 2011).

The time until results are shown, is also important. In Greece (February 2012) the government introduced new cuts in the economy to save the country from bankruptcy. The Greek population does not see the results of the cuts soon enough, and feel that their sacrifices is useless. As a result, they hit the streets demonstrating. The country has not been bankrupt before, they have always managed to survive tough times before. The time since a risk has been realized will also influence the risk perception.

2.2.10. Tame vs. Wicked Problems

Problems can be separated into tame problems and wicked problems. Wicked problems are characterised by being highly complex, while tame problems are usually easier to grasp. Examples of wicked problems are fighting terrorism, planning new freeways' locations,

reengineering business processes, underground-systems and public health care systems (Stevens, 2011).

Tame problems tend also to be highly complicated, but the problems can be broken down into problems which can be solved separately. Solving these problems can be solved by first formulating the problem, before the problem is thoroughly analysed. The problem solver knows when a solution to the problem has been reached and can judge its effectiveness. Wicked problems in contrast cannot be solved that easily. Their boundaries and the root-causes are hard to define. A trend with wicked problems is that the stakeholders do not agree amongst themselves and/or the requirements and constrains of the problem can change rapidly. The needs and wants of the stakeholders is a significant risk that need to be managed to produce a good result (Sten, 1994). When dealing with wicked problems the best approach is to tame it, because they often have occurred from a complex, and therefore are difficult by nature to control (Mostue and Rosness, 1994). There are many dangers in dealing with a wicked problem, taming it prematurely is the worst approach to a wicked problem. This is because when a scope is immature all interlinks are not identified yet, and by taming a problem to fast important elements will get lost. An entire different approach is needed in solving a wicked problem. The process need to be iterative, emergent and the stakeholders need to work together to a common solution is found (Stevens, 2011). Only through close conversation can the all interlinks in a project be identified. Mostue and Rosness (1994) stated that multidisciplinary groups are the most suitable for solving complex problems.

2.2.11. RISK IN PROJECTS

Risk management in projects is not something that is unknown for the project manager. The project manager is used to handle risks such as the loss of key personnel in the project team and uncertainty linked to long-lead-items. These risks are normally mitigated through proactive means, such as training more than one project member to do certain tasks and close follow-up of important suppliers (Black, 2008). Risk analyses are an essential activity for project management, and should be a natural part of all projects from an early stage in the project (Husby et al., 1999).

Testing the risks in a project should be a continuous procedure. A good approach in a project is to address these risks after milestones in the project. This way the project manager and the project team can continuously optimize the project through the project life cycle (Black, 2008).

Project risk management includes the following activities; planning, organisation, monitoring of risks, identification and qualification of risks, risk response development and control. The risks in a large scale engineering project need to be defined early in the project phase, as the consequences of failures of a large scale engineering project (such as defence, construction and oil industry) have shown to cause major injury to life and environment (Lee et al., 2009).

Large and medium sized engineering projects share many of the same risks. Some of the external risks that they share are risk linked to design change, manpower, availability of raw materials and exchange rates. For medium scale engineering projects the following risks are the main contributors to the overall risk picture; exceeding budget and time schedule. While large projects are more concerned about exceeding time schedule (Lee et al., 2009).

It has for a long time been a strong culture for collecting and processing data lined to RAM and Safety studies. One of the large data collecting work that has been done in the oil and gas

industry that has resulted in OREDA (Offshore Reliablity Data). In the collection of this data the main goal was to exchange reliability data among the participants of the work in the oil and gas industry. The database is now available for purchase, making the data available for everybody how can benefit from it. This way of collecting, processing, organising and sharing of data is extraordinary compared to previous approaches used in the oil and gas industry. There are similar data collection work done in areas such as finance.

Some accident models relevant for this thesis will also be discussed in the following sections. These models are "The Information Processing Perspective" and "The Decision Making Perspective". An illustration of risk influencing the Risk Picture in Statoil can be found in Appendix 16 – The Total Risk Picture

2.2.11.1. THE INFORMATION PROCESSING PERSPECTIVE

The Information Processing Perspective, also called Turners model for man-made disaster, is a model that shows how a long chain of events and misunderstanding can lead to an accident (Rosness et al., 2010). This model can be found in Figure 14.

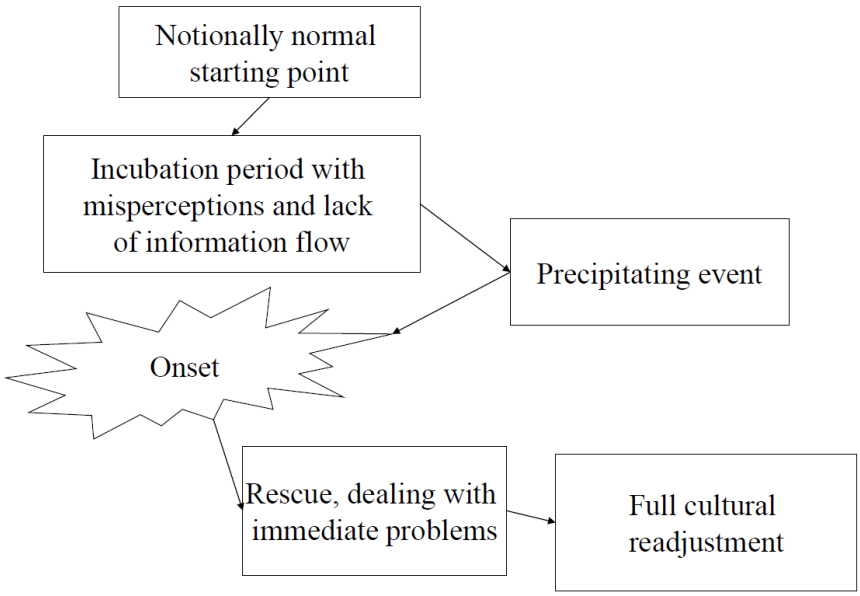


Figure 14: Main stages of Turners model of Man Made Disasters model (Rosness et al, .2010, p.70)

The model start of in a condition where everything is normal. The next step is an incubation period where misperceptions and poor information flow is present. This resulting in some symptoms of the underlying root-cause that are being treated. According to Rosness et al. (2010) the following scenarios can happen in this incubation period:

1) There are no prior information about the accident
2) Prior information is noted, but not fully accepted
3) Prior information is not handled correctly
4) Prior information is available, but not handled due to conflicts

The accident scenario starts with the precipitating event , the initiating event, resulting in an onset, an eruption. The scenario ends with the rescue and mitigation of the immediate problems.

After the accident an analysis of the problems will be conducted, resulting in a full cultural readjustment.

The information perspective emphasises that it is the root-cause of a problem that need to be dealt with, not the symptoms.

2.2.11.2. THE DECISION MAKING PERSPECTIVE

In a decision making process one need to choose something over the other, and often there is a conflict between the different choices. Rosness et al. (2010) discusses the weighing of the different trade-offs that need to be considered in the decision making process. The figure below shows the intersection between boundaries for acceptable risk, acceptable financially behaviour and unaccepted workload. The general idea in this perspective is that there is always a trade-off between your objectives. Local decision might impact the whole risk picture. In sub-optimise one process, illustrated in the figure, we can see that moving away from one boundary easily affect where the process is situated in terms of the other boundaries. It is easy to think about the quickest and most economically solution to a problem, but it is also important to have in mind that these decisions often lower the level of controlled risk. This model is not bound to these three boundaries, but can include many more. To solve this problem, Rosness et al. (2010) discusses that there should be one person administrating work permit for anybody wanting to sub-optimise their process. This person should be able to see the entire picture and be able to identify any events or changes of procedures that might influence the risk picture.

Marossezey and Oakland (2006) also discusses the fact that a failure to meet the requirements in one part of the system can have a domino effect and lead to a failure in a completely different part of the process.

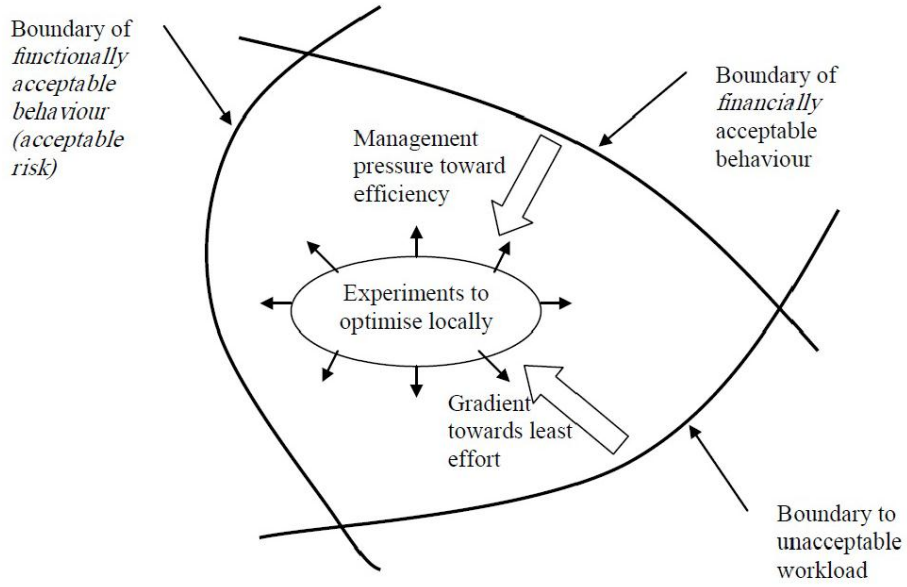


Figure 15 : Illustration of the aspects affecting the wanted performance (Rosness et al., 2010, p.81)

2.2.11.3. DECISION TREE

In projects there are always decisions to be made, often with little or not enough information (Kerzner, 2009). A way of structuring and these decision and help to make the right decisions are through a decision tree decision support tool. The tool uses tree-like model, hence the name. drawn from left to right, the tool take into consideration inputs such as consequences, change

event outcomes, resource cost and utility. The tree consists of three type of nodes, namely (PMBOK, 2008):

- Decision nodes. Represented by a square.
- Change nodes. Represented by a circle.
- End node. Represented by a triangle.

Below is shown an example of a Decision tree.

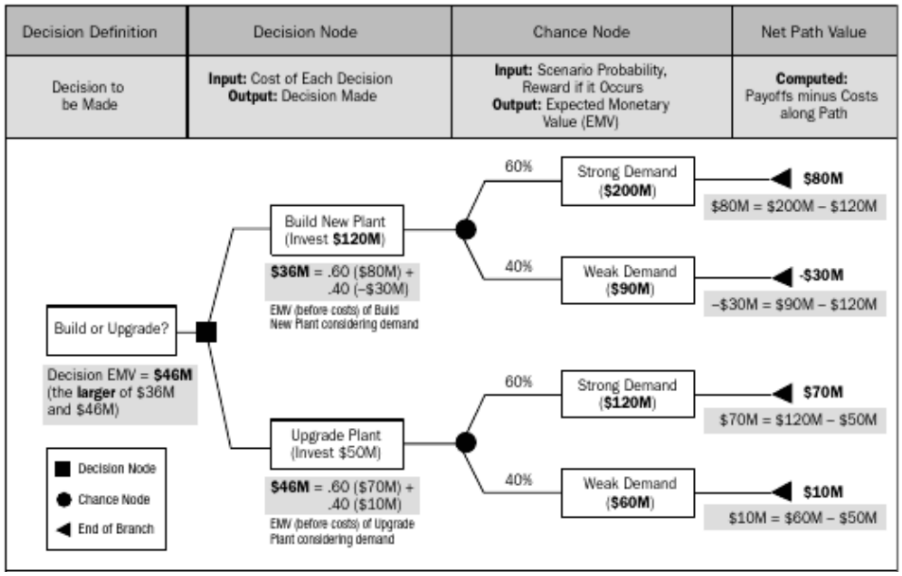


Figure 16: Examlple of a Decition Three (PMBOK, 2008, p.299)

2.3. QUALITY AND RISK MANAGEMENT

The field of quality and risk management is not well documented. Much of the literature available in the fields of quality and risk management is linked to pharmaceutical industries. Even if this literature is business specific, many of the main ideas can easily be adapted to other industries as well. A good quality and risk management system in an organisation can provide useful information to the decision makers, ensure the organisation they are capable of handle potential risks. Runciman et al. (2006) states that there is a growing need for an improved system for quality and risk management in the industry. This chapter will present the main literature regarding this topic.

To guarantee a successful quality and risk management process, the process should be implemented into the existing operation and extensively documented (European Medicines Agency (EMA) 2011). Quality risk management has been successfully implemented in the manufacturing field and in the pharmaceutical environment (EMA, 2011). These two areas are very different, which indicates that QRM can be successfully implemented in other areas as well.

In this chapter quality and risk management will be discussed. In the previous chapter these management fields have been discussed separately. This chapter will start with a general introduction to quality and risk management, then answering the following two questions: 1) What can quality management teach risk management? and 2) What can risk management teach quality management? From this a quality and risk management model will be presented.

2.3.1. HISTORY

In the 21st century risk management has become a popular business activity that seemingly "everybody" conducts, it appears in small organisations and in multinational organisations like Statoil. Managing risk might seem to be something new, but is not. Traditionally, the process has been informal, managed by intuition, experience, observations, gut feeling, trends and so-called expert judgment (EMA, 2011). It is however the systematic approach to risk management that is new. The trend in industry is that more and more predefined methods and processes are used as tool to identify risks to quality (EMA, 2011). This change was trigged by the financial uncertainty and problems during the last period of the last century, with the dot.com boom and various legal actions against top managers both in the US and Europe as good examples (Williams et al., 2006).

Historically the main reasons for poor quality in production companies was linked to the processes and the products design. Consequently the quality department in these companies developed procedures and tools to fight these problems. Examples of poor quality in these cases are wrong dimensions of a product or the lack of a requirement stated by the customer. Now, the main reasons for poor quality is more linked to the organisation's internal and external relationship with the people in the organization and its partners (Williams et al., 2006).

The European Union has developed their own standard for Quality Risk Management applied to the field of medicine and health called ICH Q9. Some of the ideas from this standard can be

applied to the offshore industry and in project management in general. These ideas will be presented in 7.5 *Generalisation of the QRM Role.*

In literature risk management and its definition is highly discussed, and the variety of different definitions are far too great to discuss in this thesis. However, the risk management procedures should feed the decision makers with information about the projects' risks and level of uncertainty.

To have a good business environment, the outside environment also needs to be taken into consideration. There have been several major changes in the outside environment (Williams et al., 2006):

- The financial marked has been totally global, and computation has become stronger as there are more actors
- Low-wages countries expectations have made logistics and supply chain decisions more complex
- The internet has made the customers more price concerned, as the price transparency has increased
- Higher level of need for innovation to meet the customer's requirements
- Media's interaction in all aspects of humans lives have made communication with the customers more complex
- A change from numerous customers to only a few major customers, has increased the level of uncertainty for many suppliers
- Stricter laws and regulations from government to organisations have increased.
- All technology, even the simplest, have become complex and difficult to predict

In addition to the points presented by William et al. (2006), there have been several changes in the world such as the financial crisis of 2008 and the exponentially growth of social medias. The effect of these factors needs also to be considerate.

To mitigate these changes in the environment, many western organisations have adopted a more outsourced and downsized organisation (Williams et al. 2006). They have transferred their risks and the organisation's independence has grown. Transference of risk is discussed in 2.2.8*Principle for Risk Reduction*. By reducing the organisations control over the situation, the organisations have only increased the uncertainty of their business environment (Williams et al., 2006).

2.3.2. RISK IN A PROJECT

According to Williams et al. (2006) there are three types of risks. The predicable risks, risks that an organisation know they will face, the second is groups of risks the organisation know they will run into, only appear by chance, consequently there they cannot be controlled by statistically approaches. The last group is the risks that the organisation do not know they are facing, the unknown risks. This type of risks is usually the most dangerous to the organisation. These type of risk differ however from the risk classified by Pritchard (2005) in 2.2.7, in terms of these risk being linked to their origin, and not to the degree of knowledge.

The first type of risk identified by Williams et al. (2006) are risks that easily can be managed by a straightforward procedure. These risks are so common and well known that very often

companies often have systems in place to discover and take care of them. Most environmental risks fall under this category. However it is important to separate between the risks caused by pure chance and risks caused by spherical causes. The separation between these two is important since only risk not caused by chance can be integrated into a database, so that statically models can be used (Williams et al., 2006).

The second category includes internal and external fraud and inherent risks in the business environment and operational area. The last group of risk is the most difficult category. It is this category that the risk management models try to target and establish systems for control of these.

Another type of risk discussed by Black (2008) is quality risks. These are risk that are potential problems that might exist in a system without ever being realised (Black, 2008) and the risk of the quality of a product is only one of the overall risk (EMA, 2011). Black's (2008) quality risk can be compared to Williams et al. 's (2006) unknown risk.

As discussed in this section, there are three main groups of risks. Williams et al. (2006) states that at least two of these three risks can be successfully managed with help from ideas from quality management, especially when it comes to predictable risks and operational risks. How to manage these different types of risks will be discussed in 2.4 *Summary of Literature .*

2.3.3. The Link Between Quality – and Risk Management

The quality gurus all have all different definitions on the word quality, one example is Joseph Juran's definition "fitness of use". Quality is defined as how well a product or services can satisfy its users, the customers and other stakeholders. The product must function according to specific functions, characteristics and behaviour. A risk, on the other hand, may be defined as a potential undesirable outcome. With these two definitions in mind, the conclusion of what risk to the quality of a system can be any problem that might potential cause the system to fail or degrade (Black, 2008).

According to the PMBOK (2008) the quality plan should be updated reflect the changes driven by the results of the risk analyses. These changes could include elements such as changes in relation to requirements, quality assurance, quality control and update in relevant documentation.

The quality of a product is not only determined by the quality of the finished product, but the quality need to last or be maintained in the expected lifetime of the product. In an effective quality system, a good risk management system need to be in place (EMA, 2011).

Through test of the system, one can assure whether or not the system is working. By this the owner of the system decreases the risks. The more thoroughly the system is tested, the more risks will be discovered and hence more that can be fixed. The more the system is tested, the more the owner of the system can be of that the system is working according to the specifications, and the risks to the quality is reduced (Black, 2008).

According to the European Medicine Agency (EMA, 2011), there are two primary principles of quality risk management:

1) Through scientific knowledge and the protection of the project the risks to quality shall be established.
2) The level of risk should be equivalent to the level of effort, formality and documentation in the quality risk management process.

Risk assurance management system is a term that is introduced by the European Foundation for Quality Management (EFQM). They argue that this system is needed to assure that planned risk management activities are performed and that experiences made in previous projects are transferred. The lessons learned become important aspects in continuous improvement, and without them the improvement loop cannot spin (Williams et al., 2006). This model adopts both ideas for risk management and quality management, and in order for it to be successful, both of the disciplines need to be managed.

Figure 17 : Generic risk assurance management system (Williams et al. 2006, p.72)

The five main phases of the system is (Williams et al. 2006):

1) *Policy* – outlines what the risk management managers shall carry out and what the success factors in a project is
2) *Planning* – deliberates the strategy of a project
3) *Implementation* – how the activities should be carried out in a project
4) *Monitoring* – is required to add facts in the system
5) *Review* – sums up the system and highlight the learning points and is the driving step for continuous improvement

In addition there is a logical link that exist between QM and RM. The overall goal for QM is to meet the requirements of the customers. What the customer want in most cases are reliable products which dose what they are told. By having reliable products, the availability of product goes up. By knowing that a product are able to deliver when it is suppose, the risk linked to it goes down, which is ultimate what the customer want. This relationship is illustrated in the figure below.

Figure 18: Link between QM and RM

2.3.4. THE QRM PROCESS IN A TEAM

According to the EMA (2011) and Black (2008) the quality risk management activities should be done in multidisciplinary teams. The team should include experts or stakeholders in different areas, such as business development, a variety of engineering fields relevant to the project, legal, sales and marketing, and individuals that have knowledge about the quality and risk management process. The information that quality risk management gives, is valuable in a decision making process (EMA,2011)., which is one of the most important inputs in a project setting.

If only one stakeholder's opinions influence the risk analysis all the potential risks in a project will not be identified. The analyses should be rather based on the combination of historical data, experiences from previous projects, design specifications, sales figures, marked research and information from the customers (Black, 2008).

2.3.4.1. THE DELPHI METHOD

The Delphi method is a method were expert's judgement is used. The method was developed by the US military in the 1940s as a forecasting tool to find out what kind of future technological war tools that might been used on them in the future, hence the name Delhi method. The method involves surveying a group and helping a group come to a consensus around a topic. In many face to face discussions in groups, the group will have a set of dominant members and a set of followers. The dominant persons will have a way of forcing their ideas, which can be wrong or right, but the main point is that many ideas will be lost. The Delphi method present a techniques where anonymity is important. The leader that want an expert opinion will send out a questionnaire to the participants. Their answers will be sent back to the leader for a review of the answers. The leader will edit the content, looking for common teams and filter out what is not relevant. When the editing is done, the document is sent back to the participants for comments, and the correspondence goes back and forth until a common ground is established (The Delphi Method, 2010)(Rausand, 2011).

2.3.5. INDICATORS

In both quality management and risk management different indicators are of great importance, in order to measure the current states and give indications whether the a process is working according to the requirements

In this section indicators with regard to risk will be discussed. Indicators in general is a way of measuring the condition of a process, and if applied in a good manner show the state of the process at interest.

According to Øien (2001, p.60) "A measurable/operational variable that can be used to describe the condition of a broader phenomenon or aspect of reality". The indicators are measures of reality, they are not a mirror of the future. This relationship is illustrated in the figure below.

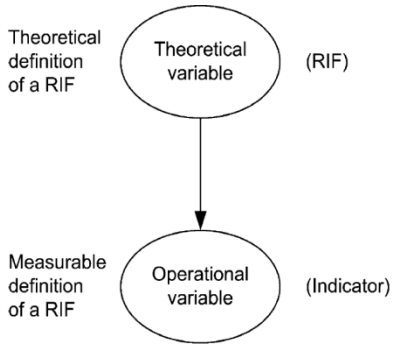


Figure 19: General measurement model (Øien et al., 2011, p.149)

2.3.5.1. WHAT TO MEASURE

What factors to measure is dependent on type of project and setting. One factor that can be hard to measure is actual level of competence. This can be measured by the number of technical employees with more than five years' experience. This does not necessarily mean that the level of competence of an employee with six years of experience will be able to handle a stressful situations better than an employee with four years of experience. Consequently, extreme points of intervals need to be analysed carefully.

In the figure below, there is an illustration of a risk picture and the location of indicators. When setting the indicators it is important to have an even spread of the indicators, shown on the left, and not a centred set of indicators as shown to the right.

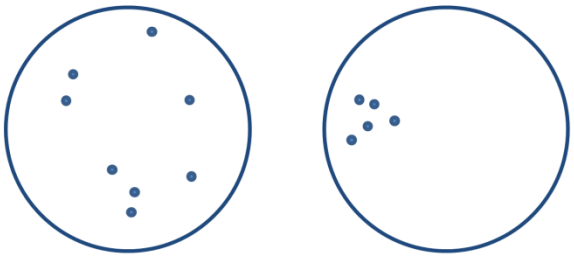


Figure 20: Risk picture and separation of indicators (Based on lecture by Stein Haugen, 2011)

According to Øien (2001) there is a difference between risk- and safety indicators. The risk indicators are defined from models such as QRA, while the safety indicators are measurable variables that have an impact on the risk level. The safety indicators are by themselves not sufficient in measuring changes in risk level, they need to be linked to another risk indicator.

Rausand and Utne (2009) discuss some of the pros and cons of indicators. They state that indicators are an easy way of presenting information and they can be frequently updated. However, they also remarks that some of the challenges using indicators are on how to find good indicators, and really knowing whether the chosen indicators are able to mirror the full risk picture. Data collection can be time and resource consuming. There is also great uncertainty of the quality of the data collected. The only certain fact about the indicators is that they do not tell

the whole story. However, the benefits from good databases can be large, because it gives information on what have worked before and where potential issues may arise.

2.3.5.2. TYPES OF INDICATORS

There are two main types of indicators, leading and lagging indicators. Lagging indicators are reactive indicators that can change their condition after an event. Examples of lagging indicators are number of leaks, down time, number of work related accidents and preventive maintenance. Leading indicators are proactive, meaning that they can give an early warning if an event is bound to happen. The proactive indicator will give a warning sign early enough to act upon it. Examples of leading indicators are employee satisfaction, customer focus, level of competence and level of innovation (Hopkins, 2009).

Finding good leading indicators can be challenging, as most of the systems are complex. In identifying the causal links in a process Bayesian networks can be used (Mikalsen, 2011).

2.3.6. QUALITY AND RISK MANAGEMENT AS FOUNDATION FOR DECISION MAKING

In most situations, decisions need to be made under uncertain situations, situations where the decision maker does not have sufficient available information. In these cases can risk analyses help in order to make the right decisions (Kerzner, 2009). All projects are unique, consequently the end target need to be identify, in addition how to get there, for all projects (Gidel et al., 2005). It is therefore important to have a good QRM analyses as a foundation for decision making.

An organisation ability to deliver accordingly to the three elements of the Project Management Triangle (time, cost and quality) is a prerequisite for an organisations success (Gidel et al., 2005). On other factor that is important for success is the organisation's ability to be innovative, a highly risk full area (Gidel et al., 2005). Consequently, an organisation's degree of success is based on how it controls factors such as risk and quality. This is especially important for projects dealing with new technology and/or are costly.

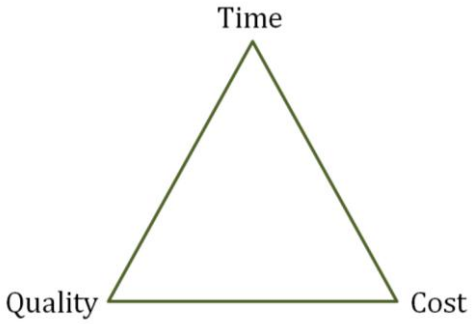


Figure 21: The Project Management Triangle based on (Kerzner,2009).

Gidle et al. (2005) highlights two quality principles that are of importance in a decision making process. These are

1) The principle of staff involvement and how this inflicts with compliance of requirement in the project.

2) The concept of prevention. This point is important because most decisions in projects are irreversible, consequently the decisions need to right the first time.

By having these ideas in mind while making decisions, quality is ensured in the end product. Husby et al. (1999) also emphasise the importance making changes as early as possible in a project, because the cost linked to changes are lower and the effect of changes are larger in the early stages of a project.

Risk analysis seeks to provide sufficient material for the decision making process. This requires that the information provided to the decision making is correct, balanced quantitative and qualitative, based on a range of perspectives and take into consideration of uncertainty associated with the information (Kammen and Hassenzahl, 1999). Therefore risk analyses are good contribution to the decision base.

On model for the link between decision making and risk analyses is presented by Rausand (2011). This model shows the relationship between the decision problem, it's constrains, stakeholders, analyses, judgement, before the final decision is made. The stakeholders influence on the decision is important to take notice of, as this will be discussed under 6 *Strengths.*

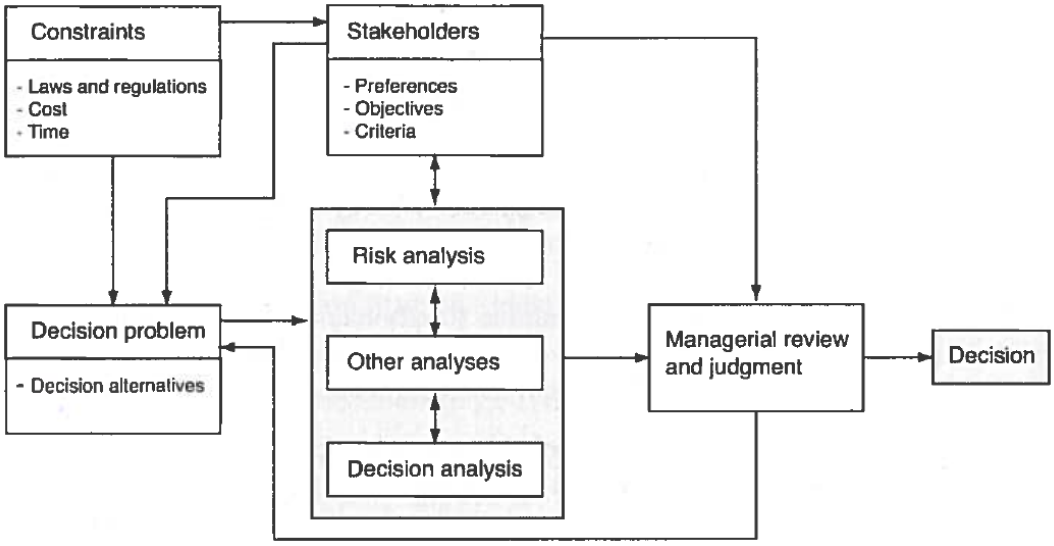


Figure 22: Decision framework (Rausand, 2011, p. 23)

In decision making, the individuals in the decision making group will play a key role. Their opinions will affect the end result (Schafer and Crichlow, 2010), and their bias opinions need to be taken into consideration (PMBOK, 2008). In group thinking the group takes on a life of its own. The voice of the group becomes grows bigger than the sum of its individuals. The social cohesion is valued over good information processing. Consequently shortcuts are taken and people's disagreements are suppressed for the sake of having a common understanding (Schafer and Crichlow, 2010). One way of structuring and generating decision basis data is by using a Decision Tree shown in 2.2.11.3.

Uher and Toakley (1999) indicates that risk management in the conceptual phase of a project is highly important for the decision making process since decisions made in this phase tend to have major impact on the total costs. This fact might be linked to the fact that the scope in this phase is still immature. In the early phases of a project, the risk analyses should focus on risks

linked to strategy. Moreover, risk analyses in the later phases of a project should be related to tactical and operational questions (Husby et al., 1999).

Husby et al. (1999) state that many of the influence factors to a project can already at an early stage be identified. It is beneficial to know about potential threats and opportunities as early as possible, in order to implement mitigating actions. Obviously will risk analyses in the early stages be based on gut feeling and personal judgement, however, the positively effect of good risk analyses from the early phases of a project will benefit the project in the long run (Husby et al., 1999).

2.3.7. WHAT CAN RISK MANAGEMENT LEARN FROM QUALITY MANAGEMENT?

Williams et al. (2006) states three areas where risk management can learn from quality management:

1) Being able to differentiate between which risks can be handled with a statistical approach and which cannot.
2) To focus on key processes.
3) Implementation of both organisational and cultural changes.

2.3.7.1. **BUILDING DATABASES AND USING STATISTICS**

One of the problems quality management face is that to be able to use advanced statistical methods and models a great deal of data/information is needed. Many causes of risks are not homogenous and of a highly diverse form, resulting in poor statistical analyses.

One of the quality gurus, Shewhart (Williams et al. 2006), has outlined this. His focus was on the source of variation and not a precise estimation of any specific risk factor. In the process of predicting something, the element of chance need to be taking into consideration. For a system to be highly predictable, the element of chance of variation need to be low, the number of variations caused by variation need to be high and constant. When the variations of the system is are caused by something outside the constant system, it is called assignable causes. The difference between these natural variations causes by chance and the surroundings is well known in quality management, but not emphasised much in risk management (Williams et al. 2006).

This point has also been made by others. In 2003 Chenhall discussed the difference between "uncertainty" or "unpredictability" and risk. Risk deals with situations where relevant databases can be built so that situation specific data can be linked back to specific incidents. Being able to link back these risks open the possibilities for advanced statistical models that can provide the decision makers with good indicators. It implies that risks can be managed in different departments, and reported to the top management when required or needed (Williams et al., 2006).

There are a wide variety of risks, and the most difficult ones to predict is the "low-certainty" and "high consequence". In these cases, there are no historical data that can be used for predicting these events. The best approach for finding these events is through expert estimations (Rausand, 2011). Internal or external experts might be used to give advice. When relaying on only human judgement, the human psychology need to be taken into consideration. My personal

opinion is that most humans do not like change, as it forces them to be outside their comfort zone. Consequently, in the field of risk management this might lead to an underestimation of risks so that the *status quo* is maintained (Williams et al. 2006). People tend to see the world as they like it to be, and not how it truly is. In using expert judgement it is important to consider the expert's bias in according to their judgement (PMBOK, 2008).

The ROSS group at NTNU have for years developed an exhaustive database for risk incidents offshore. This database might be one of the earliest steps in using "quality" ideas in a risk perspective.

Many of the challenges that this group is facing are linked to the fact that there is not enough available data to give any good statistical results. This is good information for the employees on offshore installations, but not so good for the scientific results.

2.3.7.2. MANAGING KEY PROCESSES

The most dangerous and common risk is operational risk. This risk is well handled and studied in quality management. According to Williams et al (2006) there are three main reasons for operational risks being the most dangerous ones:

1) Operational risks are highly connected to the nature of the operation, and its characteristic nature makes a standard procedure impossible.
2) Operational risks are often part of complex systems, and as most variables in complex systems, the operational risks is somehow interrelated. During the last 15 years or so, many organisations have adopted a more flexible organisation to be able to fight the global competition. This has increased the operational risks.
3) Operational risks have major influence on other risks. An example on such operational risks is internal process control.

Since operational risks are so influential in the total risk picture, these risks are very important to keep at below an acceptable level. Experiences made from quality management say that processes within the organisation is in the organisations power to change, and by this eliminate the risks linked to them. Operational risks are often a result of poor management of key processes. Risk management has not yet developed standard procedures to handle these risks caused by the organisation and its staff. Quality management has for had this focus for years and have developed techniques for managing process and ideas from this can help manage the operational risks (Williams et al, 2006).

The number of potential risks to a project is up to infinitive and testing all of these is impossible. The risk increases with complexity, budget, number of stakeholders and duration. However, an approach to these risks might be to address the most important risks to the quality and test only these. By testing the risks to a system, the risks to the systems quality is reduced (Black, 2008).

Runciman et al. (2006) states that risks that can be dealt with should be subjected to the Deming-cycle, and only the once that cannot be dealt with should be placed in the risk register. My personal opinion is that all risk should be placed in the risk register, in order to document it properly for the future. However, the risks that can be dealt with should have the notification *closed* in the actions plan.

2.3.7.3. MANAGING MAJOR ORGANISATIONAL AND CULTURAL CHANGE

A result of the complexity of the world we live in, the demands from governance bodies have rapidly increased. This is especially clear in the area of risk management (Williams et al., 2006).

Risk management cannot be a separated task only done in the top management and only implemented in some specialties. Risk, such as operational risks, can arise at anytime and anywhere in the organisation. Consequently, risk management need to be everybody's concern in an organisation. Systems where all people at all levels can be involved and committed in identifying potential weaknesses with the system need to be implemented (Williams et al., 2006). Only through total involvement of everybody can the organisations results be achieved. This is discussed further under 2.1.5.2 *Involvement of Everybody.*

Many of the quality gurus have developed different techniques to quality improvement. Deming's 14 points and Juran's ten steps shows that unless cultural and organisational change is implemented, the quality cannot improve (Williams et al., 2006).

Many of the risks that the organisation face cannot be managed by sophisticated modelling techniques. Only though cultural changes in the organisation can these risks be managed.

2.3.8. WHAT CAN RISK MANAGEMENT TEACH QUALITY?

According to Black (2008) the quality risks analysis should not only identify the risks themselves, but also their level of relevance.

In the risk management process the risks likelihood and consequence is identified. According to this, the risks are prioritised. The number of potential risks are large, and to control risks with low likelihood and consequence is not economically justified. Williams et al. (2006), recommends that quality management adopt a similar approach. They assume that if many organisations adapt this, they will experience that the organisation is spending too much time and effort on the traditional quality problems and maybe not on new key problems. These new problems are often a result of a more globalised world, such as brand reputation, company image and networking. Runciman et al. (2006) indicates that a root cause analyses need to be performed at high risk incidents. In other words, the risks with a high risk index should be future analysed, and the other less important potential incidents should not have the same level of focus.

Quality management was first introduced to reduce the number of hours spent on inspections and the amount of waste. The original aim for quality management is to reduce the amount of variation in routine jobs within the organisation (Williams et al., 2006). This is still the main focus for many organisations. However, if the idea complexity theory from risk management is adopted, the organisations should not only focus on their internal faults, but also situations outside the organisation that influences the total quality.

2.3.9. SUPPLIER RISK INFLUENCING THE END QUALITY.

One of the main reasons for poor quality is poor deliveries from the suppliers. There is a huge amount of factors that influence the uncertainty in a supply chain, such as promotions and sale periods, reorder quantities, demand and so on. These factors are to some extent controllable,

however, there are external factors such as strikes, natural disasters, terrorism, world economy and "acts of God" that affect the level of uncertainty.

Global businesses faces grand uncertainties in their supply chains. Statoil and other multinational companies might source components in China, assembly it in Europe before installing it in the North Sea. One of the biggest motivational factors for outsourcing parts of the business' operations is the potential reduction in costs. In the decision making process of whether to outsource, it is a common misguidance that the costs of the supply chain only include costs directly linked to the production and purchasing, not thinking about the potential loss of assets if the outsourcing agreement is not successful (Mikalsen, 2011). The external risks that the supply chain is facing cannot be managed, is only the impact on the supply chain that can be controlled. However, internal risks are within the organisation, and can be controlled by management actions. This concept is also discussed in 2.2.11.1*The Information Processing Perspective*.

The companies decisions regarding their business model will affect the level of vulnerability in the supply chain. If a lean philosophy is adopted, where outsourcing is a method to reduce the number of internal suppliers, the level of risks to the supply chain will automatically increase. If "single- sourcing" is applied to the supply chain, the robustness of the supply chain will go down, and vulnerability and risk will increase. In "single-sourcing", the number of external suppliers is reduced by only having one supplier responsible for one item (Mikalsen, 2011).

To prevent the risks due to potential late deliveries from the suppliers and poor quality of incoming goods is twofold: first through prevention of the situation occurring, and second having a good response plan if a mistake does occur (Williams et al., 2006).

2.3.10. THE QUALITY AND RISK MANAGEMENT PROCESS FIGURE

The European Medicine Agency (EMA, 2011) has developed a general overview of the quality risk management process. They emphasise that this is not the only solution, and other models can be used as well. The process is shown in Figure 23.

The figure shows a systematic process for the assessment, control, communication and review of risks linked to the quality of a product throughout its lifecycle. The figure is not complete, as there are no decision nodes in the model. Decision nodes can occur at any point in the process.

The different arrows in the diagram indicate different actions. The dashed arrows indicate that the parties can communicate with each other at any stage of the process. The solid arrows indicate that output/results from the previous step are taken into the next step.

The final step of the risk analysis is to repeat these analyses at regular intervals such as major milestones in the project and when new information becomes available. The analyses should be reviewed and updated so that the project organisation has an up to date risk picture (Black, 2008).

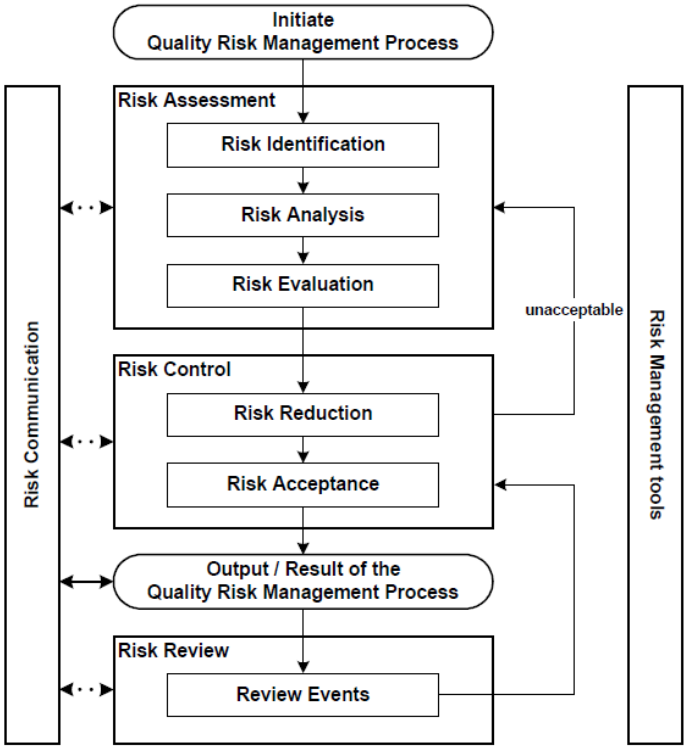


Figure 23: A typical quality risk management process (EMA, 2011, p.4)

The main steps of the quality risk management process:

1. *Initiate a Quality Risk Management Process.*
    a. The first step is to define what the problem at hand is. Followed by a background collection of the potential hazards to the assets. Then the leader and the necessary resources are identified before the timeline and its deliverables are defined.
2. *Risk Assessment*. The risk assessment step is divided into three subtasks to help identify the three classical questions of "*What can go wrong?", "What is the likelihood?"* and " *What are the consequences?".*
    a. Risk Identification.
        i. The hazard associated to the risk question is identified through the use of information such as historical data, theoretical analyses, the concerns of stakeholders etc.
    b. Risk Analysis.
        i. This step is the estimation of the risks linked hazard in step 1 though qualitative or quantitative processes.
    c. *Risk Evaluation*.
        i. In this step the identified and analysed risks are compared to the given risk criteria.
3. *Risk Control.* In this step the decision about the risks assessed above are taken. The decisions are associated with the question "*What do we need to do to get the risks down to an acceptable level?"*
    a. Risk Reduction.

   i. Is the process of mitigating or avoiding risk above a certain level. Risk reducing measures need to be introduced. It might be necessary to revisit the *Risk Assessment* step after introduction of these risk reducing measures to identify possible changes to the risk picture.
- b. *Risk Acceptance.*
   i. In this step, the decision to accept the risk is taken.

4. *Risk Communication.* This step is a continuous action and it involves sharing of information across the organisation. At any stage of the process, the decision makers can bring input to the process, and results from the process can be demonstrated to others.
5. *Risk Review.* The outputs of this process should be used as input to transfer of experience.

In order to have a system to improve safety and quality, a «quadruple-loo» for learning is recommended by Runciman et al. (2006). This loop should be on personal, local, national and international level. In this context, this states that a QRM model need to be on integrated on several levels of the organisation.

2.4. Summary of Literature Review

A consequence of the complex world we live in, the making decisions can be challenging because the problems that we face can be of a wicked character. The level of complexity increases when there are many stakeholders involved in a decision making. The needs and wants of the stakeholders is a significant risk that needs to be managed to produce a good result (Sten, 1994). This fact is also stated in Rausand's (2011) model for decision making, where the stakeholder's opinions influences the whole decision making process.

Both risk management and quality management tries to reduce uncertainty and increase level of control in a process. Therefore is an existing natural link between these two disciplines, furthermore experiences can beneficially be adopted by the other.

William et al. (2006) introduces two way of managing risk caused by pure chance based on ideas from quality management. The first approach states that the based on experiences many risks are related to poor management of key processes. As discussed in 2.1.3, quality management focuses on how to manage these processes effectively, this knowledge can be passed on to from QM to RM in order to handle these risks. The second idea is based on the fact that these are risks that can occur anywhere in the organisation. Therefor the handling of these risks should not be isolated to the top management, but should include everyone in the organisation. Consequently there is a need for cultural changes and major organisational changes. These are again an area where QM has valuable experience to share with RM.

The third risk identified by Williams et al. (2006) is the most dangerous type of risk an organisation face because these are so-called unknown risks. These types of risks are often a consequence of the uncertainty and unpredictability of many business environments. The risks are changing rapidly, thus QM cannot teach RM anything to help solve these problems because the risks are closely linked to the constantly changing situations (Williams et al., 2006).

3. METHOD

This chapter will explain the research design used in this thesis. In addition a description of the data collection regarding the interviews is presented.

In the assignment text there were no specific problem with the QRM role that were to be examined. The questions in hand where discussed in the pre-study report from early January 2012. However, throughout the work with this thesis changes regarding the problem description was made. The development of this can be found in the progress reports in the appendixes. The final problem description is:

4) What are the strengths and weaknesses of the existing QRM model?
5) How can this model be improved?
6) What are the differences between the deliverables of the QRM manager to the different project phases?

3.1. RESEARCH DESIGN

The data collection for this thesis is purely qualitative. There are four main areas of data collection – namely observations, literature, governing documents and interviews. These actions were carried out according to the timeline presented in the figure below. The idea behind this design is that the literature review should be a dynamic process in order to include as much relevant literature as possible based on input from governing documents and observations.

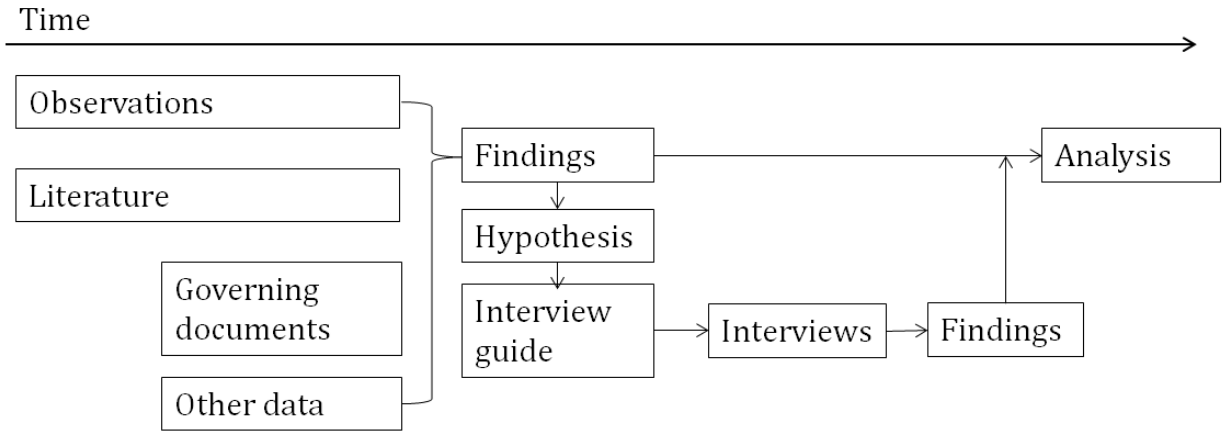


Figure24: Research design

3.2. LITERATURE

The literature used in this thesis origins from several sources. There are relevant literature from mandatory courses from courses at NTNU and the National University of Singapore. In addition discussions with Erik Jersin, senior researcher at SINTEF and PhD. Candidate at NTNU, Daryl Powel, have led to finding of relevant literature. There have also been performed searches through the NTNU University Library own internal search portal and available databases. The

literature is presented in 2 *Literature Review*, and the references can be found under 11 *References.*

The observations are based on participation in project management meetings in some Statoil projects. The meetings are mainly biweekly risk meetings and weekly project engineering meetings. On a more unregularly basis several theme gatherings, town hall meetings and project team gatherings were participated. Some of these meetings were also overseen to get a broader picture of the complex Statoil system and input on current news in the industry.

3.3. GOVERNING DOCUMENT AND OTHER DOCUMENTS OF RELEVANCE

Relevant governing documents both internally and externally was investigated in the governing document analysis. The internal documents were found in Statoil's document base, DocMap[2]. The document selection where based on relevant requirements to the QRM role stated by FR05 – *Project development,* the Quality plan, functional description and statements made by my advisors at Statoil. The external document reviewed was chosen in collaboration with my advisors at Statoil. The focus in hand was issues related to QRM managers deliveries.

3.4. INTERVIEWS

Myers and Newman (2007) describes three types of qualitative interviews:

1) *Structured interview.* In these types of interviews there is a complete script of questions prepared beforehand. During the interview there is no room for improvisations, and the interviewer is not necessarily a researcher.
2) *Unstructured or semi- structured interviews.* This type of interview is different from the one above because the interviewer is not bound to the prepared questions, but might also improvise around the incomplete script. This interview method is either done by a researcher or a member of a team.
3) *Group interview.* This type of interview can be both structured and unstructured, where two or more persons are interviewed at the same time by one or more interviewers.

In this thesis the structure of the interviews will be semi-structured, because a completely unstructured interview might not give sufficient correlated data. Themes with guiding questions was defined beforehand in an interview guide (See Appendix 4 - Interview Guide). The themes were discussed with interview objects in advance of the interviews, when the planning of the interviews took place. During the interviews the focus was on hearing the points of views from the interviewees and supplementing with the questions from the interview guide if needed. The design of the interview guide was based on findings from observations, literature, governing documents and input from Statoil personnel.

Some of the manners discussed in these interviews are classified as project sensitive and other are personally sensitive because some of the statements made are direct critique of Statoil as an organisation. In order to protect the interviewees from being prosecuted as a result of these

[2] Renamed ARIS, May 2012

statements, the interview results are not published and will be destroyed right after the censure deadline for the thesis is over.

There were both informal and formal interviews conducted. The formal interviews were first performed, following the structure for the interview guide. To clarify or add additional information to a theme, several informal interviews were done.

3.4.1. SELECTION OF THE INTERVIEWEES

It was aimed that a selection of ten Statoil employees in PRO were interviewed. Six of them was formally interviewed based on the interview guide, while the remaining four was informally interviews loosely based on the interview guide. Interviewees from different departments, different project, different roles in projects, different level of experiences and different projects phases were selected. The interviewees were nominated by experienced QRM managers.

3.4.2. DATA PROCESSING

After each of the interviews – the findings from them were noted down under the theams' headlines. After all of the interviews were finished, the themes were systematically noted down. Comments also regarding level of experience, project type, location and phase type was carefully examined and analysed as well.

3.5. ANALYSIS

According to the figure given above, the findings from the interviews were compared to the findings from the observations, literature and governing documents. The strengths and weaknesses of the system was analysed accordingly.

4. MANAGEMENT SYSTEM

This chapter aims to inform the reader about Statoil's model for QRM in PRO, as described in the governing documents. Task 2 will start off with a general description about the brick stone in Statoil (the company's value), the organisation model and project development model. Subsequently the QRM's part of the organisation will be discussed.

This chapter is built on information found in governing documents, and a complete list of the relevant documents discussed here can be found in Appendix 1 – *Document Overview*. Only the document id is used as a reference point, to ease the reading.

As in the literature section, some of the topic discussed in this chapter were also discussed in *Supplier Quality Management.* Consequently, overlapping sections between topics, discussed in the project assignment and this thesis, are close to identical with some exceptions.

4.1. THE STATOIL MANAGEMENT SYSTEM

The most important governing document in Statoil it the Statoil Book (STB). This book explains all the core activities in Statoil. In addition to STB, there are also functional requirements (FR) and other business area requirements that need to be followed.

The Statoil management system is a set of principles, policies, processes and requirements which is a foundation for the company being able to meet their objectives.

The triangle shown below is an illustration of the different levels of the management system, where the top four bricks are covered in STB. It can be divided into (Statoil, 2011, p. 9):

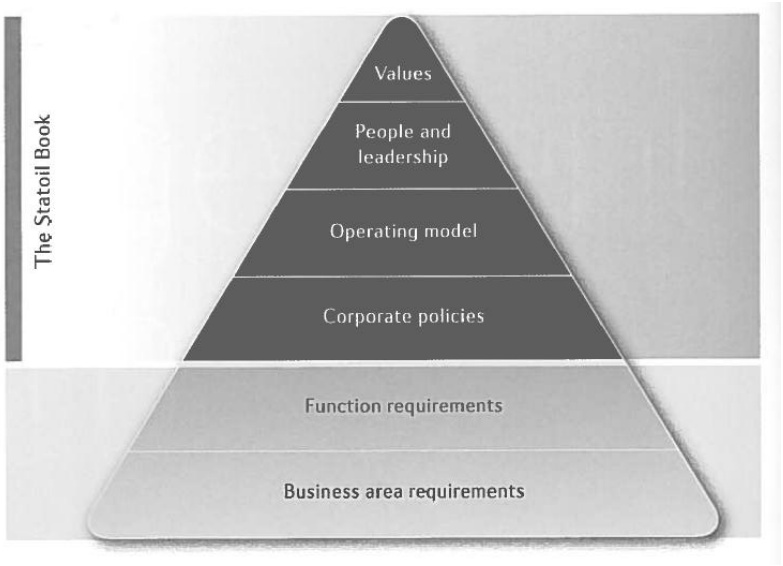


Figure 25: The Statoil Management System (Statoil, 2011, p. 8)

1) Values – guidance of the behaviour of the employees
2) People and leadership – a description of what to expect from the company, it's people and leaders
3) Operating model – describes the organisational principles and the way of following these
4) Corporate policies and governance – describes the governing bodies , internal and external control, and regulations regarding the actions of the company
5) Functional requirements – a set of work processes and technical requirements
6) Business area requirements – a set of requirements regarding several business units, including governing documents to common process areas

The first four points are mentioned in the Statoil Book, while the remaining two points can be found on the Statoil intranet.

In this section some of the key elements relevant to this thesis will be discussed. These parts are values, elements from the operating model and elements from the functional requirements.

The logic found in the Statoil Management System will form the structure of this chapter. The chapter will start off with an overview over the corporate *Values.* Followed by *People and*

leadership, Operation model and *Corporate polices.* Finally, the relevant *Functional requirements* and *Business area requirements* for the QRM will be discussed.

4.2. VALUES

On top of this pyramid are the values of Statoil. CEO Helge Lund states in the Statoil Book (2011) that " *At Statoil, the way we deliver is as important as what we deliver. "* These values set the standard for all the activities and way of doing business in Statoil. The values are (Statoil, 2011)

- Courageous
- Open
- Hands-on
- Caring

The values have all sub-values, and a full list over these sub-values can be found in Appendix 17.

Sub-values that are of importance for this thesis:

- Use foresight, and identify opportunities and challenges
- Understand and manage risk
- Deliver on promises
- Show dedication and endurance, follow through and pay attention to important details

4.3. PEOPLE AND LEADERSHIP

The *People and leadership* part of the pyramid is not relevant for this thesis and will not be discussed further.

4.4. OPERATING MODEL

The operating model provides the employees of Statoil a guide on how to manage their own performance, based on the values. It sets guiding principles for achieving a safe, precise, on time and good quality project.

In investment projects there is a decision process called the Capital Value Process (CVP). In Statoil all projects are practically investment projects. An investment project transform a business case (BC), which might be an idea or a prospect and develops this into a finished project. A finished project might be a new platform or modification to an old drilling rig.

To be able to meet the challenging and dynamic business environment that Statoil faces, a dynamic and an event-driven performance management process need to be adapted. The process need to include the following elements to succeed: a dynamically resource allocation, long-term and action-orientated follow up, holistic performance evaluation, and continued learning through sharing of experience.

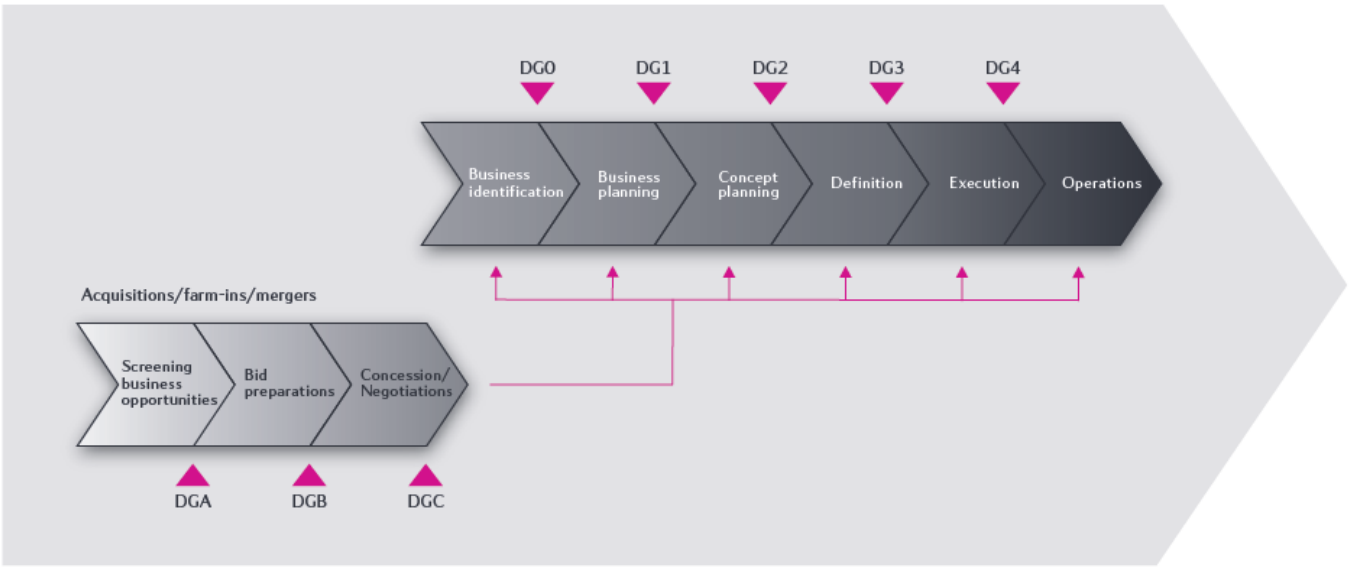


Figure 26: The Capital Value Process (CVP). (Statoil, 2011, p.36)

In this CVP the following decision gates (DG) are defined (Statoil, 2011, p. 37)

1) *"DGA: approval to develop a business opportunity*
2) *DGB : approval to negotiate*
3) *DGC : accept a negotiated agreement/decision to asses a new exploration or business opportunity*
4) *DG0 : approval to start appraisal/business planning*
5) *DG1 : approval to start concept planning*
6) *DG2 : project pre-sanction*
7) *DG3 : project sanction*
8) *DG4 : start operation"*

The DG's of interest in this thesis are DG1-DG4, as these are the areas of where PRO is operating. DG0 is managed by field development. The realisation of a business case between DG0 and DG4 is called an investment project. A project does not enter the operation stage before DG4, meaning that an investment project can be dropped at any DG before this.

4.4.1. ORGANISATION MAP

Statoil is a large energy company with many different areas of operations. In this thesis the focus will be on the projects department, known as PRO.

Many projects in Statoil are investment projects, from small research projects to new platforms. The projects handled by PRO are projects that have budgets exceeding 150 million NOK or have a high degree of complexity.

PRO's aim is to "Create value through planning and executing development, modification and cessation projects from DG1 to DG4 in accordance with business needs and requirements"[3]

[3] TPD PRO MC: http://sp-st12.statoil.com/sites/c2da0062-060c-42ba-b435-ca0b85b5fe18/orgkartPRO/Document%20library/Forms/DispForm.aspx?ID=3&RootFolder=/sites/c2da0062-060c-42ba-b435-ca0b85b5fe18/orgkartPRO/Document library. Accessed: 01.05.2012

PRO is organised according to the project hierarchy seen below.

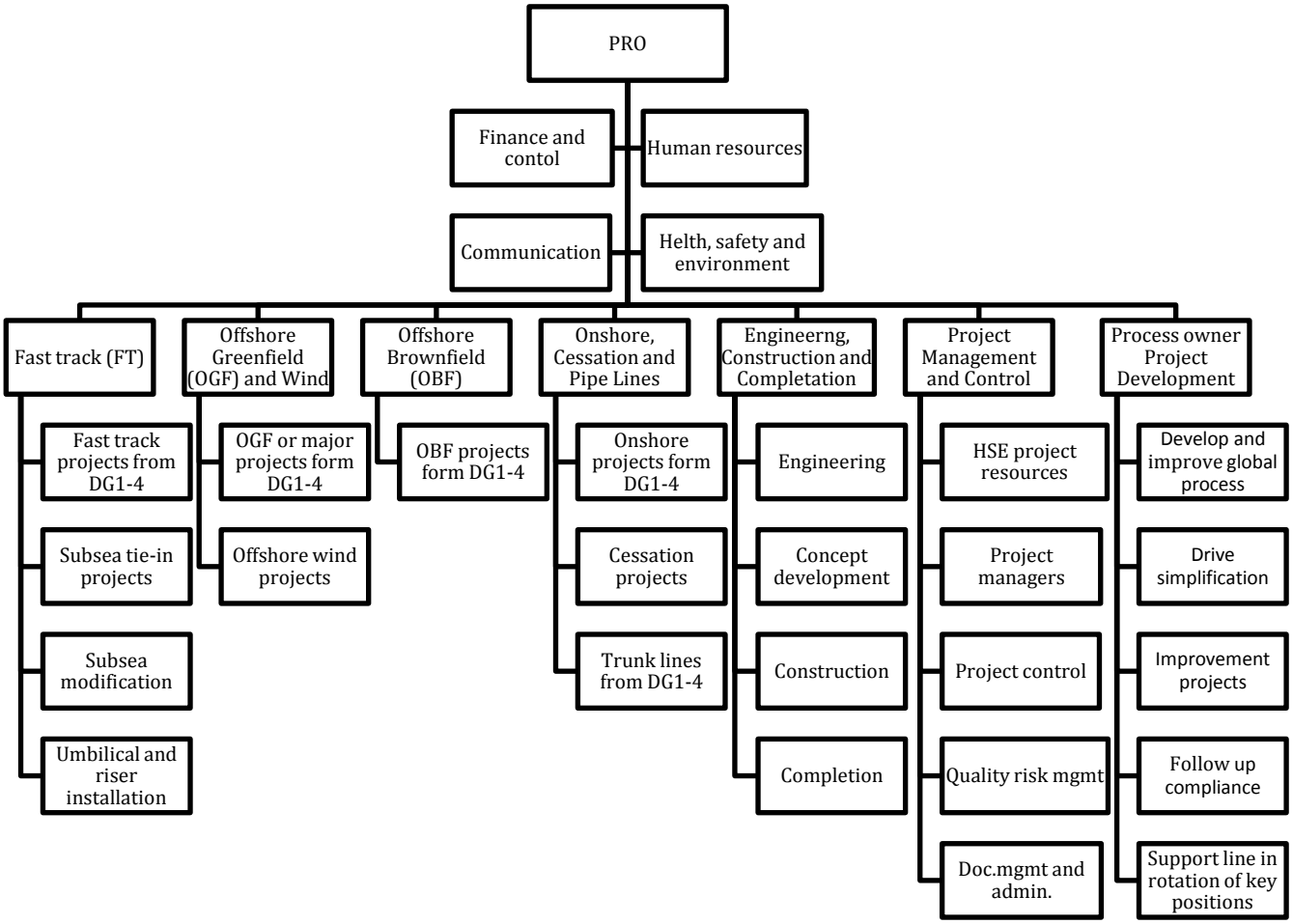


Figure 27: The project hierarchy

The project hierarchy is divided into three projects groups and four resources groups. *Fast track, Offshore Greenfield and Wind, Offshore Brownfield* and *Onshore, Cessation and Pipe Lines* are all project types. Moreover, the rest are resource functions.

This is a matrix organisation, consequently the resource functions are often involved in several project at the same time.

This thesis is written for Quality and risk management (QRM), which can be found under Project Management and Control. This functions is found under Project Management and Control.

4.4.2. PROJECTS IN STATOIL

As listed in the project hierarchy, there are four types of PRO projects. OGF's are new field development, while OBF's are modification projects on already existing fields. Onshore, Cessation and Pipelines is an umbrella for projects which do not fall under the other categories.

The final category is fast track projects. See *Appendix 11 – Fast track projects* for the Fast track CVP. This category is a consequence of changing demands and requirements linked to project execution, in terms of throughput time and costs. The Statoil book states (2011, p.27) that *«Our business environment is demanding, dynamic and unpredictable. We must continuously evaluate risk and respond quickly when the unexpected occurs and when opportunities or threats arise."*

The last couple of years, Statoil has been working to simplify and standardise some of project the developments. The new type of project execution strategy is called fast track, which can specially be beneficial for subsea projects. Fast track projects' components are "off the shelf", pre-manufactured and standardised. These components can easily be modifications to fit a specific case. Of course these projects are not that simple, as the" off the shelf" components might need to be designed to fit the specific pressure, flow rate and so on, on the specific field.

A trend in project planning and execution is the increasing focus on safety and production. A safer project execution is necessary to get competitive projects, both regarding time and cost. Quality focus is important in context, to make sure that what is supposed to be delivered is the actual output. In addition, processes need to be simplified so that total throughput time is decreased. In order to do so, the fast track ideas need to be implemented in all projects in Statoil, quick implementation of improvements and a simpler management system. The whole management system is exanimated and the goal is to reduce the amount of requirements with 45%. By reducing the number of requirements, the necessary project requirements will shine through. It allows more time to focus on what actually benefits a project. Consequently, only value-adding work will be done.

Projects are becoming more and more varied, and globally. PRO is facing international challenges as the number of foreign project and foreign construction sites increases. Accordingly a more flexibility demand are realised, and the number of location where Statoil are present increases.[4]

By adapting fast track many projects can become more efficient and a project throughput time might be sliced in half due to adjustment in work procedures.

4.5. CORPORATE POLICES

The *Corporate polices* section the Statoil book contain important guidelines on how the employees should act when representing the company. These guidelines include actions towards corruption, ethic, social responsibility and so on. Although it is extremely important that these are followed to maintain a healthy business environment, they will not be discussed further in this thesis.

[4] «Smartere projectutførelse": http://entry.statoil.no/Organisation/Units/110802/News/2011/Pages/041011_change_agenda_2.aspx. 30.04.12

4.6. GOVERNING DOCUMENTS

There is a set of different governing documents that influences how business is done. These are split into externally and internally documents.

4.6.1. EXTERNAL GOVERNING DOCUMENTS

The external governing documents relevant for PRO are:

- The Norwegian Petroleum Directorate (NPD). The directorate states that Statoil has a "Påseplikt"[5] (translated: "Look after duty") over their suppliers following the rules and regulations for operating on the Norwegian continental shelf
- According to §7 (Petroleumstilsynet, 2011, freely translated from Norwegian) "The operator shall "påse" that all work done, either personally, by employees, by contractors or sub-contractors shall follow the requirements given in law for health-, safety-, and environment regulations" [6]
- ISO 9001. All suppliers need to be ISO certified
- NORSOK XX[7]

The frame agreement §7 need to be taken into account when the risk picture is being identified. Then a system to follow up the risk picture need to be established, where one of these activities can be monitoring. The findings from monitoring are only data, and are not valuable for the future unless it is systematically registered and analysed. The figure below shows the relationship between §7 and trending of findings.

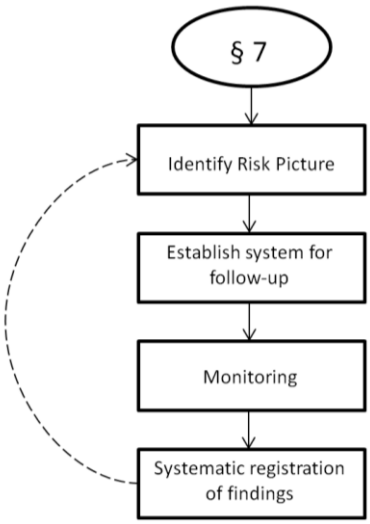


Figure 28 : The "påseplikt" in practice

[5] "Påseplikt" (Norwegian term): Supervisory responsibility.
[6] Norwegian original version can be found in Appendix 5 - Rammeforskriften.

[7] There are a lot of different NORSOK standards. It depends on the project which standards are relevant to that specific project.

4.6.2. INTERNAL GOVERNING DOCUMENTS

The lower part of the pyramid presented in the section The Statoil Management System can be divided into the following bricks; Functional requirements (FR), Work requirements (WR), Guide lines (GL). Technical requirements (TR) and a database for work processes (APOS)[8] are also part of the internal governing documents. The relationship between these documents is shown in the figure below.

Figure 29: The guiding document hierarchy

The Statoil Book is a document for all the activities on all levels in the Statoil organisation. It need to be governing for all the levels, meaning that in some areas of the organisation this document is sufficient, in others, such as the QRM department, it needs to be translated so that it can be applied into the context in hand. The WRs and FRs are internal guiding documents on how to fill the needs stated in the Statoil Book on department level.

This section will is structured according to the hierarchy figure shown above. First the ground pillar document for project development in Statoil; *FR05 Project development* is analysed. This document gives a good overview of the different phases of a project and a kick introduction to the management disciplines. Then relevant WR and GL to the QRM role is discussed.

Note: the governing documents is governing for all Statoil projects, consequently adaptation to specific projects is required.

4.6.3. THE PROJECT DEVELOPMENT PROCESS

The project development (PD) process in Statoil is separated into different phases with clear milestones that need to be followed before the next phase is feasible. The separation between the different phases is named decision gates (DG). The objectives of the PD process are to assure a successful project development by letting the business case mature towards project approval and realisation. The project development process is described in FR05.

There are three different project approaches in Statoil. These schedule selections are:

1) Fast-track: suitable for standardised projects with components that does not need heavy modifications, such as subsea tie-back.
2) Standard: projects that have high risk, high degree of complexity or projects in new regions should be handled according to the standardised procedures.
3) Accelerated: have many of the same aspects as standard scheduling, however with a higher degree of front-end-loading in the business planning phase.

[8] On the 18th of May 2012, all the TRs and APOS processes was gathered into a system called ARIS.

The notation (-> DGX) in the headlines in this chapter indicates to what decision gate that specific phase leads up to.

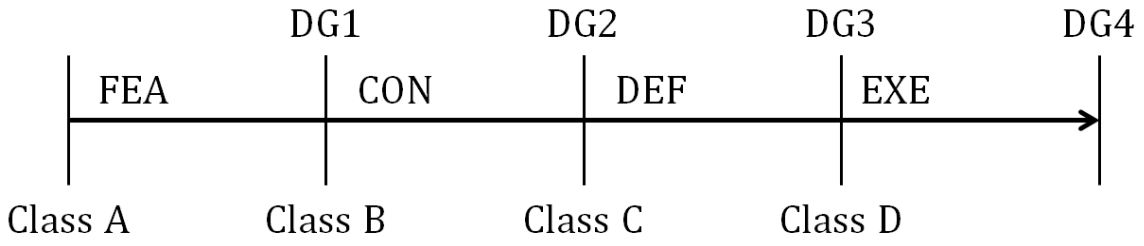


Figure 30 : The CVP-process. Statoil (2011)

Class A to D in this figure indicates the required maturing level at a DG passing. A checklist for each phase is located in Statoil's DocMap. Unfortunately, these checklists are too long to be included in this thesis. The main idea is that the complexity of the classes corresponds to the progress of a project. As a project gets closer to DG4, less uncertainty is linked to that project and more elements of that project is in place.

4.6.3.1. BUSINESS PLANNING (FEA) (-> DG1)

Before passing DG1 is possible, feasibility studies need to be carried out. The objective for this phase is to justify further development of the business case into an investment project. This phase is in some areas of the organisation called *feasibility.*

If a project should be further developed the concept must be documented to be technical, commercial and organisationally feasible, moreover the economic analysis and stakeholder analysis needs to be positive to this development.

More specific, the tasks that need to be fulfilled in the business planning phase is:

- Set the direction for the business case, by freezing it and develop its objectives.
- Identify possible concepts and their opportunities
- Establish documentation that assures that the business case meets the corporate strategies
- Identify risk liked to project development
- Demonstrate the concepts technical- and economically feasibility
- Identify the need for new technology
- Establish the required documents in the decision gate support package (DGSP) for crossing DG1

This phase gives the project management group possibilities to shape the project into their own, as long as it aligns with the corporate strategies. It might be seen as a creative phase, with fewer requirements to follow compared to the projects other phases.

4.6.3.2. CONCEPT PLANNING (CON) (-> DG2)

In this phase, different concepts are identified and a viable concept is selected, defined and documented. Through this the DGSP for DG2 is established.

The design elements for the concept are described with the basis of the following elements; *commercial, reservoir or energy resources, technical* and *operations*.

The commercial elements include legal aspects, finance and marked demand. The energy resources might be elements such as how to assure good flow and how to drain the potential reservoir. The technical element is for example facilities and drilling and well technology. The final element is operations, which includes start-up of the plant, the operation of it and the maintenance.

Due to what was defined FEA-phase the following should be done in the CON-phase:

- Provide a fixed design basis
- Evaluate the different concepts
- Remove the non-viable concept, and mature the selected concept
- Set the basis for project execution
- Involve stakeholders in the development of the projects
- Establish the required documents in the decision gate support package (DGSP) for crossing DG2

During the CON-phase the selection of appropriate concept is done. This process needs a great deal of decision making skills. The decision makers need to be able to make the decision on what concept to adopt based on the right assumption. To be able to do this risk management procedures need to be a natural part of the process. The QRM's knowledge about risk management and quality management is essential. The concept with the most potential for success should be selected and to do so risk management and decision analyses need to be adapted. The focal point of this phase is to further mature the business case.

4.6.3.3. **DEFINITION (DEF) (-> DG3)**

This project phase ensure further maturity, definition and documentation of the business case.

More in detail the deliverables to this phase is:

- Carry out a Front End Engineering Design (FEED) studies
- Fully mature the business case so that late changes in a project are avoided
- Plan and prepare the next phase
- Prepare submittal of applications to external authorities
- Define the basis for the how to award the contractors
- Establish the required documents in the decision gate support package (DGSP) for crossing the next DG

The FEED's objective is to give the decision makers adequate information so that the right decision whether or not to execute is made. It reduces the uncertainty in a project, consequently the predictability of that project increases.

The foundation on how to select contractors is established in this phase. A set of weighting is established (such as cost vs. quality), and will be the same for all the contractors that have been given an invitation to tender.

4.6.3.4. **EXECUTION (EXE) (-> DG4)**

The execution phase objective is to realise the business case.

More in detail this phase shall:

- Prepare a project for start-up and operations
- Final detailed design, construction and installations
- An agreement on when a termination is to take place is established
- Handover the project to operations

In this phase it will be more physical components that need to be handled, due to the finalised design. Follow up on contractors activities by controlling through verifications, auditing and monitoring.

Below is a figure that adds up the CVP phases, its focus area, business decisions and objectives.

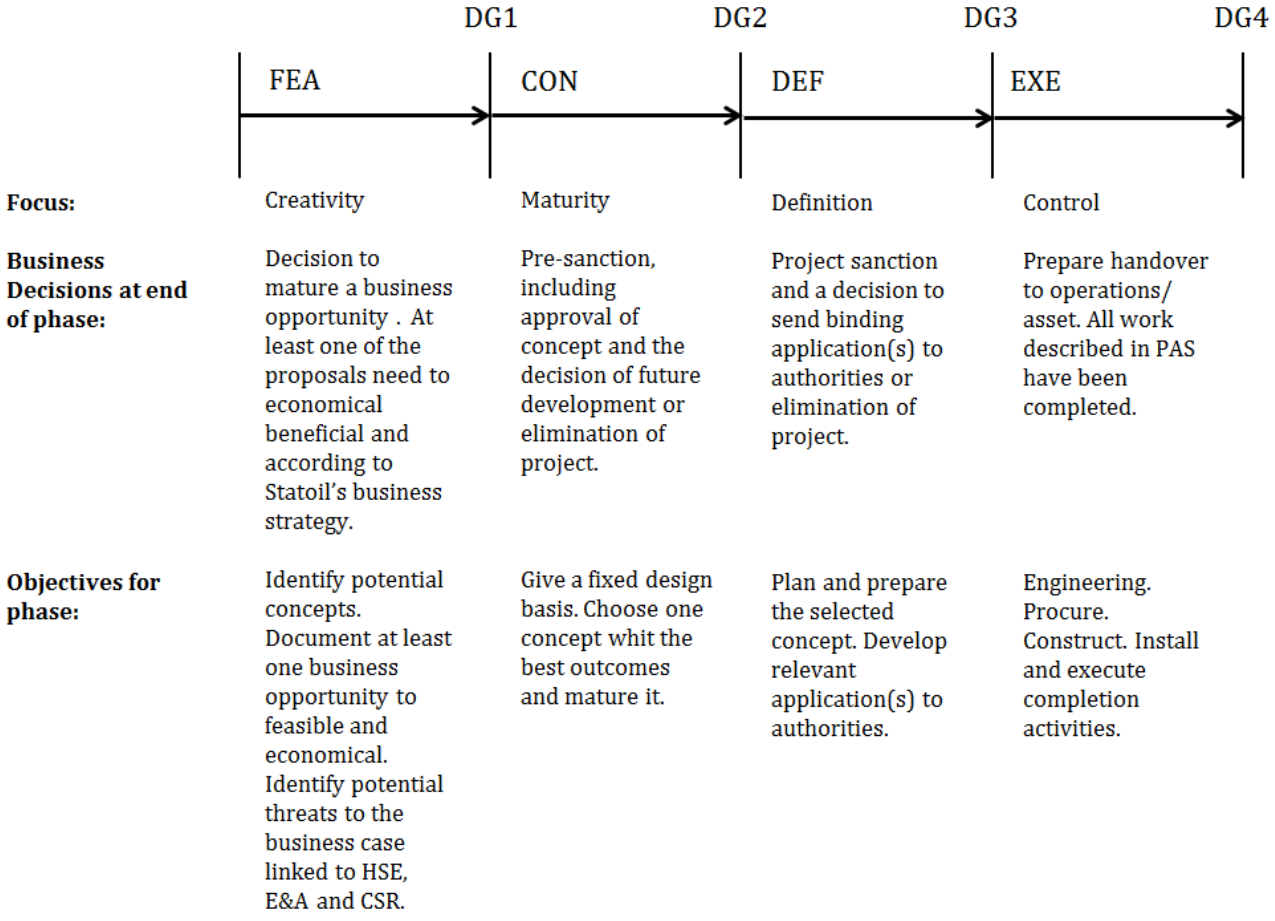


Figure 31: Focus and Objectives in different CVP phases. Based on figure in GL3000.

In each phase there are sub-processes called *initiating, planning, execution, closing* and *controlling.* Not all of the projects have all the stages. The flowchart of the sub-processes can be found under 5.4.6 *Phases in the Phase.*

4.6.3.5. DEVIATIONS FROM THE PD-PROCESS

The PD-process is strongly recommended to be followed. However, with current challenges and the extensive focus on project execution time deviations from the process might happen. If the deviations are regarding the product requirements, the PD-owner and the relevant process owner should be involved in the planning of the deviation procedure.

4.6.3.6. **MANAGEMENT DISCIPLINES**

The 10 management disciplines listed in FR05 Project Development.

- Integration Management
- HSE, Social Responsibility and Ethics & Anti-Corruption (ISR)
- Scope Management
- Time Management
- Cost Management
- Quality Management
- Human Resource Management
- Risk Management
- Communication, Information and Document Management
- Procurement Management

In FR05 a project execution plan is shown. In addition, the management disciplines are presented. The QRM are responsible for quality management, risk management and stakeholder management. Stakeholder management is a part of integration management. The next section will discuss relevant *Functional requirements* and *Business area requirements* for the QRM.

4.7. QRM IN PRO

The QRM is responsible for risks management, quality management and stakeholder management. The areas of responsibility will be discussed in that order. A quality and risk manager should be involved in a project as soon as possible, at least before DG2, to assure it's success.

In identifying quality actions and the priority of these the QRM uses risk management. A so called *risk based monitoring* system is established. One project risk factors can be linked to the stakeholder's interest in that project. Without the stakeholders consent and support, a project might go from potential success to failure.

FR05 explains that a risk based monitoring programme should be established for a project, both on business case and on project level. Based on the risk analysis a monitoring programme should be established. This programme needs to include audits, verifications, reviews and examination activities. All of these activates are quality related activity. The results from this activity, such as non-conformities and dispensations, should be handled.

Many of the activity linked to the QRM are linked to the suppliers of a project. It is important that the QRM have a good general knowledge about the supply chain. However, this area was one of the focus point the in the project assignment *Supplier Quality Management.* This topic will not be further discussed in this thesis. The relevant document for this topic is FR09 – Supply Chain management.

4.7.1. RISK MANAGEMENT IN STATOIL AND PRO

This section will focus on the risk management in PRO. There are several governing document on different levels that discuss risk management in Statoil. However this thesis will only focus on those requirements that are relevant for the QRM managers.

Risk management is a continuous process, and should be established prior to DG1. An illustration of this continuous process can be found in Appendix 10 (GL3000).

The internal governing documents relevant to risk discussed in this section is

- WR2404 – Risk management process
- WR2365 – Risk Management in projects

In addition, FR08- Risk management is used as a supplementary document.

4.7.1.1. WR2404 – RISK MANAGEMENT PROCESS

This section will describe the risk management process in Statoil and is based on *WR2404 Risk management process.* Only the governing structure of the risk management process is shown in this section, however some of the steps in this process are described in more detail in Appendix 14.

The risk management process is a central process in all PRO projects and an important part of the Project development process discussed in 4.6.3 *The Project Development Process.*

The purpose of the process is to ensure unambiguous risk management process and result, and establish requirements for the process and carrying out the assessment.

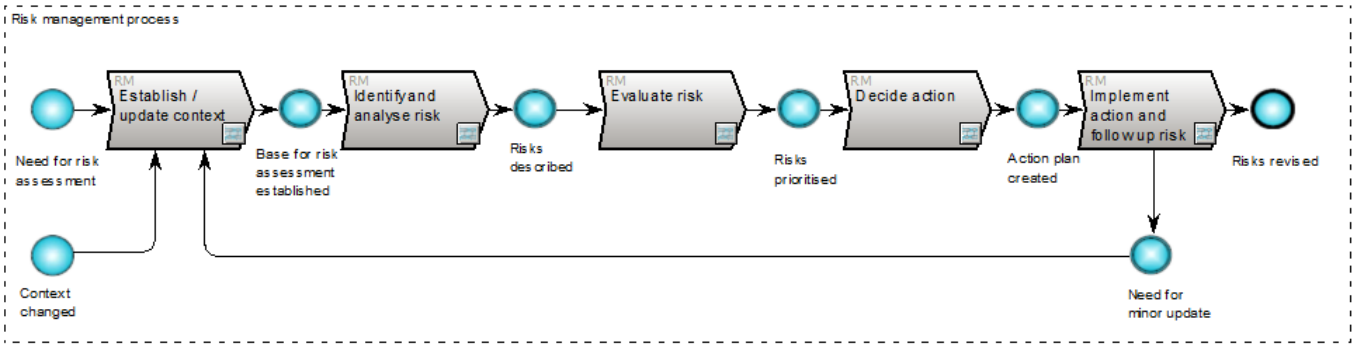


Figure 32 : WR2404 Risk management process

The first step of the process, *Establish/ update context,* is straightforward. The next step, *Identify and analyse risk*, is very much alike to the process discussed in under 2.2.6 *Risk Management Framework*. The only difference is the emphasis on the stakeholder's role in the process. The stakeholders are active during the communication and as a consultant during the document analysis.

The activity *identify risks* recognise risks that impact the achievement of the objectives, both upsides and downsides. To also look at upsides and downsides risks differentiates from the classical risk management. Suggested approaches to identify risks in WR2404 is checklists, brainstorming, earlier experiences and records. More suggestions can be found in Appendix 7 – Risk Techniques. WR2404 call attention to that different area of expertise should be present in the risk identifying process. This aligns the literature found in 2.3.7.1 *Building Databases and Using Statistics.*

In Statoil there is a strong culture for good documentation control. This is reflected in the risk analyses. The process behind the analysis, including the methods for identification and analysis, including the assumptions.

To assure that the interest of a project's stakeholders are maintained, it is important to keep close communication with them. It is the risk owner's responsibility to include both internal and external stakeholders in the risk management process when required. The stakeholders are also an important part of *Decide actions.*

One other characteristic of the Statoil risk management process is quality control. This accrues both in *Identify and analyse risk* and *Evaluate risk.* The quality control includes at least completion of the risk register, acknowledgement of a step is adequate and that the stakeholders is consulted and informed.

After the risk evaluation process, the prioritised risks are often evaluated according to their cost benefits. The risks are further prioritised based these potential cost evaluations and the consultancy form the stakeholders and the process owner, and an action plan is established.

4.7.1.2. WR2365 – RISK MANAGEMENT IN PROJECTS

The risk register is updated at least on a monthly basis. In addition risk workshops are performed minimum once before a DG. Risk analyses where the QRM does not have ownership of are cost – and schedule risk analysis, however the QRM gives input to these analyses. These analysis are required before DG2 and DG3, but can also applied to other phases if applicable.

This document emphasise the importance of cross disciplinary input to the risk identification process. In addition the group doing the risk assessment should have in-depth knowledge about the objectives on all levels. The risk identification process in Statoil is a bottom to top process.

The risk identification workshops are facilitated by the QRM. It is essential that the facilitator have knowledge about the risk management procedure so that the right questions are asked in order to identify relevant projects risks. Together the group establish a risk register and a "Sub project top 10"prioritising list which again is communicated to the project management team/ BCLT. All of the projects prioritising lists give a combined risk which is communicated to a higher management level. An illustration of this can be found in Appendix 15 – *Generation of "Top 10 Risk list*".

To reduce the impact of the potential threats, Statoil use one or more of the following approaches discussed in the figure below.

Approach		Action	The action aims to reduce:
1	Eliminate, avoid	Re-planning Re-design	Probability
2	Reduce risk (mitigate), pursue opportunity	Re-planning Re-design	Probability
3	Transfer	Re-planning	Consequences
4	Accept and prepare	Development of contingency plans	Consequences
5	Ignore	No action	--

Figure 33: Risk mitigation approaches in Statoil (WR2365).

A projects threats and opportunities is in that project's interest to control and should be one of the core activities of the project management's agenda. It is important that the team competency is high so that risk management reaches it's true potential.

In successful implementation of risk management in a project the following success factors are defined:

- Risk management is on the project management agenda, both internally and with contractors.
- Strong commitment in identifying risks.
- Awareness and acceptance of responsibility in following up mitigation actions.
- Risks are communicated within and outside the project group.

4.7.2. QUALITY MANAGEMENT IN STATOIL AND PRO

"Statoil defines quality as *" degree to which a set of inherent characteristics fulfil requirements that have been specified for the project*"(GL3000). More specific for investment projects quality is liked to fulfilling what is defined in the Stakeholder start-up meeting, Project assignment and Statoil's requirements. Quality management includes activities linked to quality planning, monitoring, non-conformance and deviations, benchmarking and transfer of experience.

The internal governing documents relevant to quality discussed in this section is[9]

- WR2353 – Quality Planning in Investment Projects
- WR2359 – Quality System Audits and Examinations in Projects
- WR2259 – Project interface, non-conformance, query management
- WR1283 – Corporate project reviews
- WR2090 – Commissioning manual
- WR2363 – Mechanical Completion Manual – Amend for the US and Mexico

The two last documents in this list are not covered in the functional description, only in FR05's requirements for quality management.

In addition there are some suggested working requirements which is to be replaced shortly. These documents are not discussed in detail. WR0011 – "Tillegg til: Behandling av kvalitetsavvik i D&V og A&F" and WR0002- "Intern monitorering og eksternt tilsyn".

This section is organised different compared to Chapter 4. *Management System*. The subsection is divided accordingly the QRM job description and the relevant information from the governing documents are discussed under these. The areas that will be discussed are *Quality planning, Quality control, Quality assurance* and *Quality improvement.*

4.7.2.1. **QUALITY PLANNING**

One of the quality planning tasks is the establishment of a quality plan from DG0. In addition the project management system (PMS) is established.

[9] Please make note that some of these document are not included in the sections below, as some documents are only illustrations of processes.

FR05 states that a quality plan should cover both the business case and project level. The plan should identify all governing documents and project specific documents relevant to the CVP process.

The quality plan process aim is to set out how the investment project should meet the requirements of the business case. In addition, it sets all the deliverables required for a project. The plan should be established and maintained in all phases of that project. The quality plan should identify the relevant requirements and the function responsible for that specific requirement. In addition a time frame for when this is to be meet need to be established. Requirement from outside the organisation, such as authorities and partners, should also be included in the quality plan (WR2353). Quality planning is an essential activity in all of the phases in the CVP process.

In addition a project management system (PMS) should be established. The PMS includes all the principles, polices, processes and requirements needed for a successful investment project. The structure of the PMS is flexible, resulting in that the documents might be modified to the business case, seeking to reduce the amount of unnecessary documentation and meeting the requirements at the same time (WR2353). The AOR for the business case and the project managers are responsible for fulfilling the requirements in this document. However, the QRM gives input the process.

As part of the quality planning activities the QRM need to facilitate the establishment of a monitor program. The fulfilling of this program is discussed under 4.7.2.3*Quality Control*.

The QRM should contribute to the development of TORG, which includes all the technical and operational requirements and guidelines for a project. In addition, the QRM should establish target performance measurements for the project in the quality planning phase.

4.7.2.2. QUALITY ASSURANCE

In the quality planning phase, a monitoring programme was establishes. A quality assurance activity is linked to the realisation of this programme through system audits. Quality assurance ensures and documents that a quality process is established and implemented. Monitoring activities make sure that the management system is followed.

The monitoring programme includes an examination programme, which need to be followed-up. To ensure that the quality in investment projects is established, a monitoring program covering the business case and project levels is implemented. As a minimum to this monitoring plan an audit and examination plan on suppliers is established, audits and examinations performed by external stakeholder and project self-assessment reviews (WR2353).

The findings of a quality activity can be either a non-conformities or observation. Non conformities are deviations from specified requirements, while observations are areas of improvement. According to the finding, actions need to be made (WR2359).

There is a close link between the risk picture and the monitoring actives. Consequently, the monitoring plan should be update frequently, as a minimum at each phase up to DG3, and then after each baseline (WR2353).

Examinations are linked to external stakeholders such as contractors. In addition *self-assessment, multi discipline reviews, internal project audits, IDC/DIC activities,* and *maturity measurement/ team alignment* is important quality assurance activities (GL0275).

Internal quality control actives include independent project reviews such as CAR, PER, COQ and Arena (GL0275). These outputs need to be followed-up.

External activities towards contractor are audits and examinations of contractors quality plan and work processes. This is the main contributor to the motioning plan after DG2 (GL0275).

4.7.2.3. QUALITY CONTROL

The degree of control in the CVP process increases closer to the execution phase.

According to WR2259 the following work processes should be implemented at DG2; interface management, non-conformities and dispensations and site queries. Interface management process makes sure that all internal and external interfaces are clearly identified. In addition, the information between these interfaces are dealt with. The site quires process is in place to ensure that any construction work on installations goes smoothly. If there are any questions during the construction phase, a site query is establishes quickly and sent to the contractors/ engineering manager that will deal with the task in hand, making sure that the question/error does not cause much delay to a project. The QRM need to ensure that a system for the non-conformities is established and implemented.

One important quality activity is to document the quality process. Without the proper documentation the quality activity is not fully completed. It is the QRM's responsibility to ensure this. One solution is to have self-assessment activities as a part of the quality control plan.

In addition the QRM have a responsibility to be a 3rd party quality audit team assistant to other project roles, such as Petec and D&W. They should also assist in pre-qualification and biding evaluations of contractors.

Monthly there are project reports provided in the Quality management module in Project Information Management System (PIMS), the QRM should provide input to these. The QRM should also undertake the role of management system coordinator in a project.

In WR1283, an illustration of the quality assurance assistance is given. This figure show that there are three possible ways of assuring quality is in the project. One is through the QAA, one through CAR/CQC, and the last one is through LCE before the project is reviewed by Arena.

After a DG passage a customisation meeting takes place as early as possible, closely after the stakeholder start-up meeting. In this meeting a member from Arena is present, and the objective of this meeting is to determine a QAA (Quality Assurance Assistance) leader. The QAA leader's responsibility is to establish a QAA team. This team's functions as a sparing-partner for the team members when the term need to discuss issues.

The QAA is an important contribution to the quality assurance activities in the project as they give valuable input about the quality before the Arena review. The outcome of the Arena review is often determining for the outcome for whether the projects passes the next DG or not, because Arena is the "exam" before the DG.

Through the CAR/CQC the work requirements are verified within each competence area. In addition, the LCE and the BA controller get input to their reports.

The competence area review (CAR) is a review of the documented decision basis within the competence area. A competence area in this context is a group of discipline guided by a chief engineer.

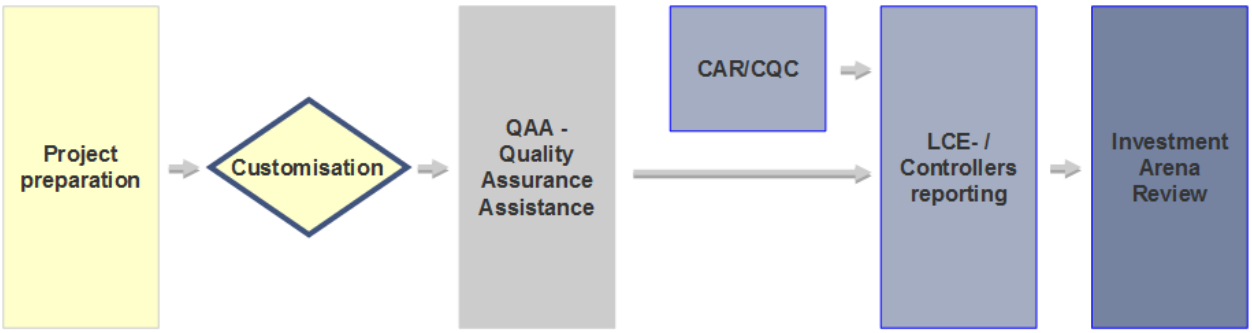


Figure 34 Quality Assurance Assistance (WR1283 Corporate project reviews)

4.7.2.4. QUALITY IMPROVEMENT

One of Statoil's goals is to be a learning organisation. In doing so, the organisation need to focus on continuous improvement.

Follow-up and reporting of KPIs, regarding both quality and risk, contractors' performance and stakeholder satisfaction are important tasks assigned to the QRM.

Based on experiences gathered in pervious projects, the QRM should always seek to contribute to develop a company best practice. This means that the QRM should share experiences with each other in different networks and databases. Problems linked to the databases were discussed in the project assignment *Supplier Quality Management,* and will not be discussed further in this thesis.

The QRM should in addition identify the need for training, and execute training in areas such as examinations, risk management, experience transfer, stakeholder management and other quality related issues.

5. RESULTS

The aim of this chapter is to describe and analyse how the “quality and risk management “ role work in selected projects and project phases in PRO, Statoil.

The relationship between quality management and risk management is examined. The main focus in this chapter is the characteristics of the project phases and the QRM role linked to these. The first section of this chapter is devoted to project phase.

During the data collection some new issues emerged. Some of these non-phase specific issues is the root-cause of the challenges linked to the different project phases, and will be discussed in the last section of the chapter.

The findings in this section are based on subjective answers from the interviewees and personal experiences. Consequently the separation between analysis and description of the findings are vague. The subjective answers from the interviewees become an integrated part of the analyses. The answers collected in the interview are not objective because the topics discussed in this thesis are areas where it takes years of experiences to develop an opinion on, consequently the interviewees have all made up their personal opinion about the discussed topics.

5.1. METHOD

As an introduction to this chapter a short summary of the method chapter disused in Chapter 3 – *Method* is given.

In order to get a solid and broad data foundation three different approaches have been used:

1) Participation in project meetings and PRO gatherings
2) Formal interviews of QRM managers and other project disciplines
3) Informal interviews of QRM managers and other project disciplines

Two projects where followed during the construction of this thesis. These projects were modification projects of already existing installations in the planning phases, which is from DG1 to DG3. The projects had different challenges regarding the project execution. The meetings that were overseen were management meetings, risk meetings and risk workshops. Additionally management meetings for facilities in the projects were also attended.

On a regular basis several theme gatherings, town hall meetings and project team gatherings is carried out. Some of these meetings were also overseen to get a broader picture of the complex Statoil system and input on current news in the industry.

Based on the observation made from meeting participation and informal interviews of project team members, formal interview guides were prepared. The formal interviews were done on QRM juniors and seniors, from all departments and all project phases. The interview guide was changed and a new guide was developed were the target group were other project roles. One of the founders of the QRM role in Statoil was interviewed, in addition other to roles in the project team.

In the development of a hypothesis and a clarification of governing documentation, informal interviews were performed.

5.2. HISTORY OF THE QRM ROLE IN STATOIL

The QRM role was first introduced in Statoil from Norsk Hydro ASA (Hydro) after the merge between these two companies in November 2007. Before the merge Hydro did not have the same process focus as Statoil had. One of the challenges was to develop and implement these processes in Statoil.

One of interviewees state that there is in general not much focus on quality management in Norway compared to other European countries. One of the reasons for this view is that Norwegian industry can afford to make mistakes, however this is about to change as Norwegian industry is becoming more global. Before the merge, Statoil only had quality integrated in a project setting through a Healthy, Safety, Environment and Quality (HSEQ) manager. Statoil did not have a pure quality manager in projects, rather a HSEQ manager. Based on a review of reports addressing the combination role in other companies than Statoil, shows that the HSE part of this role becomes the dominant one. Hydro on the other hand, separated these two into a QRM manager and an HSE manager.

The integration of the new role in Statoil was not easy. The QRM managers from Hydro needed to spend time and effort in trying to convince that the change was for the better. Many of the challenges that Statoil faced was due to cultural issues. The HSE managers were sceptical towards the new role, scared that it would challenge their role in projects. After some heavy discussion, the HSEQ managers and the rest of the organisation came to realise the benefits of having a QRM manager.

The discipline leader in StatoilHydro came from Hydro, in addition the first 5 QRM managers were from Hydro as well. The five persons have now developed into a discipline with closer to 90 members during the last four and a half years. It is stated that the growth the QRM discipline is experiencing is the fastest growing in a Statoil context. Consequently the top management have stopped any new recruiting of QRM managers until the internal issues in QRM is sorted out. These internal issues are linked to deliverables from the role, and it is the motivational factor for this thesis.

5.3. General Deliverables

The main objective of the QRM manager is to assure a successful business case. The QRM manager should assure quality accordingly to the Statoil processes and compliance of the requirements is carried out in a good manner. In order to know whether the project is doing a good job or not a score from the IPA benchmarking can give an indication. This indicator tells the organisation which areas that might be changed to increase value-adding activities. The IPA score indicates that Statoil need to work on their compliance.

The two fundaments in the QRM manager's work is the quality plan and the risk register. The quality plan lists all of the requirements in the project and how the project addresses these requirements, while the risk register is a requirement and from this the monitoring plan will be established.

The foundation for all planning is the Project Assignment (PAS). The PAS is the agreement between the Asset Owner and the relevant Business Arena. It sets the basis for a project's planning and execution and includes framing conditions such as scope, budget, schedule and interface.

Based on the PAS a quality plan is established. It is the QRM manager's responsibility in a project, amongst others, to establish a quality plan. The quality plan defines how the business case and each project will meet the requirements. It is the further foundation for the risk register, monitoring plan, document plan, document management procedure and Project Management Schedule (PMS). This plan can be prepared and updated in the feasibility phase, and shall be prepared and updated in the other stages of a project as well. This figure does not comply with requirements from 4.7.2 *Quality Management in Statoil and PRO*. This states that based on the risk register a monitoring plan should be established and that the risk identification process should not be a static event. An illustration of the original quality planning process is shown below, with updated terminology.

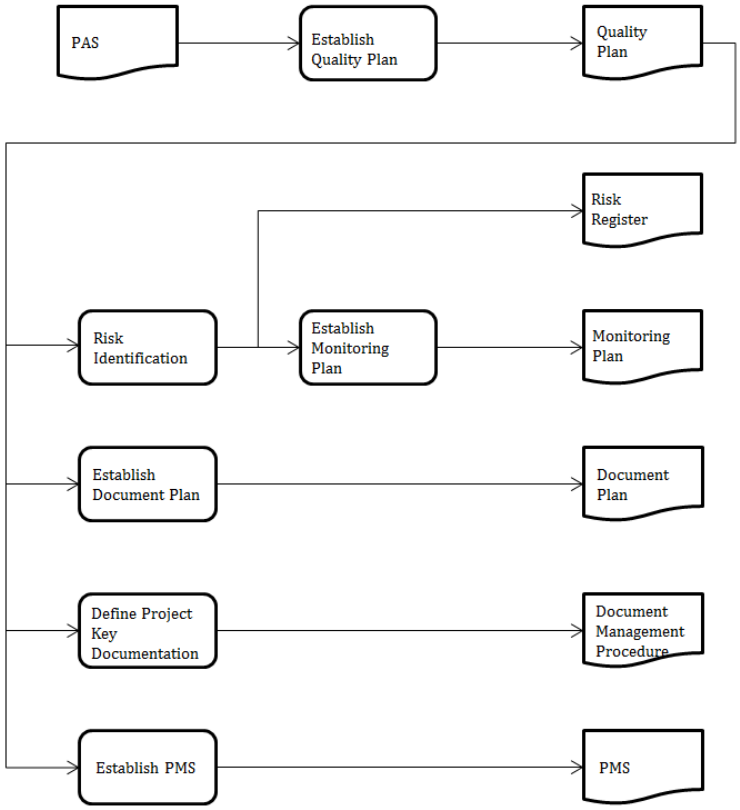


Figure35: Quality planning procedure based on figure from GL3000

A suggestion of improvement is presented in 7.3*Proposed Solutions to Governing Documentation.*

It is important to take notice that the QRM manager does not own neither the risks or its verifications, they only facilitate the risk workshops and establish a monitoring programme.

The QRM role changes through the CVP. In the early phases there is a focus on stakeholder management, and as the project develops closer to EXE this focus shifts to a more hands-on approach. This is a consequence of an increasingly more fixed scope. Formally the decision about investment is made in DG3, however some of the interviewees states that already from DG2 there is "no way back", the only action that can be done is to mitigating the threats. All the planning done pre DG2 will be tested in the execution phase.

The QRM manager is only a facilitator of the risk process. The risk analyses done in PRO are semi-qualitative, and easily communicated. This is both a strength and a weakness of the selected risk analyses, and will be discussed in Chapter 6.

One of the most important characteristics the QRM manager is that he/she is hands-on, sees the situation and ask the right questions in order to generate the right risk picture. Moreover, the QRM managers need to be pushy to get the participants in a risk workshop to identify the right risks. The QRM manager is responsible for following-up on the identified risks by following-up on the people responsible for the mitigation actions do them and do the required update in PIMS. The QRM manager also gives input to other disciplines such as HSE, document controller, the project controller, procurements and others. The QRM manager has a reporting responsibility towards the AOR and the project manager.

The project team members see the QRM manager as a guard dog for the system, that follow-up and sees to that the system requirements are meet. The QRM manager need to be hands-on in the project, and needs a general overview over the project.

There are no "check/study" points to fulfil the Deming cycle (Summers, 2005) in the existing QRM model, because there are no self-assessment in the current model. Consequently, the QRM role does not fulfil the basis foundation in classical quality management.

One of the most important customers that need to be satisfied through the business case is the stakeholders. They will define some of the requirements for the business case, in addition to the requirements from the AOR and requirements from authorities. If the stakeholders are not identified and followed-up on, the project might fail.

The QRM manager often has roles linked to the facility part of a project. The QRM manager has also deliverables to the AOR and BCLT in general. This relationship is illustrated in the figure below. The deliverables are linked to risk follow-up, in addition the QRM manager is responsible for the risk workshops. In addition, the QRM manager follow-up on the contractors/ suppliers and their deliverables into the project. It is the contractors responsibility to do quality checks on their suppliers. However, in key tasks and/or suppliers with previous negative experiences Statoil might go in and follow-up on these. There is a need to check if the suppliers have a good system for following up on quality issues.

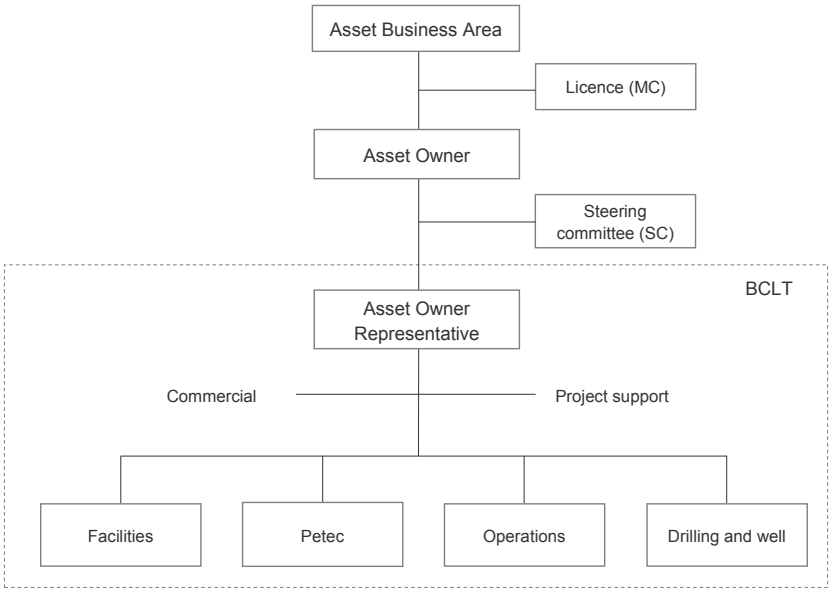


Figure 36 : Investment project structure (FR05)

There are several ways of reaching Rome, as long as this objective is met. Consequently, there are several approaches to the QRM role, determining which is more important than the other is one of the questions at hand. This challenge is addressed in 7.5 *Generalisation of the QRM Role.*

5.4. PHASES STUDY

Because there are several fundamental issues linked to the QRM role, there is no clear consensus in what is expected nor delivered from the QRM managers. Consequently, this section is based on my understanding and generalisation of the QRM managers phase approaches.

The QRM manager usually does not get involved in a project just before DG1. As a result of this there are not many QRM managers that have experiences from the feasibility phase and the data collection from this phase is poorer compared to the later phases.

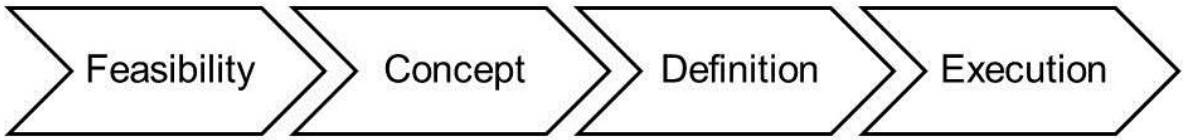


Figure37: The CVP Development

Some of the foundation for this phase study is based on findings from the QRM role's functional description. In this description areas such as quality planning, monitoring devices, non-conformities, experience transfer and risk management is discussed. All the phases are defined as "can", "shall" or "non-applicable". However, for the risk management section, all of the requirements are "Shall", consequently, there will not be much focus on this topic in the following sections, since the requirements apply for all of the phases.

5.4.1. THE CVP

The CVP process is well established in the project team members mind. However, the process is not always strictly followed. Due to various factors, dispensations from this process is needed.

All of the activities listed in the job description apply for all of the phases, it is only the focus points that changes. If this is the case, then the QRM manager can work in all phases, with only having to change their focus point.

5.4.2. FEASIBILITY

On an overall level this phase should document a possible business opportunity or a hydrocarbon discovery, whether or not it is profitable and possible. It should document the appraisal status and if it finds adequate information so that a concept study can be done. In addition, a realistic project schedule should be established. In all of the phases a quality plan need to be established, and it should be established early in the phases.

The feasibility phase, also called business planning, is the first phase of the CVP where the QRM is present. Before DG0 the project is owned by field operations given that the project is a green field (GF) project. The QRM are mostly involved in GF project in this phase. Brown field (BF) are less loose in that sense that there are already existing foundations, which sets more constrains to the projects, compared to an new field.

The main focus of this phase is to develop a robust business case. This is done through generating several concepts that can possible realise the business case. In order of generating these concepts, and selecting a feasible concept, experiences from previous projects need to be included at an early stage. This fact is also communicated from top management. Furthermore, the concept generation process should have several concepts that fit the organisation's business strategy.

In order to not make the same mistakes twice, experiences made in previous projects need to be identified early in a phase. These experiences include both good and bad, and will be an useful

contribution to the risk picture. It is highly important that these experiences are taken into consideration at an early project phase.

In order to fulfil the tasks identified in 4.6.3.1there need to be a strong focus on stakeholder management from an early point. The requirements set by the stakeholders are very important, but it does not mean that they are easy to identify. When the scope has an immature character, there are many loose treads that need to be tightened and stakeholder's opinions to be identified.

The stakeholders opinion is also important for the concept generation and selection. Not only does the concept need to be technical, organisational and commercial feasible, it also need to be aligned with the business strategy and stakeholders' interests. QRM managers who find strategic thinking and partner negations interesting enjoy working in this phase.

My opinion is that the first phase of the CVP is more or less the same as described in 4.6.3.1 *Business Planning (FEA) (-> DG1)*. This might be a result of small amount of data which have only confirmed what is stated in that chapter, as there were no findings suggesting otherwise.

In this phase the concepts' impact on corporate social responsibilities, ethics and HSE need to be identified through risk analyses. These risk analyses are not the QRM manager's responsibility, however, the result from these will be input to the decision base for concept selection.

Later on in this section some general issues regarding risk and PRO is discussed. One of the most challenging risk concerns is to understand the business case early enough. This should be in the project members' minds from the feasibility phase and onwards.

5.4.3. CONCEPT

The objective of this phase is to evaluate facility alternatives and select a concept for further development through a screening process. One important part of risk management in Statoil is to look at the template over all the different potential requirements, and figure out which one is applicable for that specific project, and to what degree does this need to be followed.

The concepts are tested according to financial beneficial criteria and technological possible criteria. In this phase the QRM managers focus need to be on strategic alignment between Statoil's business strategy and the project strategy. Through this phase there is a strong focus on the business strategy. The project might be dropped at any decision gate. My impression is that the most critical decision gate for the project is at DG2, because before this DG the amount of uncertainty in the project is high.

During the concept phase there are only studies contracts that are follow-up on. Consequently, the focus is rather on internal issues directly linked to own organisation, rather than external issues. There are some study contracts, such as screening and concept studies, that are done externally, but these are not followed-up on to the same extend as the later studies.

In order to select the concept with the best outcome opportunities the QRM manager need to facilitate risk workshops for all of the disciplines. Identifying the right risks, as in the other phases, is key. One of the most important inputs to the screening selection is the stakeholders' requirements. As in the previous phase, the stakeholders are an important area of responsibility

for the QRM manager. In the screening process this is one of the most important decision inputs. The QRM manager needs to facilitate the internal stakeholders, both on offshore and onshore (when it is applicable), asset, and the AOR. When working with the stakeholders, it is important to have the same approach towards all of them. However, the QRM manager struggles to get the project participants to follow-up in the stakeholder module in PIMS. This is because it is a new module in PIMS. Consequently there are no straight forward procedures for the use of this module.

This phase is full of concept generation and screening. Risk analyses are done at numerous concepts at the same time, and the selection of final concept are based on these. In the early phases of the project, the construction method has not yet been settled, thus a different mind-set to risk is required in the early phases compared to after concept selection. In the screening process, the concepts that did not make it to the next phase need to be adequately documented why this was not the ideal solution. Finding the balance between sufficient documentation and too much is important for the QRM manager in order of not get burned out in this phase. The QRM manager has to juggle several risk analyses processes on different concepts. At the moment there are no tools or role description for the QRM manager in these types of settings.

In this phase, there are some study contracts done by contractors that need follow-up on. The outputs from these studies are important for the screening selection, as it gives a better foundation for decision-making. However, the level that these contractors are followed-up on will depend on capacity of the project team.

In order to ensure a smooth handover from field operations to PRO, the PRO Project manager should be involved in the project in due time (three to six mounts) prior to DG2. After the concept selection, then the selected concept needs a firm decision basis for FEED, which leads us to the next phase, Definition.

5.4.4. DEFINITION

In the definition phase sets out to further mature and ultimately freeze the selected concept finalising it for project sanction.

According to the CVP, no investments are to happen before the execution phase. This is not always the case. Many of the long-lead items are ordered before DG3 is passed, because of their long delivery time they have to be ordered before so that they can be completed in time.

Suppliers will get more and more involved in the project throughout this phase. There are two different groups of contractors that require different degree of follow-up. The group that needs less follow-up is contractors that are part of the frame agreement. These are prequalified, consequently, they have a good quality system installed. Contractors that are directly linked to the project without being part of the frame agreement need closer follow-up.

The degree of frozen scope increases linear up to the FEED studies done post DG2. That all the project factors are set at this time is not always the case according my understanding. Often the FEED studies are started before the scope is matured enough, resulting in a poor study and problems in execution phase.

The level of quality planning is the highest in this phase, with the previous phase, definition, as a second runner up. Based on findings from the functional description, the level of quality control increase from this phase, and into the next which is execution. Quality assurance actives, such as pre-qualification and bid evaluation, is only a requirement from the definition phase.

5.4.5. EXECUTION

In the later phases of the project, the infrastructure in the project needs to be understood to get a good risk picture.

The deliverables from the QRM manager in this phase can be separated into three; asset, sub-projects and contractors. The QRM manager delivers an aggregated risk picture to them to the AOR and the Asset. Other deliveries to the Asset are monitoring actives, reviews and random samples from the project.

Compared to the previous phases stakeholder management is not done to the same extent. Of course there will be some stakeholder management, but they are not the same as in the previous phase. In this phase the stakeholders are Plant Integrity (PI) and Operations. This is because the concept has already been chosen in line with the stakeholders requirements.

The result of good planning (or poor planning) will show off in the Execution phase. In the definition phase, the process was maybe pushed and the project team was too eager to get things done. A potential result of a speeded process is poor foundation for the execution phase.

In this phase the focus is on making sure that the suppliers understand the project requirements (both Statoil's and NORSOK). One example of how this was not meet, is in an offshore installation project where a contractor in Asia was used. This contractor did not understand the Norsok requirements completely. Accordingly, there were many problems linked to the execution phase. As it is the QRM manager's responsibility to find these potential risks, and implement actions towards these. To follow-up on these monitoring actions and quality audits need to be implemented. The QRM manager needs to ask the right questions so that the risk can be identified and mitigated through a monitoring plan. The QRM manager should also make sure that the framework is installed, and that a good management system is maintained.

This phase is more hands-on compared to the previous phases. It requires a lot of travel from the QRM managers, therefore if the QRM manager likes to travel and seeing physical components this is the ideal phase to be in. It is in this phase that some of the risks identified in earlier phases will strike or not. And no matter how much work is putted into the alleviating actions in planning phase, some of the risks are bound to happen

5.4.6. PHASES IN THE PHASE

In the CVP the process is separated into four phases. Furthermore, these phases is separated into the sub-processes indicated in the figure below. The majority of the interviewees stated that the CVP process is not the most beneficial project development process. They also indicates that the process is well adapted into the project team members, and the CVP assures that a good project execution is obtained.

The question was raised whether it was sufficient to separate the CVP into four phases (not including the phases where PRO is not active) the interviewees disagreed. This topic and it solutions is discussed further in Chapter 7.

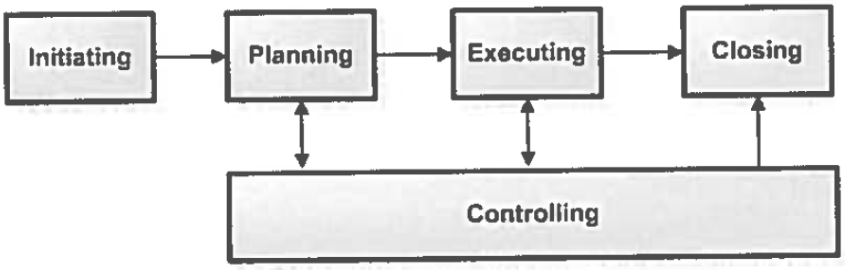


Figure38: Sub-process (GL3000, p.47)

5.5. General Issues and Factors Influencing the QRM Role

No projects are the same. There are factors such as time limitation, requirements for project execution time, type of project, available resources and personal characteristic, all influencing what the QRM manager can bring into the project. Throughout the data collection for this thesis many factors was brought to attention. The findings are from different levels of the organisation, and can be divided into external and internal factors. The internal factors are within Statoil's power to effect, while the external factors are outside the organisation. Naturally, some of these overlap.

On the next page, there is a table showing different themes and findings from the interviewees linked to them. Theme number one was discussed under the phase study. The numbering system established here is also the numbering system for the proposed solution in Table 5 : *List of actions*.

Theme	Nr.	Finding from interview
Internal factors		
Link between quality and risk mgmt.	2	Quality and risk Definition of risk and quality
Interface/ several disciplines	3	The QRM role Document manager, PCI manager, HSE, Engineering leader, Project controller and Planner Overlapping risks
New employees	4	Blooming market Training and recruitment process Increased number of juniors
Project team	5	Lack of knowledge about the QRM role
Work load	6	Matrix organisation
Compliance and leadership model	7	The QRM role
Terminology and certification	8	ISO certification Poor consistency between Statoil terms and the rest of the world The QRM name
Sub-cultures	9	QRMO vs. QRMS Project focus vs. discipline focus
The QRM personality	10	Courageous
Two discipline leaders	11	One for each discipline
Number of QRM managers	12	Different view on number of required QRM managers
Incomplete Deming cycle	13	Missing *check/study* and *act.*
Quality control	14	Different control CAR process
External factor		
Different projects	15	Different approaches

Table 4 : Findings from different interviews and observations

The following sections will identify and analyse the internal factors listed in Table 6. Then the external factor from the table will be discussed and analysed. This chapter will end with some general findings regarding quality culture (number 16) in Statoil and some of the risk challenges (number 17) the organisation faces. In total there are 17 findings in this thesis.

5.5.1. Different Phases, Different Deliverables.

As mentioned regarding the numbering system, this theme was discussed in 5.4 *Phases Study.*

5.5.2. Link Between Risk and Quality

The majority of the respondents indicates that there is a strong link between quality and risk. However, the arguments to support this statement is inconsistent.

Some of the interviewees pointed out that there is a link in the PRO's strategy to link risk and quality together. Whether this is successfully implemented or not is still up for discussion. People tend to do what they have always done, "because it has worked before". Furthermore, a small number of the interviewees pointed out that the top-management in Statoil have a

successful implementation of risk based prioritisation in their work. Risks are identified and acted upon.

One response to this question introduced a cyclic view on the relationship. This view can be adapted into the illustration shown below. This illustrate a learning cycle, which aligns with Statoil's vision of being a learning organisation.

As shown in the Figure35 the monitoring program is based on risk analyses. The monitoring activities are essentially quality actives. Experiences made from these quality actives, will be valuable information for the future phases and future projects, and will help in identifying the correct risks in a later context. This is a simple approach, which can be easily adapted and understood.

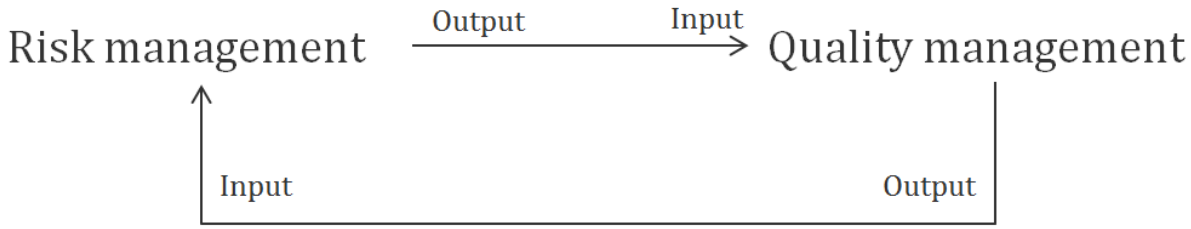


Figure 39: Link between risk management and quality management

The majority of the interviews could not give a unified answer to what risk and quality was in PRO context. There were more consensuses around quality management than risk management.

The answers regarding risk management were fluctuated. The main differences were linked to type of risk to include in the risk register.

The only black on white definition of risk and quality in PRO context can be found in a withdrawn document called GL3000. Even though most of the QRM managers still act according to this document, there is a gap between the QRM's perception of both quality and risk and the definition found in GL3000.

5.5.3. Interfaces/ Several Disciplines

One of the challenges that the project phases are the interfaces between the different support functions in the project.

As result of the QRM manager's objective approach to the project, it will strive to attend to all the interests in the project and allocate focus accordingly to the link to the risk register.

There is a disagreement whether or not there are overlaps between the different roles in the project. Some QRM managers state that there are no interphases between the different roles. Potential interphases are predefined. This statement is expressed by senior QRM managers. However, both seniors and juniors state that interface challenges do occur.

The QRM managers objective to take care of the projects risk register will naturally lead to an intersection of different disciplines. The question at hand is how this intersection is handled. The QRM manager need to be objective in order to facilitate the risk workshops, but at the same time be a generalist and know something about everything in order to ask the right questions. If there is not a good balance between these two aspects, interface problems might arise. The

natural interfaces is illustrated in the figure below, followed by a brief discussion on some of the intersections.

Figure 40: Illustration of interfaces between different project disciplines

The project controller will produce monthly reports, which the QRM manager contributes to. The contribution is in form of risk input and verification. The QRM manager also does a quality check of these reports.

The QRM manager and project controller have close working relationship in the projects that were observed. This will however vary from project to project. It is the project manager's responsibility to determine where the intersects between the different roles are. This process is not always formal, and might be settled only trough oral agreements.

A cost- and schedule risk analysis is required in the project. It is the project controller's responsibility, but the QRM manager gives input to the analyses. The output from this analysis will be added into the total risk picture.

The Document manager quality control of some of the documents can either be done by the document manager or the QRM.

The HSE manager is present in the risk workshops where HSE risks are identified. The HSE manager is present, but in some cases does not actively participate in the risk identification process, while the QRM manager facilitates the meetings. Some interviewees stated that there is an uncertainty linked to who owns the process. In addition will the QRM manager often participate in HSE audits of suppliers.

The Engineering leader will follow-up on relevant risks, actions and verifications. The QRM make sure that the engineering group works according to the requirements in PIMS.

One example of interface between the QRM manager, engineering leader and the document controller is quality control of TORG. The document is the engineering leaders responsibility, however the quality control of the document is not determined.

The PCI manager and Planner will not be discusses because these roles have not been investigated

As there are several disciplines in a project there will naturally be overlapping between the risks as well. A project's risk picture is seldom similar to any other. Therefore, project risk might have different characteristics, and might be anything from project execution risks, cost and plan risks, new technology risks and HSE risks.

When there is uncertainty to whom owns the risk, the approach is accidental. Therefore, in situations where there is something risk concerned that need to be fixed, the one addressing the problem is usually the one that does the mitigation actions. When there is an overlaps of risks, the area of responsibility need to be clarified with the project manager. At the moment there are no clear predefined procedures for who does what.

5.5.4. NEW EMPLOYEES

One of the major challenges that the QRM role faces, likewise the rest of the industry, is the fight over the same human resources. The marked is blooming and more and more contracts are given. The QRM department in Statoil has grown extensively over the last few years, resulting in a heavy new requirement.

It is stated that there is a philosophy that 50% of the work force should consist of consultants in PRO. This again leads to a high turnover rate. By hiring consultant it is expected that they know what to do, while the reality is that they are struggling with the same issues.

A quality strategy implemented in the recruitment process is that none of Statoil's own suppliers are recruited to PRO. The idea is that by removing key persons from the suppliers, the suppliers deliveries to Statoil might get weaker. Consequently, most of the new QRM managers need to be trained from scratch. Because there are not some many available seniors that possess the desirable level experiences, several juniors have been hired as QRM manager. As a consequence of this, the QRM environment struggles with how to develop the level of competence to the junior QRM managers.

PRO is in a constant growth, with heavy recruitment of both seniors and juniors. In a project team there should be a mix of both. The seniors from one discipline can as easily guide the juniors from another discipline trough the project.

It is not beneficial to have a project team consistent only of seniors or only of juniors. Experience from the seniors should be distributed across the organisation, so that the juniors will need less and less follow-up.

To have multifunctional team members is a bonus to a project. This will increase the system view of the project, since these individuals are able to better see relations between the disciplines because they know what is required from other roles besides the one they already got.

A consequence of the unclear linked with the role, the role is redefined each time a new project is established. The role is defined as a result of the QRM managers' expectations and experience and the project's expectation to the QRM role. This approach is unnecessarily time-consuming.

5.5.5. PROJECT TEAM

When the interviewees were asked about whether the other project team members had a good idea about what to expect from the QRM manager, the majority answered that this is not the case. This was stated by both QRM managers and other roles in the project. This applies to both deliverables and responsibility. Some project team members are so fundamentally uncertain about the role that they do not know what the QRM abbreviation stand for. The uncertainty in expectation of the QRM role can potentially harm the true potential and intention of the role.

However, the majority feel that the way that risk is handled by the QRM role is good. One interviewee with experiences from other organisations, stated the Statoil is years ahead when it comes to risk management compared to other companies.

5.5.6. WORK LOAD

Stated as a matrix organisation, the QRM manager can be assigned to multiple projects at the same time. If the projects are in the same portfolio, then a QRM manager might have responsibility in 3 or more projects at the same time. This applies more for projects in the early phases. Project in the later phases in the CVP tend to have more workload linked to them, and cannot be that easily combined. Projects that are not in the same portfolio require that the QRM manager (and the other project team members) to understand the business case in order to find the right project risks.

One consequence of this organisational structure is that there are several projects fighting for attention at the same time. As a result of this the project that is able to express their need for attention is the one that gets it. However, this is not necessary the project that needs it the most.

5.5.7. COMPLIANCE AND LEADERSHIP MODEL

According to the leadership and compliance model presented in the Statoil book (see Appendix 12 - Compliance and Leadership Model) the first step of this process is to understand the task at hand. The next step is to identify the requirements. Already at the first two steps, the QRM role fails to comply with the model, because QRM managers tasks are not understood nor identified since there is unclear description about what to deliver. The result is only partly compliance with the model.

In order to be compliant with the QRM role, the QRM role needs to be understood. The required compliance is already at the first step at conflict.

5.5.8. TERMINOLOGY AND CERTIFICATION

Statoil have a unique set of terminology. These terms are not necessary better than terms defined by international standardisation organisations, in many cases they are no more than equivalent to existing ones. The Norwegian contractors are used to the Statoil terminology, but the new marked that Statoil is seeking to hire is not. Statoil is expanding more globally and with it a set of new contractors comes along. These contractors are not used to Statoil terms and expressions, and might deliver poorly due to misunderstanding regarding the requirements.

My understanding is that the terminology used in Statoil is based on ISO 9000 *Quality Management* and PMI's definitions. Furthermore Statoil's organisational structure is strongly influenced by PMI's, both directly and indirectly.

Statoil have chosen to not recertify their ISO certificate. The winning argument for this is cost. Recertification of a company of Statoil's size is extremely costly, even recertification of PRO is. On the contrary, the question whether a supplier is ISO certified is one of the must haves for the in the supplier selection. Through discussions with the interviewees is became clear that it is not the certification itself that Statoil should have, rather the systems that is required within that comes with a certification. Statoil is missing a system for internal check.

The name quality and risk management is a merger between two disciplines. Some of the interviewees have indicated that this title is to some extend misguiding. In my opinion, the merge between quality and risk management suffer the same faith as the HSEQ role. In the HSEQ role there was excessive focus on purely HSE activities, making quality neglected. The same happened to the QRM role, where quality is the only child in a family and risk is the new sibling that often get too much attention. Both are equally important and need to similar attention from the parents.

It is important to keep in mind that the QRM manager is first and foremost a quality manager, with a risk based approach to quality. Some of the interviewees stated that the QRM managers have lost their focus of QRM activities to purely risk management actives.

5.5.9. SUBCULTURES

The QRM environment is separated into two main departments, where the Oslo based department (QRMO) is in charge of Oslo and Stjørdal, while the Stavanger based department (QRMS) is in charge of Stavanger and Bergen.

Throughout the interviews it was brought to attention that there are clear differences between these departments. Whereas there is strong project focus in QRMS, there is a focus on sharing of experience within the disciplines in QRMO.

5.5.10. THE QRM PERSONALITY

The impression of the QRM managers from personal experience and the interview rounds is that they all have strong personalities. They have all courageous personalities and are not afraid to go their own way. When given an ambiguous job description, they will embrace it and transform it to their own. Accordingly, the deliverables from the QRM managers to the project differs from project to project and person to person.

There is nothing wrong with the QRM manager's spirit, and their love for the job is inspiring. The free spirit of the QRM managers need rather to be tamed and guided in the right direction so that the QRM disciplines work practise becomes more homogenous.

5.5.11. TWO DISCIPLINE LEADERS

Most disciplines in PRO have a discipline leader. QRM, on the other hand, have two. One discipline leader for quality management and one other for risk management. There are both positive and negative aspects of having two disciplines compared to having only one.

Having one for each of the line responsibilities consequently mean that there is more time on each discipline for development. Often the problems that the QRM discipline faces are purely risk management or quality management based. The two line managers are focused on their areas of responsibility, but not necessarily on the link between these two. By having two leaders the discipline come across as vaguely defined.

By potentially having only one leader, the leader will have a more harmonised approach. But again less time to each discipline.

5.5.12. NUMBER OF QRM MANAGERS

The QRM manager's main task is to facilitate the risk workshop and make sure that the quality actions are followed up. The role is a guard dog for the other roles in the project. By the interviews it was raised questions on how much follow-up is really needed. As the role mainly involves overseeing others work. Several of the interviews stated that it is important that the QRM manager does not become a very expensive secretary.

Is it truly necessary to have 8 QRM managers in a project, for all of the sub-projects in a portfolio there is a QRM manager. Subsea part? Topside part? Modification?

The QRM manager's main objective is to make sure the processes are followed. If the QRM manager is good, they will source out this assurance tasks, only providing guidance and making sure that the process is good. The QRM manager does not need to be hands-on all the time.

5.5.13. INCOMPLETE DEMING CYCLE

The Deming cycle (one of the fundaments to quality theory) is not followed. The cycle consist of Plan-do-study-act. A couple of the interviewees states that the two first part of the cycle is good, while the last two falls short.

It was also stated that PRO have a poor trending culture of their suppliers deliverables in to the project. In other words, they fail to *study*, by not checking what are doing is good or not. The other part that is missing is the *act.* There is not a good experience transfer system installed. This topic was discussed in the project assignment *Supplier Quality Management.* The main findings from this assignment regarding this topic was to improve the all existing Supplier Info database in PIMS (a tool for project development). PIMS's main function is to store and share information within a project. The Supplier Info database has some weaknesses making trend analysis of the suppliers difficult. These weaknesses are linked to metadata, authorization level, ambiguities linked to what should be trended, inconsistency between the architecture of PIMS and the governing documents, and lack of available data to put into the database (Mikalsen, 2011).

5.5.14. QUALITY CONTROL

Regardless of level of experience, location or project type, how the QRM managers check their work varies. My understanding is that the level of self-confidence (and even priggishness) will be determining how a QRM manager quality controls their deliverables. The most common quality control is to discuss with the competence area, discipline leaders and other QRM managers. The challenge many are faced with is finding the right people with the right experience. Sometimes these experiences cannot be found internally and information sources outside the organisation need to be contacted. An example is the use of new technology.

Based on findings from the functional description of the QRM role, there are not any regarding internal project audits, nor multidisciplinary reviews.

On other arena for quality control is the CAR process (shown in Figure 34) . The Arena review is the "exam" for the project. The project might get many "red" actions, which will indicate to the top management that this project is not at a mature enough level. However, a project might go through regardless of these red flags.

5.5.15. Different Projects

The QRM managers cannot influence time limitation or information available on projects they take on. Therefore the different types of projects can be seen as an external factor. The three main project groups are Green field, Brown field and Fast track.

Green field projects are typically exploration project, and newly found reservoirs that might be extracted. In these projects the available information will increase along with time as the geophysics, drilling engineers and reservoirs engineers collect and analyse more data about the well. More important for the QRM manager is the use of previous experiences. Only based on these experiences and input to the risk register can the right decisions be made.

Already existing equipment that need some sort of modification are common factors for brown field projects. In these types of projects the project is limited by solutions that have already been made, consequently these need to be taken into consideration. As a result, a lot of information that need to be taking into deliberation, but then again more certain in decisions made.

In fast track projects the limiting factor of time is important in all aspects of the project. Finding the right risks as early as possible in a fast track problem is essential, as there will not be any room for failing. When time is a focus point in a project, some of the interviewees raised a concern regarding the required risk analyses. There are requirements regarding risk analyses, however when time is limited the analyses sometimes becomes a burden and is done for the sake of it. Often resulting in that the wrong risk are identified and that time is spend on non-value adding activities. Time is always a limiting factor in project planning. The classical cost-time-quality triangle indicates that you cannot optimise all these factors at the same time.

The fast track approach can be on both green field and brown field projects.

Different type of stakeholders that need to be satisfied. Can a QRM manager jump between these different project types and still perform a good job, is a question that arise.

5.5.16. Quality Culture in Statoil

The majority of the interviewees felt that the quality culture both in Statoil and in PRO was poor. In trying to quantify how the situation is in Statoil, one of the responded answered that the quality culture in Statoil was six on a scale from one to ten, were ten being world class. This number is not in line with Statoil's mission to be world class.

There have been several project planning related incidents in Statoil's late history, such as Gullfaks C (2010) and Snorre A (2004). Both of these incidents could have had major consequences, due to failures in the project planning. It was stated in the interviews, that if this had been the outcome, Statoil would not have been anything like what we see today.

The result from the Norwegian Petroleum Safety Authority (Ptil) report regarding the Snorre A accident, stated that Statoil fell short on the following factors (Petroleumstilsynet, 2005)

- Compliance of governing documents
- Poor assessment of risk picture
- Lack of management involvement
- Violation of requirements linked to well barriers

These are the areas of weakness in Statoil and are areas that should be focused on. Leadership and compliance is in the spotlight at the moment (spring 2012), however this report dates back to 2005. This example lines up with many others in that changes and implementation in a complex system is time consuming. Moreover, the other factors identified by Ptil have not been discussed to the same extent as this factor. This can also be referred to as the human factor, getting people to work together and in a team towards the same goal. Other organisations that have struggled with the same problem is the football club Real Madrid. They did not win the series for many years. They had everything, all the right people, the world's best players, like David Beckham, Ronaldo and Zinédine Zidane. However, they did not work together and towards the same goal. The same parallel can be drawn to a project management team where the different disciplines have different roles but need to be coordinated.

In order to show how different departments in Statoil have to work together to reach the same goal, an illustration of the cash flow in Statoil is given below. This figure shows some of the influential factors to Statoil's cash flow of a typically offshore installation.

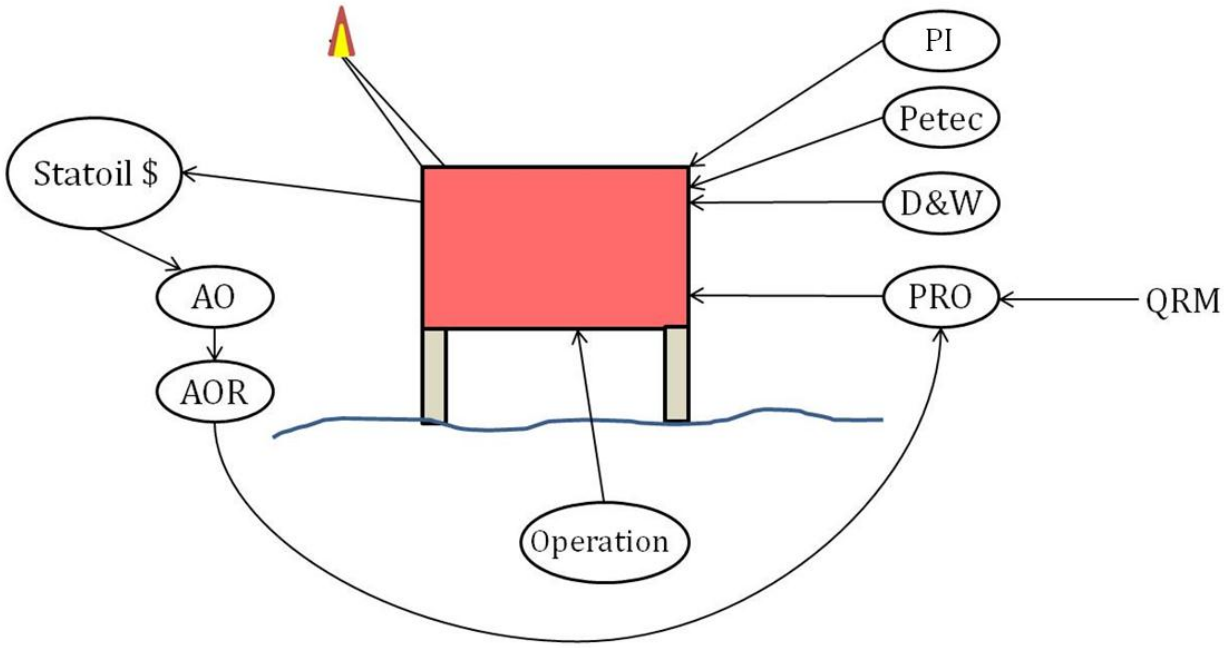


Figure41: Illustration of factors influencing the Statoil cash flow.

PI is an abbreviation for Plant integrity, and owns the systems for the platform. Petec stands for petroleum technology, while D&W is an abbreviation for drilling and well.

These departments will not be discussed more in depth, only quickly described so that the reader gets clearer view over the complex system that an installation represent.

The installation is owned by the AO, they administrate all the installations in Statoil. On behalf of the AO an AOR is nominated. The AOR is the single point of contract between the facility project and AO. This AOR sets out a contract to PRO, which is responsible for the "planning of the project". One of the members of the project management team is the QRM manager. The AOR leads the BCLT (shown in Figure 36 : *Investment project structure (FR05)*).

After an installation is build, it is handed over to Operation. It is operations that make the "wheels go around" and make sure that everything is in order. The installation is managed by an offshore manager. One of the findings is that there is no quality role linked to either operations, or the left-hand side of the figure. Extremely costly installations are well planned by PRO, but there is no one to take care of the quality actions in Operations.

In order to have a successful offshore installation (or any other installation) all of the mentioned above need to be present. It was stated in one of the interviews that around two out of three project failures are due to failures of one of the elements in the cost, time and quality triangle in Figure 21. Therefore, focus on quality in a project is extremely important.

One other findings, is that there are no one to take care of quality interest in ownership of the platform. With no focus on quality management in the AO, the overall quality aspect of the project might fall short. There is neither a person with risk management background in this group, only a HSE manager. When a HSE manager is responsible for the risk management process the risk focus is often on HSE related incidents, and not on project risks, such as execution and deadlines. Thus, these types of risks are not communicated easily to top-level management and might not be taken into consideration in major decision making processes.

Between the interviewees there was a disagreement on who is the customer to PRO is. Some stated that it is always the AOR, while others the subprojects. It is stated in the eight QM principles that the customer focus is towards the AOR and the stakeholder expectations. Only through a clarification conversation with the AOR can the deliveries from the project be settled.

Safety before production is Statoil's main rule. Accidents are often caused by the lack of not meeting the requirements, meaning that there should be a natural focus on safety in the organisation. When this matter was addressed, some of the interviewees stated that this is not the case.

5.5.17. RISK CHALLENGES

There are four main issues that QRM role struggles with regarding risk analyses.

1) Identifying the right risks
2) Getting the right people to participate in the risk workshops
3) Understanding the business case early enough
4) Mitigating actions

In order to find the right risks, the right questions need to be asked. Without understanding the business case the right risks cannot be identified.

A busy time-schedule limits the available time for the risk analyses. At the time the analyses are done, the scope is still immature, which is a limitation factor to the quality of these analysis. There is always a struggle to get the right people at the right time. The projects are fighting to get the same resources, and for the risk workshops it is desired that people with the right experience is present.

By adapting a fact-track project schedule the risk analyses might suffer. The necessary analyses still need to be done. By merging the DGs together, the project team need to be perceptive in making sure that all the necessary analyses, steps and documentation in the process is followed.

In order to close the risk process loop (Figure 49) mitigating actions need to be implemented. The easiest part of this process is often to identify the risk, but it is harder to find good mitigating actions and get these implemented.

One observation made regarding to the finding of the right risk and implementing actions towards these, is that even though the right risks are identified, the project team might want to act on other risks that are more easy to handle rather than the right risks which need more effort to solve and will not be prioritised. Consequently, the wrong risks get undeserved attention.

If the QRM manager is not good enough, then the risk analysis will not be value adding, because the analysis will not be able to find the "right risks". Just doing the analysis because it is required is not value adding. Consequently, there is not enough focus on finding the correct risk picture, rather just finding *a risk picture*.

In addition one of the interviewees responded that there is a need for a common risk breakdown structure for all projects. At the moment this approach is based on human/personalised assumptions, consequently there is an inconsistence in the way things are carried out.

My understanding is that most project participants have been doing risk analyses without even noticing. Thoughts such as "what have gone wrong before" and "how can I make sure that this does not reoccur" is a standard mind-set. The only "new" aspect of risk management is that the risk management has now a documented process. This process might come across as estranged and unnecessary time consuming. Arguments such as; *it has always worked before, why change something that is working*, is common. One step of the Deming cycle is continuous improvement, and this is an natural reaction to change. In order to have verifiable processes risk management processes need to be adapted.

In facilitate projects, one of the risk challenges are linked to communication of risks. The risks are the same risks in different sub-projects, but when addressing them to the bigger risk picture, they might have a different name for the same risks. When making the risk picture the viewer need to be considerate of whom these risk are communicated to.

6. STRENGTHS

The main objective of this chapter is to identify and analyse strengths of the QRM role. This is based on findings from the literature, and information gathered about the QRM role in Statoil.

Some of the strengths presented here will form the basis for the generalisation of the QRM model found in 7.5 *Generalisation of the QRM Role.*

6.1 COURAGEOUS QRM MANAGERS

The most important Statoil value that the QRM manager possesses is being courageous. There are many levels of being courageous, but in the QRM context it is important to challenge the surroundings and push for constructive change.

The persons responsible for employment of QRM managers have focused on finding courageous people, which they have successfully found. It is in their nature to challenge the surroundings and not just sit on the border-line nodding their heads at the world, consequently they will do a good job.

6.2 PRIORITISATION LIST OF WORK

It is a well-known fact that time is money, thus there is a desire that as little time as possible is spend on non-value adding activities. In addition there is not always enough time to do what is wanted. In these cases it is beneficial to have a tool for prioritisation of work. Using risk analyses as a generator for quality work will reduce the amount of work done purely on routine, which in many cases is unnecessary work. By having the risk based approach that the QRM manager has, the project can focus on the right areas.

6.3 RISK WORKSHOPS FACILITATORS

The QRM managers' ability to be a generalist generates their ability to be good risk facilitator. In order to ask the right questions the risk facilitator need to understand the other disciplines concerns and challenges. They need to have some technical understanding, as well as financial and project management understanding. These are qualities that the most QRM managers possess. In addition the QRM manager does not have any ownership in these disciplines, and can stay objective through the workshop. Accordingly the QRM manager is the perfect risk facilitator.

6.4 COMMUNICATORS

As mentioned above, the QRM managers are generalists and have an objective approach to their work. The QRM manager need to be able to communicate on different levels in the project. These levels are:

- To higher levels. By generating a risk picture to the AOR and partners
- Between the different disciplines in the project. The QRM manager can help the different disciplines to see the others needs and concerns
- Commutations with contractors. Through verifications and auditing, the QRM manager often need to work with the contractors and follow-up on their deliverables

The QRM manager is able to communicate well with all of these levels and is a natural link between the different levels.

6.5 AUDITOR CERTIFIED

One of the requirements of the QRM managers is that they are certified auditors. Thus certification abele the QRM manager to have a system approach and focus. As discussed in *The Decision Making Perspective* it is important to address the whole system and not a sub-system in the decision making process.

6.6 RISK WORKSHOPS

The EMA (2011) emphasise the importance of a multidisciplinary team to help identify the different risks in a project. By having a multidisciplinary team all of the discipline's risks will be represented. Mostue and Rosness (1994) also stated that multidisciplinary groups are the most suitable for solving complex problems.

It might seem as a logic and simple tool, but it is important that the risk management process does not get to complex. Then the users will spend more time learning how to use the tool, rather than spending their valuable time on what they are supposed to; identifying the risks in a project.

Risk based monitoring is discussed by Williams et al. (2006). In the risk management process, there is a list of "Top 10" risks that are identified. These risks are somehow generated up in the system, and these are the focus point. The focus is on those risks that have the most influence on the end quality (of the project).

In addition the risk matrix is an intuitive tool, in that sense that it is easy to understand and its results are easily communicated.

6.7 RELATIONSHIP BETWEEN RISK- AND QUALITY MANAGEMENT

The QRM model takes advantage of the natural link and intersection between risk management and quality management. The model tries to take the best ideas from risk management and integrates them into quality management.

In addition, the Statoil QRM model follows the PMBOK's (2008) recommendation of that the quality plan should be updated to reflect the changes driven by the results of the risk analyses.

Furthermore, there are still some areas of improvement regarding the topic "what can QM learn from RM?" (Discussed in 2.3.8).

6.8 THE QRM MANAGERS INTEGRATION ON DIFFERENT LEVELS

The QRM manager is not only a part of the project management team in facilities projects, but also part of the business case. By having this set of organisation, the QRM manager make sure that the QRM role's objective is communicated to Petec, Operations and D&W. In addition the QRM managers often facilitate risk workshops for the support function, with focus on project execution risks and business case risk. These are experiences that the other support functions

are missing. Without the QRM managers involvement in these subprojects might not have been able to be carried out.

In addition the QRM role is a natural part of the leader group for facilities projects, which consequently leads to that the QRM managers objectives and view on quality and risk management gets sufficient amount of attention in all facilities projects. Without the QRM role represented in the context, the allocation of the resource might not be ideal.

6.9 Meets the Needs of the Organisation

In Statoil in general there is a focus on risk management. From the top management it is communicated that risk management is one of priority areas for the organisation. The focus on risk management is not only present in Statoil, the rest the industrialised world is also following the trend. By having the QMR role in PRO, the department are able to meet the requirements from top management regarding risk management.

6.10 QRM as Foundation for Decision Making

The QRM model used in Statoil allows internal decisions made in projects to be based on risk analyses. As stated in 2.3.6, this is necessary to assure a that the decision makers are have sufficient amount of data to help in the decision making process.

In addition, Statoil's QRM model include the stakeholders requirements in the decision making procedure, in a way that resembles Rausand's (2011) Decision framework.

Statoil's approach to handling projects in an early phase also correlates with Husby et al.'s (1999) emphasise on strategic thinking in these phases.

6.11 Summary of the Strengths

The strengths of the existing QRM model is identified as it is presented in the list below.

- Courageous QRM managers will challenge the system into continuous improvement
- Good organisation of resources based on risk analysis
- Being a generalist is an advantage in facilitating risk workshops
- The QRM managers poses the ability to communicate with different levels of the organisation
- Good system understanding through being auditor certified
- Facilitation of risk workshops and use of risk analysis
- Take advantage of the relationship between risk- and quality management
- The role is integrated into several levels of the organisation
- Statoil's focus on risk management is in line with the QRM role
- QRM as foundation for passage of major decisions and mile stones

7. AREAS OF IMPROVEMENT

This chapter will discuss areas of improvement linked to the QRM role based on chapter two, four and five. It starts off with a list with direct suggestion to the findings addressed in Table 4 : *Findings from different interviews and* before general areas of improvement are presented. This section is structured similar to Table 4, in order to easily show the link between findings and proposed areas of improvement. In order to have a successful implementation the proposed solutions should:

- be as simple as possible in order to meet Statoil's simplification strategy
- be able to meet with overall business strategies

In other words the perfect balance between too much information and sufficient info needs to be established. The implementation should be as simple as possible in order to reduce potential waist in the project by having a lean approach to project management (2.1.5.4 *Lean in Project Management*). Where areas of improvement are identified, they will be discussed in relation to findings from the previous chapters. This chapter ends with a suggestion of how the QRM model in Statoil can be generalised and adopted into other organisations and business areas.

No.	Challenge	Action
1.	Different phases, different deliverables	Value stream view
2.	Link between RM and QM	Homogenous use of terms, based on GL300
3.	Interphase, several disciplines	Predefined work requirements
4.	New employees	• Better training of new staff • Changing the rules
5.	Project team	Define the QRM role
6.	Work load	Communication and common understanding
7.	Compliance and leadership	Common understanding
8.	Terminology and certification	• Adapt to standardised terminology and change the QRM name • Internal "certification"
9.	Subcultures	Align with PRO's strategy
10.	QRM personality	Recruit persons with desired qualities
11.	Two discipline leaders	Have one QRM discipline leader
12.	Numbers of QRM managers	Clear definition of responsibility
13.	Incomplete Deming cycle	Implement the cycle in all aspects
14.	Quality control	Pee- and self-checks
15.	Different types of projects	Experience transfer database
16.	Quality culture in Statoil	• Communicate Statoil's quality goals • HSE approach to quality • Customer focus in line with 8QM principles
17.	Risk challenges	• External help • Database of experience • Continuous update risk register • Identify type of risk before actions are decided

Table 5 : List of actions

7.1. AREAS OF IMPROVEMENT

7.1.1. THE DIFFERENT PHASES, DIFFERENT DELIVERABLES

In the previous chapter, a description of the current separation in the CVP was presented. The main finding from this study is that there are different approaches to the QRM role according to which phase you are in. In order to make the QRM role as easy as possible, the following solutions are proposed and discussed: V*alue Stream View* and *Focus within the Phase.*

7.1.1.1. VALUE STREAM VIEW

In the value stream view there is a clear separation between post and pre DG3. The phases before DG3 have been merged into one phase called *Planning,* while the phase after DG3 keeps it's name, *Execution.* The logic behind this that in order for a project to succeed the whole value stream need to be considerate. It is in the late phases that the quality of the work done before DG3 will show off.

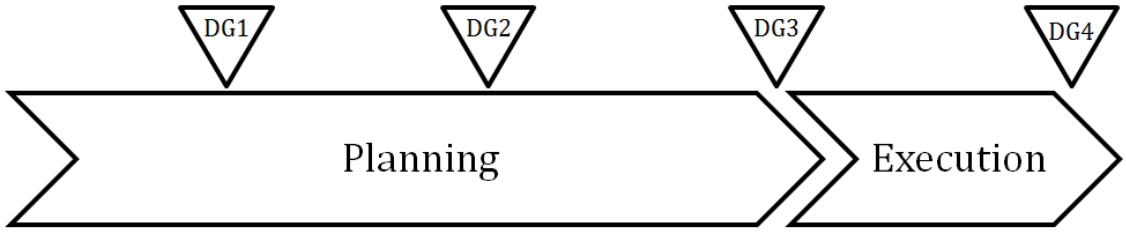


Figure42: Value stream view of CVP

In order to have a successful implementation of a value stream view the project team need to follow the project longer than what the CVP process requires. There are some negative aspects of this view, namely not getting new inputs from new project team members, it is not as dynamic as the old view, the project team participants might follow the same project for years and becoming bored. However, the project team members will get more ownership to the project, because they get to see the result of what they have planned. Since there are only two "phases" in this model, and their characteristics are very different raises the question is whether the QRM manager (and the other project team members for that matter) are able to deliver in both phases. In the first phase there is a strong focus on planning of the project, important tasks here are linked to strategic planning and stakeholder management. On post DG3 there is a stronger focus on being hands-on with the contractors and more quality control work.

7.1.1.2. FOCUS WITHIN THE PHASE

Another possible solution is to focus more on the phases defined in the CVP. The functional description should focus on all the deliverables that the QRM manager has during a phase. There should be some sort of check-list that makes sure that all the deliverables are met. This way there will not be any doubt regarding the deliverables of the QRM role. However there are some negative aspects connected to this solution. It has already been stated that the QRM managers should be courageous personalities that like to challenge the system. By having a predefined role description that does not leave any room for personal touch, the QRM managers might get bored and lose their well appreciated confidence. In addition this solution can potentially lead to sub-optimised solutions, which is not desired according to *The Decision Making Perspective.*

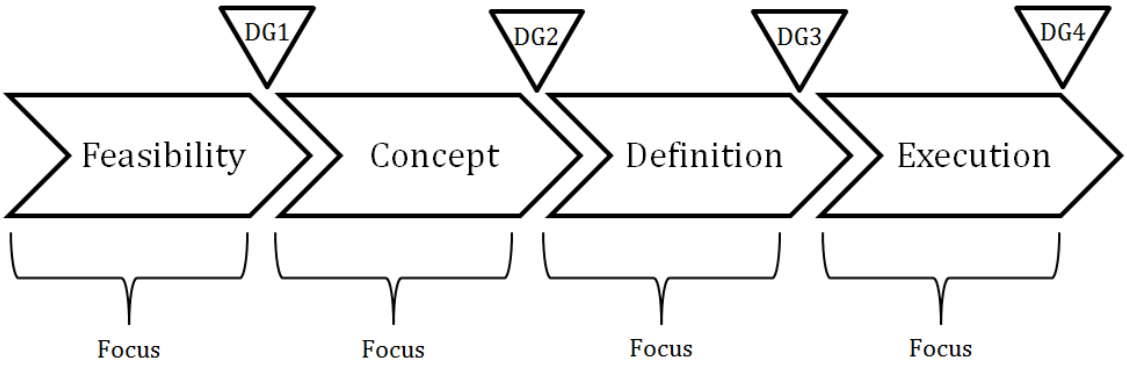


Figure43: Focus within the phase

Conclusion

Based on this and findings from governing documents and interviews, the functional description should be separated into two, and not four as before. The split should be between the planning phases prior to DG3, and execution phase post DG3, because the project team members need to be able to see the whole picture in order to see what need to be done in the previous phases. Already in the project's early phases it is important to have a value stream focus on the process. By only optimising the sub-processes, other areas of the project might have to pay the price. There should only be one QRM role description, but the job description will change according to the different phases.

It is also stated that the project will benefit from having a QRM manager as soon as practically possible, and at least before DG2 (GL3000).

In the early phases there are a lot of human interactions, with partners and others, while in the execution phase the project are located at the contractors' office. There are also a lot of human interactions in following-up on contractors and partners, consequently there should be a focus on the QRM managers people skills as well.

This conclusion asks a new question regarding the QRM managers' ability to deliver good project both to pre DG3 and post DG3. The answer to this question is yes as concluded earlier in this thesis. However, people have differ preferences, some like to work in the early phases, letting their creative sense flourish and strategic thinking be tested. While others are fond of the execution phase, and the interaction with the contractor and the follow up on their work. Depending on the person, they will prefer different phases. If a QRM likes control and order, they will normally like to work closer to DG3. While a more creative and strategic thinker will prefer the early phases, where strategic thinking is the key to success.

Through the interviews it was commented that there is a different focus point in each of the phases, and that throughout the phase there will be a change in focus. This relationship is illustrated in Figure44.

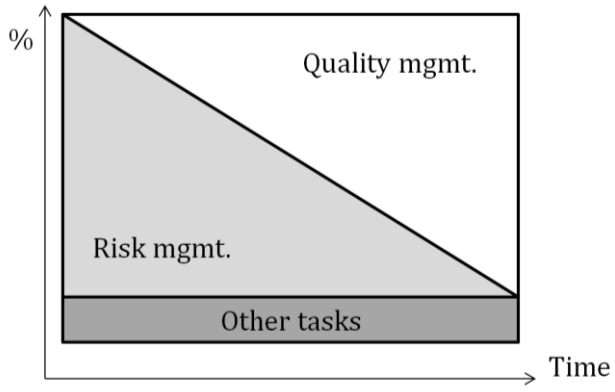


Figure44: Proposed relationship between QM, RM and phase development. This figure illustrates not a known relationship between risk- and quality management, rather an idea.

Early in the phase there are more focus on risk management related activities and on establishing a understanding of the situation. Based on these risk analyses, a monitoring plan with quality actions is established. Naturally there is a gradual shift in focus from risk management to quality management. In addition there are other tasks that the QRM manager needs to see to, consequently there is never a 100% focus on either of these disciplines.

7.1.2. Link Between Risk and Quality

There is no doubt that there is a natural link between risk and quality, however, to what level is the question in hand. In order to get a more aligned QRM role is it is highly suggested that a basis understanding of the link is established. This understanding should be based on Figure 39.

There is already a consensus regarding this figure and it is simplistic and easy to communicate. One of the challenges the implementation of this figure might face is that it is to simple and not powerful enough.

The background of the different QRM managers varies from juniors with no experience besides a university degree, highly experiences project managers, economists, experienced master of Sciences, PhDs and consultants with various experiences. Consequently, the QRM managers have different level of experiences, and different foundation for determining a view on both risk and quality. In order to mitigate this, a common set of words should be established in PRO.

The simplest and easiest way of implementing these set of words is by adapting the definitions that are already defined in GL3000. The same definitions can be found in Appendix 2 – Terms and Definitions, and GL3000's definitions forms the definitions used in this thesis. One of the challenges with this implementation is that GL3000 is a withdrawn document and does not have a high place in the hierarchy, see Figure 29. However these are simple definitions that can easily be communicated and aligns with the definitions used in the literature study.

7.1.3. Interfaces with Several Disciplines

In order to clarify potential interfaces with the different disciplines there should be a discussion with the project manager before the project starts, and predefine areas of responsibility. One negative aspect of the approach is that the project is dynamic, the available resources can wary.

Sometimes the one with the responsibility allocated does not have time to solve the problem, but have to because of the predefined responsibility.

One positive aspect of having a blur definition of the interfaces is that the project can optimise the team by allocating areas of responsibility according to the individual's strengths and weaknesses and team members' experience.

One other solution is to establish a specific work requirement for each project. It predefines the areas of responsibility, releases time spent on addressing the same issues over and over again.

7.1.4. NEW EMPLOYEES

The issues regarding the blooming market is on an external level, outside the QRM managers power of control. However, the symptoms of this problem can be reduced through actions suggested here. In order to mitigate the symptoms of the blooming market, the disciplines should make sure that there are good training systems for the juniors, and set some requirements for the consultants

Many of the seniors survive the QRM job because they have experience from similar work. They use earlier experiences and adapt them into a QRM setting in Statoil. The mind- set is often that "It has worked before, why should it not work this time also". Sometimes they hit nail on what the QRM manager should do, while they at other times fail to meet the deliverables.

A statement made in the interviews was that Statoil is poor on training and learning. These are areas that need a strong focus in order to get competent QRM juniors and further develop existing staff's competence level.

Juniors can potential follow a senior in some projects, and see how things are being done. It should be up for discussion whether this is the ideal solution, considering the possibility that the junior potentially can adopt the seniors' bad habits. Input to this discussion has to be the QRM personality. The QRM managers are courageous, and as discussed earlier, the QRM manager will change the role into its own, potentially eliminating these bad habits.

One of the symptoms of the blooming market is the high turnover rate of consultants. There is a rule that consultants should not be externally hired in for more than four years. Adding this fact to the statement addressing the philosophy of having 50% consultants will automatically lead to a high turnover rate. In addition, many of the consultants are turning 50 years of age. Another fact is that Statoil have a philosophy that no one over 50 are hired. Of course this is the black and white answer, but the main point is still made. Many of the preferred experiences that the QRM managers should have, takes years to achieve. It is a well-known fact that the older one gets, the slower one learns. In this case, this fact will be overruled by the value of possessing the right experiences. By ruling out the possibility of hiring previous consultants, and any other over 50, is like shooting oneself in the foot. Especially in PRO in Statoil, this rule of thumb should be reconsidered in order to get people with the experiences that the project needs.

PRO need to recruit new people to the team from somewhere, and taking them from the suppliers is not a good strategy. Because it can potentially reduce the quality of delivered products into the project by more than the potential gains from having the same people in Statoil would have. Thus many QRM managers are requited with no or little experience from project management.

To assure that the juniors will perform according to expectations, proper training need to be in place. At the moment there is a set of courses and training sessions. New QRM managers need to go through a "new QRM manager in Statoil"- programme. In addition a buddy is addressed to the QRM junior, the buddy's role is to take care of the newcomer. There is an environment for transfer of experience, but there is still room for improvement in helping the juniors and new QRM managers becoming good. It is a well-known fact that good planning and investments in the early phases of any project will benefit the end result. The same philosophy should be added for the juniors. The juniors can be compared to new projects that need training and investments in order to succeed later. By addressing potential problems on an early stage, changes are less expensive. Ideally the project should have multidisciplinary roles to guide the juniors in their "extra" discipline. This project arrangement will be the first step after following a senior in some projects.

Some say that the only way of learning is by doing, however this should not be the only solution. Based on literature addressing what RM can teach QM, experiences can come from databases. In order to get the experiences needed, a search in the existing databases can be the solution. Challenges linked to this approach is that there are no good procedures for it, and bringing this database up to an useful level will be both costly and time consuming (Mikalsen, 2011).

Statoil is in a unique position as a fully integrated energy company. It covers the whole lifecycle, from explorations, conceptual phase, planning, execution, operation and maintenance. This position sets a good position for transfer of experience. It is a shame that the transfer of experience database is not fully explored and developed (Mikalsen, 2011).

One of the best ways of learning is to make mistakes and later on learn from these. However the organisations cannot have this philosophy in order to survive the harsh rules of business. Decisions need to be right the first time, not the second or the third time around.

The QRM manager need to be a generalist and the easiest way of becoming one is through personal experience. However, this addresses a conflict of interest, because many of the juniors hired do not possess this quality.

There are some challenges linked to the constant changes in the organisation. There is a lot of work going on linked to the governing documentation and the QRM manager need to pay attention to these changes, not always that easy.

Another symptom of a blooming market is the lack of resources. Consequently there are many projects crying out for attention at the same time, and the project that cries highest get resources. This fact will lead to a vicious circle of constant fire fighting, and not fire preventing.

7.1.5. PROJECT TEAM

As a symptom of the QRM manager's free interpretation of the role, other project team members do not have a clear view of what to expect from the role in general, but rather have expectations to the individual QRM manager.

The symptoms described here have been root-cause analysed. The result states that that in order to reduce the symptoms a more defined QRM role need to be established. This is the essential of this chapter, and will not be discussed in this section. However, when a good functional description is in place, it is not only enough to get the QRM managers up-to-date with

the changes. In order to reduce the uncertainty linked to the QRM roles in the project from the other disciplines, these changes need to be communicated to the other disciplines. Ares of responsibility, limitation to the role and work method should be highlighted. The changed QRM role cannot be successfully implemented without help from the other disciplines.

7.1.6. WORK LOAD

Based on Kerzner's (2009) description about project organisation, there are no other organisational structure that will meet the requirements.

Advantages of the matrix structure are that it allows a flexible allocation of resources and scheduling of these, rapid response to changes, key persons are shared and roles such as the QRM manager's role can address several projects, technical focus, sharing of authorities and prioritisation of that specific project is possible (Kerzner, 2009).

Moreover, there are some disadvantages to this type of organisation and these points need special attention. These are complex information and workflow, dual reporting, management goals differs from project goals, difficult to monitor and control, functional managers may prioritise their own function first, and a more ambiguously approach to managers and employers are common (Kerzner, 2009).

To mitigate problems linked to matrix organization structure, good communication and a common understanding of the project goal is important.

Many of the projects are not big enough to have a fulltime QRM manager. Possible alternatives could another structure of multi-disciplinary roles. The possibility of having multi-disciplinary roles has now been experimented with at Stjørdal, and experiences from this will be shared with the rest of PRO.

7.1.7. COMPLIANCE AND LEADERSHIP

In order to be compliant with the QRM role, and fulfilling the Compliance and leadership model the first step of the model need to be achieved, *Understanding the task.* In order to do so, the task needs to be defined through a functional description.

Statoil have developed a set of own guidelines on how to follow the Compliance and leadership model[10]. This guide states that in order to follow the first step of the model the deliverables and desired results need to be determined on order to get a shared understanding of the risks involved. In order to get to the next step, both the threats and opportunities need to be addressed. The proposed solution to this challenge is to make a clear description of the QRM role. This description should include elements such as deliverables, limitations and challenges.

7.1.8. TERMINOLOGY AND CERTIFICATION

Certification

By adapting to an ISO certification, the challenges regarding terminology might also vanish. However, there are several aspects that need to be taken into consideration when discussing whether or not Statoil should get recertified.

[10] « A guide to the compliance and leadership way of working» http://entry.statoil.no/HowWeWork/Globalinitatives/Compliance/Training/Downloads/Compliance%20and%20leadership%20guidelines.pdf (Accede: June 5, 2012)

The most important aspect is that Statoil is a large company. A recertification must be renewed at regular intervals and demands enormous amount of resources. In addition it extremely costly.

In the interviews several people stated that Statoil are not up to a required level for the certification, and will not survive a hypothetical certification process.

It is not necessarily the certification itself that is important, but rather the level of organisation it requires. Instead of spending a lot of time and resources on getting the international standardisation organisations acknowledgement, Statoil should seek to meet the same standards. This should be checked internally on a regular basis. It might not be necessary to apply this to the whole organisation, but PRO should at least adapt this self-checks.Because, humans tend to work harder if they know that somebody will double-check their work, compared to situations where work does not go through quality control.

Terminology

By not using a standardised terminology, there is a potential risk that the contractors will fail to meet the requirements. In order to mitigate this risk, there are two possible solutions. These are:

- Adapting the ISO terminology
- Keeping the Statoil terminology and implement a heavy focus on getting the contractors to "talk the same language"

The first and simples solution is to adapt to the standardised terminology, such as ISO 9000:2005. This is the terminology used by many of the contractors. Furthermore, if Statoil decide to continuously ignore the fact that they are operating in a global business, and not only in Norway which have been the main business area, they will potentially have projects that fail. Demanding contractors to obey the Statoil terminology and not expecting any challenges linked to that are bigoted. The Norwegian contractors are used to demands like these from Statoil, but the rest of the world will see this as a challenge and a potential threat to the project's success. It is like going on holiday abroad, expecting everybody there to speak Norwegian.

In a worst case scenario the contractor might refuse an invitation to tender or the contractor might act in good faith accruing to the terminology but fail the delivery due to communication problems. The sum of potential cultural differences and terminology challenges will cause the project to fail. The proposed solution is to adopt ISO terminology.

The name

The objective of the QRM manager is to assure a successful business case through a risk based approach. The QRM manager is first and foremost a quality manager.

The QRM manager does not have the same area of responsibility as the quality manager in Statoil before the merge. To emphasise that there was a shift in the quality role and to adapt to the organisational structure they had in Hydro the QRM name was implemented.

Many QRM managers are lost in the name, and many more, such as the other disciplines, share the same faith. The easiest solution is simply to change the name to "Quality Manager", this to emphasise that the QRM manager are first and foremost a quality manager.

To verify the statement that the QRM manager is a quality manager, eight other businesses have been contacted to get an example of their task description for a quality manager. All of these organisations are seeking new quality managers. Only two of the contacted business responded. Based on the small amount of data collected there are some clear similarities between the quality manager role and the QRM role. The proposed solution based on that the QRM should be renamed to quality manager (QM). It should be stated in the functional description that the QM should have a risk based approach to quality, and nothing more. This will hopefully eliminate the amount of QRM managers which mainly focuses on risk management activities.

7.1.9. SUBCULTURES

QRM deviation is divided into two main groups, with operations on four different locations. Consequently, some subcultures have emerged because of these geographical challenges, and local geography. In this thesis the two extremes of these sub-cultures are called discipline focus and project focus.

One example of this is the Stjørdal situation. Many of the employees at Stjørdal lives in Trondheim, a 45min bus ride away. When the project has a contract located at Trondheim, many choose to move operations to the contractors' location. To mitigate this migration there have been focus from top management at Stjørdal that there should be a discipline focus in the projects. The QRM managers should only do what they are supposed to do, and no other parts of the project. By having a too strong discipline focus, the disciplines often communicate frustration because they are not fully integrated in the projects. Consequently they do not share the project's understanding of the goal. The different roles cannot do multidisciplinary tasks. The QRM manager need to enough information about the project in order to understand the goal and then be able to facilitate a proper risk workshop, and therefore the discipline focus is not always the best approach as it separates the disciplines from the project.

The other focus approach is project focus. In a project focus the project team work together towards the same goal. Due to the need for dynamical approach and variation in qualification, this approach is much used. The project members sit together and form the project together. Working on a project isolated from others that share the same roles as you in other projects, can be challenging in the sense that it strangles the experience transfer. Sharing of experience between people with the same background, perspective and goals might help in finding new solutions to problems. The idea is that in being able to achieve the level of transfer of experiences that the organisation requires, the disciplines need to have close relations.

The QRM role need to be an integrated part of the project team in order to get the full picture of the project scope. The decision need to be aligned with PRO's business strategy. This strategy is unknown to the author, therefor no solution is presented.

7.1.10. THE QRM PERSONALITY

All of the QRM managers should be courageous. In addition there are some other personal characteristics that that the QRM manager should have. These are discussed in 7.4.4, and have been added in as a sum up point to this chapter. A symptom of this strength is that QRM managers take the role and address it how they like, consequently leading to many different approaches.

The proposed solution to this area is that the one responsible for the requirement process seeks to find persons that possess several of the personal qualities listed in 7.4.4. In addition it is important that the newly established functional description allows to nurture these qualities and not suppress them.

7.1.11. TWO DISCIPLINE LEADERS

There are both advantages and disadvantages of having two discipline leaders, one for both of the line responsibilities. The proposed solution for this is to have only one discipline leader, as this accords with the QRM role.

7.1.12. NUMBER OF QRM MANAGERS

Because there are many complex systems that requires reporting of quality and risk related tasks by the project team members, the QRM role might come across as a burden. One proposed solution to this is to raise attention to the user interphase of these reporting tools.

Through correct reporting and use of the systems by the other disciplines the QRM managers work gets more easy. A clear description of what the QRM manager shall deliver need to defined, in order to prevent the other disciplines form taking advantage of the vague description of the QRM role. The functional description need to defined based on a lean approach, in order to reduce unnecessary time spent on duplication of work. In addition the functional description need to be standardised, in order to comply with literature disused in 2.1.5.4. There are two possible solutions on how to get all the management disciplines to provide the required documentation and follow-up.

The less time consuming option is to invest more in training of the existing systems, with focus on training of the project management teams. However, many of the existing systems requires daily follow-up, which again leads to unnecessary time spent on non-value adding activities.

The second suggestion was introduced by the interviewees from the other disciplines. They stated that there is too much administrative work, and not enough focus on what the different disciplines are supposed to do. To mitigate this, the reporting systems need to be simplified. However, this alternative requires a lot of commitment from top-management, as well as a lot of resources.

Another area of improvement is in situations where there are more than one QRM manager working on the same project. In these situations there need to be a clear definition of responsibility between the different QRM managers in order to prevent duplication of work.

7.1.13. INCOMPLETE DEMING CYCLE

The quality cycle can only be completed if all the steps of the *plan-do-study-act* are in place. The Deming cycle is discussed in 2.1.4.1.

To get at better quality culture, the cycle needs to be fulfilled. PRO can improve on their *study* ability by internal audits of the organisation. Implementing this might be a challenge since the word audit is negatively loaded. The human psychology tends to make people act opponent if they think that they are being investigated.

In order to fulfil the cycle, the cycle needs to be integrated in all aspects of the QRM managers work. The audits should apply for everybody, not only on the lower levels of the organisation. By

carefully selection of words, the negative association of the word audit might disappear. The word audit can be changed with more positive words like verification or confirmation.

In order to fulfil the *act* part of the cycle a possible solution is to have focus on that the results from the audits/verification are analysed and areas of improvement are implemented.

The benefits of having a complete quality circle is identified by Kerzner (2009) to be improved quality of end products, better communication in the organisation, improved worker performance and morale.

7.1.14. Quality Control

In order to have a good quality control system for the QRM managers deliveries, a standardised procedure need to be in place. This procedure should clarify which documents that could pass a peer review or other reviews.

In addition the QRM discipline should continuously check their own performance. Self-assessment on a regular basis is recommended. Based on results from IPA and these self-assessment both PRO and the QRM managers know which issues to address in order to move towards a world class organisation.

Furthermore, there is always a struggle for resources, the QRM managers should help each other, but they need to be aware of potential dangers attached. This must not affect their own work, and everybody needs to be willing to help each other in order for this arrangement to work.

As a result of the high turnover rate in PRO, valuable experiences will be lost from the organisation. To mitigate this the experience transfer database need to be updated and improved. Challenges this database experiences is discussed in the project assignment *Supplier Quality Management,* and a summary of the finding regarding the databases can be found under 5.5.13.

7.1.15. Different Types of Projects, Different QRM Approaches

It has been up for discussion whether Offshore Brown Field at Stjørdal shall be addressed other types of projects and if the QRM manager can juggle between different project portfolios. The question that needs to be answered is whether valuable portfolio related experiences are will be addressed in the new projects.

A solution to this question is further development of the existing experience transfer databases, which was discussed in the project assignment *Supplier Quality Management,* and the summary can be found under 5.5.13.

7.1.16. Quality Culture in Statoil

The quality culture in Statoil has a long way to go in order to become world class. However, with some easy steps the quality culture could increase.

In the previous chapter findings from a Ptil-report were presented. These reports, or at least the findings from them, should become compulsory. Employees in PRO need to know where projects have failed in order to not make these mistakes again. The reports have low value if they are not read and it's findings not acted upon.

In addition there should be a similar QRM role in both Operations and in the AO group, in order to have a quality focus throughout the entire value stream. The QRM role in the AO will focus on quality in the strategy, while the QRM manager in Operations will see to that planned quality by PRO is working. Measurements of quality should be done on the project in operations and reported back to the experience transfer database, so that PRO can see the actual result of their planning.

To get an increase in quality culture in Statoil's projects, there need to be focus on the important factors in a project. These factors will vary between the different projects and only through risk analyses can these factors be identified.

One solution to improve the quality culture level in Statoil is to increase the awareness of good quality. In order to do so, people need to see that it pays off to plan the project thorough, and that changes on the business case need to be made as early as possible in the project. One of the interviewees suggested that this can be done by making posters. All campaigns in Statoil have huge posters at the front entrance of office locations. There is a close link between HSE incidents and quality incidents. There are already many HSE posters at many meeting rooms and other office locations. One easy idea for implementation is to address the link between HSE and quality in these posters. The organisation has an extremely high focus on HSE, and it is surprising that that quality is not embedded into this knowing about the strong link.

In addition the quality goals in Statoil need to be communicated. Another approach is to have pure quality posters informing about the quality philosophy and quality goals. This will be a constant visual reminder of its importance.

There has already been established a guideline for how to assure quality in the projects called *The 8 quality management principles* (see 10.8 for the full list) As long as these principles are followed and communicated throughout PRO, the quality culture in Statoil will increase.

Value-adding activities

This section will discuss how the rest of the project management team can learn to see the benefits of good quality work, and proper documentation of risk processes.

The first step is to have easier systems for registration and documentation. Now there are several IT-solutions and registration systems that need to be followed up. In order to get people to document their work, the systems need to be "simple stupid", with a user interphase so easy to understand that there are no needs for training. In addition it needs to so simple that people are willing to register and document their work, and can focus on their area of responsibility.

My personal opinion is that many of today's IT-systems have been designed with the wrong customer in mind. The systems are designed for those analysing the outputs of the collected data, and not the ones giving it input.

To get the rest of the project and organisation to see the value of good quality work, a similar approach as the one HSE has adopted can be useful. Likewise HSE the value of its work is difficult to measure, and its value does not become clear before the function fails.

The QRM manager should seek to be an invisible function in the project. Not in that sense that he should not do anything, but rather make sure that the other project functions are able to meet their requirements, in other words make others perform.

A campaign focusing on the value of good quality planning can be a solution to this challenge. The implementation challenges of the campaign will depend on its context and content, and the impact might also be hard to measure

Customer focus

It is stated in the eight quality management principles (see 10.8 for the full list) that the customer in projects are the Asset Owner and the stakeholders. In order to get successful projects, the customer focus need to be in place. One of the tools discussed in the literature review to get a more efficient customer focus is the Malcolm Balderige criteria (2.1.2.2). The criteria stated by Summers (2005, p. 78) should be set a basis for a review over PRO's action towards their customers, which in this case is the AO and the stakeholders.

7.1.17. RISK CHALLENGES

7.1.17.1. IDENTIFYING THE RIGHT RISKS

In order to find the right risks, the right questions need to be asked. Being able to ask these questions the risk facilitator need to challenge the team and also have the right competence and experiences. The possibility of getting these resources externally should be considered. Standards like NORSOK Z-13 (Risk and emergency preparedness analysis) define some requirements for risk analyses. If the company is not capable to fulfil these requirements, external hire from consultancy companies are needed. If the competence is not found in PRO, it should be imported from outside.

In order to identify the right risks, the different possible risks need to be known. The different type of risks identified by Pritchard (2005) is discussed in 2.2.7. However, Statoil have a definition of the risk picture, which can be seen in Appendix 16 – *The Total Risk Picture*. This approach is more suited to PRO's context. Therefore should not the risk identification process be based on Pritchard's (2005) definition, but rather based on Statoil's own definition. It is also stated in the literature review that multidisciplinary groups are most suited for solving complex problems, which by definition all of the projects in PRO are.

PRO have already a semi-objective approach to risk analyses. As mentioned earlier, the QRM manager does not have ownership to any of the disciplines. The challenge is often that the QRM manager lacks relevant experience, and therefore is not able to ask the right questions. The question in hand is whether the project can benefit from having a second opinion to consult in the risk workshops.

A secondary person (a consultant) can be completely in charge of the risk workshop or bring a supplementary opinion to the workshop. By being in charge of the workshop, the secondary person will facilitate with an objective approach, but might fall short in understanding the whole business case and relations between the disciplines in that specific project. The secondary approach should rather be a support function to the project, and just bring in those extra challenging questions based on previous experiences. In order for this supplementary role to be

successful, it should be responsible for gathering relevant experiences which can be used in the risk identifying process. The consultant can be external or internal, the most important factor is that he or she knows Statoil's project history. One other option is to adapt *The Delphi Method*(2.3.4.1) in order to get external experts opinions. An expert's judgement is necessary in order to determine the correct probabilities and consequences, and therefore the location in the risk matrix (PMBOK, 2008).

In the trade-off between being objective enough and see potential interlinks in the project system and having good knowledge about previous experiences it is most important to possess the first quality. This personal quality is already possessed by the QRM manager.

The proposed solution is to have an external party to come and help with the workshops, ask more questions, in order to identify all the right risks. All projects will be able to access the same resources and experiences on equal terms through involvement of this consultant role.

It is important to keep in mind that the QRM manager is an independent role in the project, with no ownership to other disciplines in the project. If the other disciplines, such as the project controller where to facilitate these risk workshops, there is a chance that risks linked to plan and cost will have an unfair weighting in the risk matrix. The same problem will be a possibility if the HSE- or the procurement manager facilitated the workshops. It is also important to keep in mind that to perform risk analyses for the sake of meeting requirements, will not help in identifying the right risks.

The Information Processing Perspective shows how a long chain of events and misunderstandings can lead to an accident. When identifying the right risks it is important to keep in mind that it is not ways what is in front of you was is causing problems and that the world is not always black and white. When the project team members have identified a new risk, they should ask them self if the prosed mitigating action are treating the symptom or the cause of the disease.

7.1.17.2. GETTING THE RIGHT PEOPLE TO PARTICIPATE IN THE RISK WORKSHOPS

It is not adequate to just ask the right questions, people getting these questions need to be able to answer them, in other words the right people need to be present. Get the right people with the right experience to join the risk identification process is the key for success of the project. One example of how this was solved is from a modification project of a *Floating production storage and offloading (FPSO)* vessel that required knowledge about vessel standardizations. Somebody with this experience was not part of the original project management team. In order to mitigate the risk of "The lack of personnel in the project management team with vessel experience " an external resource with relevant experiences was introduced to the team.

A solution in finding the right people is to first document what is needed in a project and document what the employees can, and setting up the correct match of people and projects. In order to document what the people can, virtual CVs can be used. The focus on these CVs should be on relevant experience and courses, a similar approach to www.linkedin.com, can be adopted. Before a new project starts, the project leader needs to check if there are people filling all the requirements.

When consulting experts, there are some concerns that need to be considered. In 2.3.6, PMBOK (2008) addresses that the biasness of the experts' judgment need to be taken into consideration before application of statements.

7.1.17.3. UNDERSTANDING THE BUSINESSES CASE EARLY ENOUGH

In order to understand the business case early enough there should be focus on freezing the scope early. There are two approaches to mitigate the risk of an immature scope.

1) Mature the scope first, and then do the risk analyses
2) Continuously update the risk register, a cycle approach. Is somewhat what is done at the moment

Due to an immature business case the project team members cannot grasp the business case before midways in the phase. Consequently, the focus on risk becomes stronger closer to the DG. However, this statement contradicts with Figure44. If this model should be implemented in a practical setting, this factor need to be addressed in further investigations.

As discussed in 2.2.10 *Tame vs. Wicked Problems*, when trying to tame an immature scope when the interlinks are not yet identified, important elements will get lost. When trying to understand the BC the essence of that BC need also to be taken into consideration, since the approach to tame problems are quite different to wicked problems.

One can ask if it is a good idea to put time and effort in identifying risks at an early stage. However, the more information about what can go wrong or potential upsides of the project will help to set boundaries for the project.

PRO handles different types of projects, all different business case, with different risks pictures. One example of risks that are purely a product of project type is risk linked to fast track. When adapting fast track to a project it is important to think about all the natural checkpoints that will disappear. It is extremely important that even though some checkpoints are gone, the same requirements for the projects still apply. Moreover, fast track is a good approach to have in small projects where it is easier to keep track of all the documentation. In smaller projects the required documentation of the CVP is often seen as unnecessary complicated and time consuming. By adopting fast track, the number of produced documents goes down.

Based on this, the second approach, which is the one adopted in PRO, should stay.

7.1.17.4. MITIGATING ACTIONS

The majority have already a risk based approach to their work without even recognising it. Being unaware of this, none of the risk analyses are documented. It is extremely important to document this procedure, so that it can be used as decision material and document the process for potentially reviews of the process.

The challenge lies in getting people to understand the whole project how their discipline can affect the project, and how to communicate these risks. It is important that the risk workshop group is able to talk together, and start a creative risk identification process together. It is a well-known fact that more ideas are generated if people work together in groups, than by doing it alone.

Communication of risks between different sub-projects can be challenging, the same risks might have been identified, but there could be different name on the same risks. This is a challenge when the risks are generated. A possible solution is to have a strong focus on the viewer of the risk picture when making it. The risk picture needs to be constructed in a way so that both contractors and partners understand it.

In order to close the risk management loop, mitigating actions need to be set and followed-up on. In literature- and in the Management system chapters, principles for reduction of risk is introduced. Statoil's approach for risk reducing (discussed in 4.7.1.2) resembles Williams et al.'s (2006) and PMBOK's (2008) actions for risk reduction actions. Consequently, the risk reducing actions in Statoil should not change. However, the follow-up on these actions might improve.

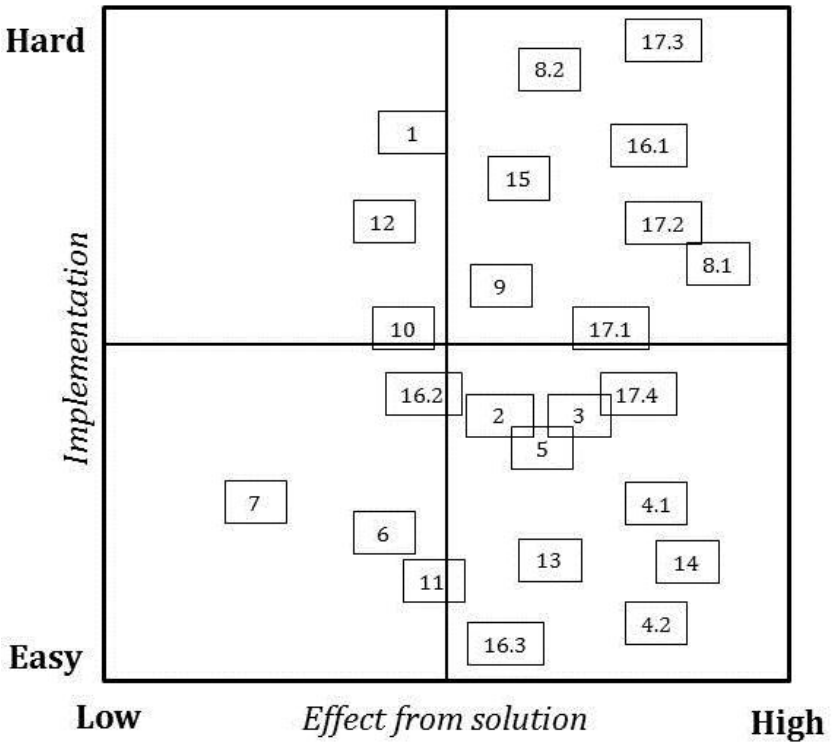
It is the QRM managers' responsibility to follow-up on these. There are challenges linked in both finding the best mitigating actions and its implementation. In order to find the best mitigating action the project team can rely on previous experiences from internal or external resources. The internal resource can be given the same role as the consultant presented earlier in this section. In order to see to that these actions are followed up on there need to be focus from the QRM manager on this matter.

When the mitigating actions are identified it is extremely important that these are communicated properly. A proposed solution is to have mandatory e-learning course for everybody in PRO that addresses themes such as "How to understand risk" and "Risk is everybody's responsibility". In addition it is important that the risks are communicated through the right canals.

As discussed in 2.3.2*Risk in a Project,* there are three types of risk. Where only two of these risk types can be managed by ideas from QM, and the third (unknown risks) can only be managed by purely RM. Based on this, Statoil should seek to identify what type of risk they are dealing with, in order to find the right mitigation action. Furthermore, the risks need to be separated between predictable risks, risk by chance and unknown risks.

7.2. ANALYSE OF PROPOSED SOLUTION

As a summary of the areas of improvement the different solutions are presented in this section in a comparison matrix. The matrix variables are *Implementation* and *Effect from solution.* This matrix is used as a basis for discussion for which solutions that should be prioritised, and which requires a lot of effort and resources to implement.



1) Different phases, different deliverables
2) Link between risk and quality
3) Interfaces/ several disciplines
4) New employees
    1) Training of juniors
    2) High turnover rate
5) Project team
6) Work load
7) Compliance and leadership model
8) Terminology and certification
    1) Terminology
    2) Certification
9) Subcultures
10) The QRM personality
11) Two discipline leaders
12) Number of QRM managers
13) Incomplete Deming cycle
14) Quality control
15) Different projects
16) Quality culture in Statoil
    1) Value adding
    2) Customer focus
    3) Ptil reports
17) Risk challenges
    1) Identifying the right risks
    2) Getting the right people to participate in the risk workshops
    3) Understanding the businesses case early enough
    4) Mitigating actions

Figure45: Analyse of proposed solutions

From the figure of the proposed solutions, it is indicated that there are several areas of improvement that can easily be implemented and that gives a high effect from its implementation. These solutions are in the right lower corner of the matrix. There are always a trade-off between effect of implementation and the cost of it. Also some of the proposed solutions found in the right higher corner should strongly be considered. Furthermore, the solutions in the left higher corner are the least important solutions, because they will not affect the QRM role that much and they are difficult to implement.

7.3. Proposed Solutions to Governing Documentation

In 5.3 *General Deliverables* it was stated that the Figure35 did not give a good indication of the quality planning procedure. The figure below shows a better and more updated quality planning procedure. It is recommended that the quality process is updated according to the figure below.

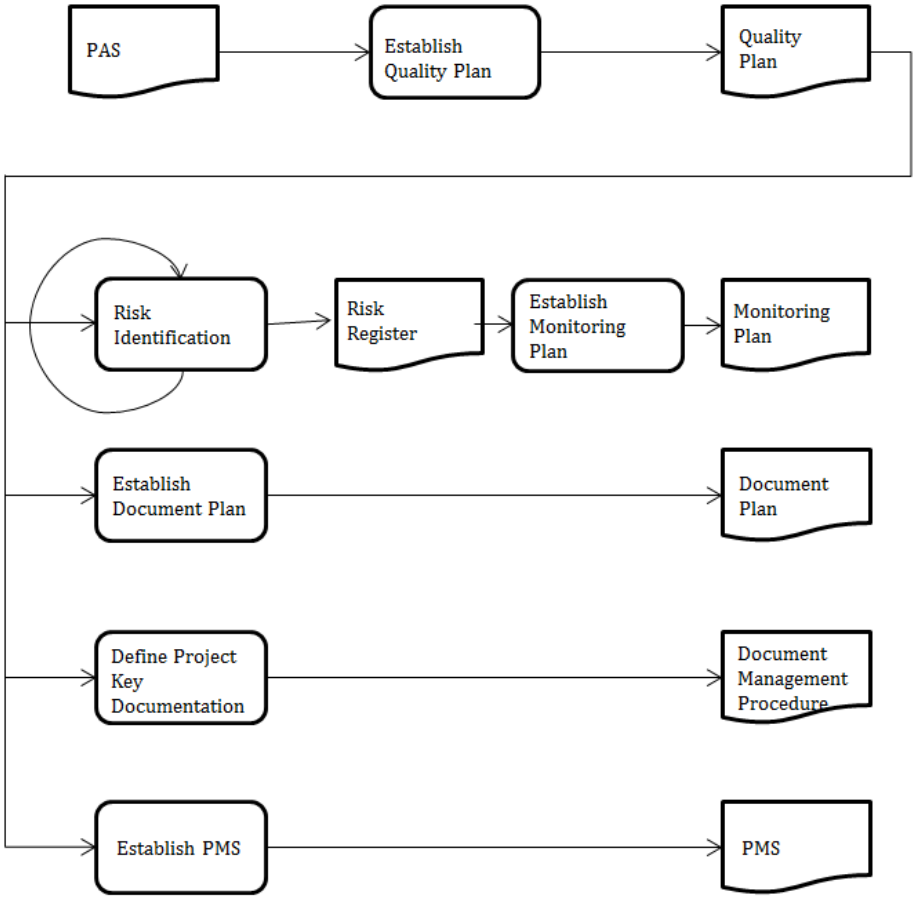


Figure46: Improved quality planning procedure based on figure from GL3000.

Take notice of the circle around "risk identification" which symbolizes the continuous process which risk identification is. As more as the scope matures, more risks can be identified.

7.4. Different Approaches to the QRM Role

In previous chapters the finding from the data collection have been presented and analysed. The next section will try to sum up the symptoms of these findings and how it has affected the QRM managers approach to the role. Throughout the data collection it has become clear that the QRM role can be addressed in several ways.

The first separation is between the QRM managers are their level of experience, accordingly the separation is between juniors and seniors. The second level is based on personal interest of the QRM manager. Depending on what the QRM manager find interesting will affect how they grasp the role. The third and last level is linked to level of interest and passion for the job.

This section will end with a summary of what qualities the ideal QRM manager should possess, before a generalisation of the QRM model is presented to show how ideas from Statoil can be implemented into other organisations.

7.4.1. SENIORS VS. JUNIORS

There are two different approaches in grasping the QRM role.

1) Seniors with many years of relevant experience have no problem grasping it, and will use their experience to define what they need to bring into the project
2) Juniors with little experience from either risk management or quality management will grasp the role according to the job description, and try to analyse it

One of the challenges with the QRM role is that it a "free" role with few limitations. When there are few limitations to the role, the holder of that role is free to determine it's direction. Individuals' interests, procedures and preferences will inflict on the how the role is carried out.

The most important quality of the QRM is their ability to challenge their surroundings, not only the project and the suppliers, but also the QRM discipline environment. The QRM manager need to be courageous, which is one of the four Statoil values.

7.4.2. PERSONAL INTERESTS

Below is listed there different personal approaches to the QRM role depending on personal interest. This list is not complete, and it takes into account that there are more than what is listed here.

The all-rounder

- Solution orientated, not enough focus on solid documentation. In an investigation process, the QRM manager's work might fall short.

The system orientated

- Focus on the suppliers' quality system, and making sure that these are in order. If they are in order, the delivery should be good.

The fact driven

- Has a list of prerequisites that is the foundation for their work. Sees the situation in black and white, where only two findings from an audit etc. are conformities or non-conformities. Documentation of work is a priority for this QRM manager.

There are several different approaches to the QRM role. These differences can be separated into section level, department level and personal level. Section- and department level was discussed under 7.1.9 *Subcultures.* On the personal level the differences depend on the persons characteristics and on education. These differences might be viewable in risk workshops or audits of suppliers. The QRM manager can approach the role in two ways. The first and wrong approach is to only facilitate these meetings (secretary approach, does not understand the project or have not any interest in it). The second approach is to facilitate these meetings, and be hands-on and challenge the project team members in finding the right risk picture by asking the right questions.

Another separation of the different approaches to the QRM role is a direct consequent of the inconsistency of terminology regarding risk- and quality management and personal interest of the QRM manager. There are three approaches to the QRM role based on terminology:

1) To meet the requirements of the role
2) Too much focus on quality management activities
3) Too much focus on risk management activities

The two last approaches is a result of a too liberal approach to the role, and people only doing what they want to do. Based on the three approaches above the following is stated in relation to the these:

1) Is what is desired
2) Forget to have a risk based approach to quality
3) The most unwanted approach. The mitigating activities will not be good enough according to quality standards

It is important to remember that people are different, and that most independent character will choose to make their own path when there is a lack of direction and guidelines. Without a clear black and white guideline for a problem, there are numerous different solutions to the role.

7.4.3. Passion for the Job

Several of the interviewees stated that they see the QRM manager as a support role to the project manager, because they have a lot of relevant experience. Others on the other hand emphasised the importance of following the role description of the QRM manager in order not to become burned out. Other commented that there are some QRM managers that are not able to deliver anything to the project, and are more secretary than a QRM manager. These differences in answers indicate that there are several approaches to the QRM role in terms of involvement. The QRM manager's level of involvement in the project is illustrated in the figure below.

The three types are

1) Too much involvement
2) Good balance
3) Not able to deliver

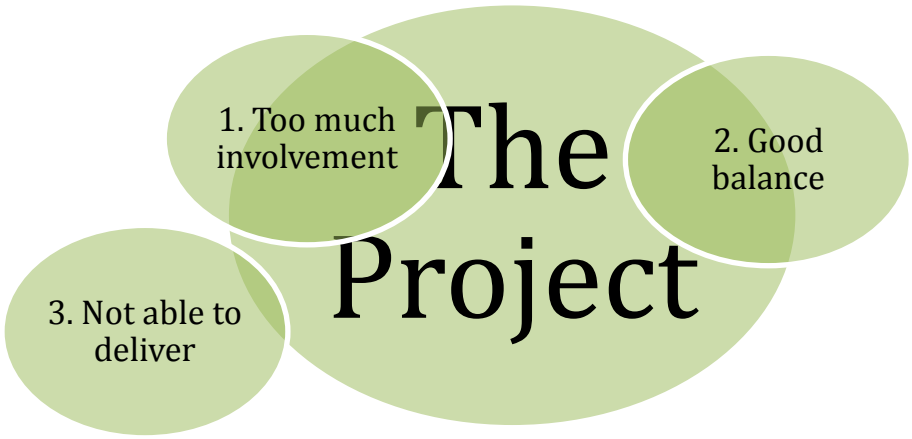


Figure47: Different levels of involvement in the project by a QRM manager

7.4.4. QRM MANAGERS' QUALITIES

As discussed before the QRM manager should be a generalist, rather than a specialist. One who discussed this separation of qualities was Collins (2001). He stated that there are two extremes of people, the foxes and the hedgehogs. The hedgehog is focused on one single idea, while the fox is a generalist in terms that it knows many things and therefore cannot define the world through a single idea. It depends on the situation what qualities are preferred. There are several great historical personalities that are one or the other. Typically hedgehogs are Plato, Dante and Ibsen, while foxes includes personalities such as Aristoteles, Shakespeare and Erasmus. One of the challenges that many big organisations struggles with is that the different departments are isolated from the rest of the organisation, only having their eyes on their own contribution to the organisation and not how they interact with the rest. One of the QRM managers responsibility is to include a system view to the project management team, by having generalist qualities.

My personal opinion is that a junior QRM manager cannot perform as good as a senior. In order to be a generalist and to know what type of problems to look for, experience is important. Experiences can come from personal experience or an experience transfer databases. As the databases are not well developed at the moment, experience need to come from self-experience.

In 7.1.17 it was raised attention to that the QRM manager (and the others in the project team) should be able to understand the situations quickly in order to identify the right risks. In order to understand the scope of work, a technical background is required. One of the challenges liked to risk management in PRO is that the analyses are done while the scope is still immature, and continually updated throughout the phase. If the QRM manager had a more technical background, the understanding of the scope would have been more efficient. The QRM manager also needs to be able to communicate on different levels. Both to top management, engineers and others, such as contractors when audits and examinations are done. It is important that the QRM managers keep in mind that they are constantly dealing with people and that they should seek to find practical solutions to problems because different projects need different approaches.

The QRM manager should aim to challenge existing truths, and by challenging the systems find its weaknesses and act according to these. In order to do so, the QRM manager needs a passion for the "game". Their focus should not be on themself, rather helping the project reach its true potential. The QRM managers need to be able to put others before themself and helping others become good.

The most important personal quality that a QRM manager should possess are listed below:

1) Generalist
2) Adaptive to new situations
3) Communicator
4) Confident
5) Persistent
6) Have sense of humour
7) People person/ practical

My opinion is that the most important quality that the QRM manager should have is to be a generalist. Being able to get information about a problem quickly and seeing the whole picture, having an objective view of the problem and being able to challenge the rest of the group. The

QRM manager needs to be proactive and hands-on, and not be an administrator or a secretary, but challenge the project team.

7.5. GENERALISATION OF THE QRM ROLE

Based on many of the strengths identified with the Statoil QRM model and findings from literature – this section will discuss how the QRM model can be adopted to other organisations, regardless of type and size. However, the only factor that needs to be in place is that the organisation has a good quality foundation.

This thesis has focused on QRM in a big project organisation. All organisations, regardless of whether they are project organisations or big organisations can adapt a risk based monitoring system. Risk management and its tools are well used in fields such as finance, insurance, HSE, public health and any industries affected by these (EMA, 2011). It is only natural to take experiences from this and modify them into the necessary area for application.

Not only in Statoil is risk management the "talk of the hour", but also in other organisation the same level of focus can be seen. The QRM model developed in Statoil after the StatoilHydro merge can be an inspiration for other organisations, showing a successful implementation of risk based work. Other companies such as Lundin, Conoco Philips and Aibel have also QRM managers. Whether the QRM approach is similar to the QRM role in Statoil is not known to the write, but it would be assumable to say that there are some similarities since they are all project organisations in the oil and gas sector.

Literature, governing documents and findings from interviews have shown that it is smart to prioritise the quality work accordingly to where the most gain is expected. Risk analyses are a good way of finding these priorities. To assure a successful quality and risk management process the process should be implemented into the existing operation and thoroughly documented (EMA, 2011).

This thesis discusses whether the current qualitative risk analyses are sufficient or not. The conclusion is that the in most cases a risk matrix or other qualitative- or semi-qualitative risk analyses are enough in order to create an awareness of potential risks. PMBOK (2008) also states that qualitative risk analyses is a rapid and cost-effective way of making list of priorities, and can potentially save a business unnecessary work.

Many are already working risk based and focuses on that previous failures should not happen again. But only a selection of them are aware of this. In order for the risk process to be verifiable for the future it need to be put into some kind of system and documented. By a successful implementation of the QRM model presented in this thesis, this is possible.

Several discussion in this thesis emphasise the importance of good risk management as early as possible. When scope of work is identified, risk management shall be introduced. It is also possible that findings from the risk analyses will create a demand for update in quality plan (PMBOK, 2008). In other words, based on findings from risk analyses, the scope of work identification has become better.

The Decision Making Perspective emphasised how important it is not to sub-optimise only sections of a system. Based on this perspective, a generalised model for QRM should be implemented in several levels of the organisation.

To show how other areas can implement a risk based approach, some examples of implementation of the idea from other disciplines are presented.

The procurement discipline should pay special attention to suppliers delivering long-lead items or suppliers that are of special interest. In addition they need to pay attention to setting the wrong initiatives (bonuses and penalties for the supplier) in the procurement strategies. If the wrong bonus plan is established, the supplier might work towards these rather than focus on the completion of the delivery as a whole. The project might end up delayed, or the total cost might be higher due to the fact that the supplier is working targeted to get the bonuses. The potential threats or opportunities linked to this need to be considered. Choosing a supplier with a lower rate than the competitors might indicate that the team that the supplier is offering got less experience than the competitors. This is a risk that the procurement discipline should include in their procurement strategy.

In both QM and RM indicators have a significant role. In order to a have a successful implementation of a QRM model companies should identify indicators which show the link between these disciplines.

In all projects, there are a number of stakeholders. In dealing with projects the stakeholders need to be pleased. However, the stakeholders does not always share the same point of view, and might react differently to the same hazards and level of risk. The different hazards might affect the different stakeholders with different severity (EMA, 2011). A similar approach used by the QRM managers can easily be adopted by other organisations to mitigate this.

In order to generalise the QRM role, some of the challenges it face regarding value-adding activities should be addressed. Quality issues struggles with many of the same problems that HSE face regarding measurement of degree of value adding. In a world where everything is driven by figures and numbers, it is hard to measure potential gains from no losses due to quality errors. ROSS (1997) have stated that there is a strong link between quality control and HSE-control, consequently, there is a strong link between these disciplines.

8. CONCLUSION

This thesis is set out to determine the QRM manager role in different project phases in a Statoil context. In this investigation, the aim was to assess what the QRM manager is to deliver in the different project phases.

Returning to the question posed in the beginning of this study, it is now possible to state that there is an ambiguous mandate of the QRM role that causes a conflict in how the QRM managers should assess their deliverables to the different project phases. Therefore the reasons for this vague mandate was further identified and analysed.

The findings from this study make several contributions to the current literature, showing that there is a logical link between Risk- and Quality Management. First, the logical link between QM and RM is presented, before the point on what the different disciplines can learn from each other is addressed. This section shows that even in well-established areas there is still some room for improvement. However finding these areas can be challenging, and looking at other areas for input can be successful.

These findings suggest that in general a risk based approach can be successfully implemented in all quality management related areas. The winning argument for this statement is that by having a risk based approach to QM, the QM work will be based on a priority list. Consequently, non-value adding work will be minimised.

It is stated in Statoil's governing documents that there is a strict project development process that need to be followed. However, evidence from this study indicates that the deliverables from the QRM managers to the project is not optimised from the current phase separation. The finding from this study suggest that a more overall focus on the whole value chain will increase the QRM managers ability to focus on the end result, and not on sub-deliveries. By changing this approach, the risk of sub-optimising of the phase will decrease.

The QRM manager is responsible for RM, QM and stakeholder management in Statoil projects. The second major findings from the governing documents are that a risk based monitoring programme should be established for a project, both on business case and on project level. The QRM discipline, which holds this responsibility, should establish a monitoring program. The results from this activity, such as non-conformities and dispensations, should be handled.

The trend in industry is to have a risk based approach to all decision making, the current QRM model enables Statoil to meet the requirements regarding risk analysis in their projects. This study have shown that the current QRM manager department holds some of the advantageous personal qualities required of a QRM manager in order to carry out the QRM role in a project. The two most favourable personal qualities that the QRM manager should have are being courageous and hands-on. The fact that most QRM managers are courageous personalities will create a snow-ball effect that forces the system to continuous improvement. Other strengths of the existing QRM model is that the risk analysis done in relation to the projects are easily communicated and provides a priority list of work. In order to have a successful QRM model the QRM managers need to be objective generalists and able to communicate with different levels of the organisation.

However, the level of simplification of the risk analysis implies that there is still room for improvement in terms of more quantitative risk analysis. Other areas where the QRM model should improve is regarding better training of juniors, actions towards reducing the turnover rate of QRM managers, improving quality control of the QRM managers work, more quality focus through a more cycled view on quality in the department, and at last getting the missing experiences through studies of investigation reports from the Petroleum Safety Authority Norway (Ptil). These are the areas where the QRM model can get a big impact to relatively small investments. The more challenging actions that should be focused on in order to get a more homogenous and less ambiguous mandate is that the QRM department should focus on adapting to a set of terminology equal to the rest of the world, closer follow-up on mitigating, and focus on getting the right people to participate in risk workshops in order to identify the right risks.

In general, therefore, it seems that there is one optimistic answer and one negative answer regarding the implementation of the QRM model in Statoil. The optimistic answer is based on the development that the QRM model have had over the last five years in the organisation, from only being a couple of people 'til having a QRM staff of over 90. This explosive growth in staff have raised a quality focus on PRO, however the quality focus is solid, most companies that experience these type of growth will experience some hiccups. The organisation struggles to reach its goal of being world class, but taken into consideration, they are following a good trend. Because of the growth in staff, the level of experience internally differs and consequently the quality focus varies. The second major finding is the negative answer to whether or not the QRM model is successful. The link between QM and RM can only be seen in TPR PRO Facilities and no other departments in Statoil. Furthermore the top management in the organisation does not have a QRM focus. Consequently there are challenges linked to communicating the QRM link throughout the organisation.

9. Further Work and Limitation of the Current Study

In the previous section the conclusion of this thesis is presented. The conclusion could have been different if only the elements of the following section have been taken into account. This section will discuss actions that could have been made possible if only the time limitations were present, any areas that need further investigation, and a discussion regarding the quality of this research.

Looking back on the literature study presented in the beginning of this master thesis and knowing the results of the collected data, the literature section should be updated to better fit the rest of the thesis. The literature should have either helped to verify the findings or created a discussion about the theme. However, there is always a trade-off between when to draw the line for end of the literature study, and when to fully focus on analysing the results.

Further work needs to be done to establish whether the generalisation of the QRM model's implementation in other areas it is successful or not. This can only be done through trial and error methodology.

I suggest that before a new functional description is introduced, a study similar to this one should be carried out on the expectation from the QRM role by the other disciplines in PRO. Further investigation and experimentation of what the other roles in the project management team expect, is strongly recommended. Because if the new functional description is not able to meet the requirements from the project, the resources put into the update are non-value adding.

It would be interesting to assess whether the other companies which follow a similar model share the same challenges as Statoil's QRM model.

A further study could assess the impact of following the findings from the literature study regarding the areas where both QM and RM could learn from one and other, and implementation would be very interesting.

There are many requirements that apply for the whole projects, such as establishment of Project Assignment (PAS), kick-off meetings, scope definition and deliverables, organisational planning, team development and alignment, Project Management System (PMS), establishment of Project Execution and Overall Procurement Strategy (PEOPS) and Technical and operational requirements and guidelines (TORG). As these are requirements for all of the phases, they will not be discussed in further detail. However, the stakeholder management strategy have a strong focus in the early phases compared to the execution phase, and was therefore discussed.

It would be interesting to look at accidents related to poor project execution and planning. An example of NORSOK related accidents are M/S Sleipner (1999), where one of the reasons for the accident is related to "short-cuts" taken during the project planning (Hovden, 2000). By having this approach, the link between risk and quality can potentially be highlighted.

This thesis was initiated as a pre-study whether this concern was real or not, an throughout the spring 2012 this concern have made it to QRM top-managements agenda. The decision makers in QRM will set out to define and set the scope of the role is by summer 2012. This thesis will provide the decision makers with valuable data and proposed solutions as input to their

analyses. It is good to know that this thesis foundation were able to make it through the next round, implementation in the real world.

9.1. LIMITATION TO WORK

One of the questions in the interviews asked how much focus there was on the different management disciplines (risk and quality) in the different phases. The data collected to this question need to be seen as invalid because the answers regarding poor consistency in terminology overrules it.

A lot of the basis for this thesis is the governing documentation in Statoil. There has been a revolution in the internal governing documents the last couple, and it is still not completed. The "project development bible", GL3000, is withdrawn because it is not updated according to the changes. The interviewees were not certain what the future is going to hold, and what requirements that will be needed. Some projects follow the new project development strategy, while others are following the old. As a result of this there have been some biased answers from the interviewees.

Regarding the collected data from the interviewees some of these results need to be reconsidered since there was such a great variety of people that was selected in such a small group, the variation of the results can be discussed. However, there is some value to this as the thesis as it identifies several challenges of the existing QRM model.

Both RM and QM are well established areas in literature, and since there have not been any revolutionary findings in any of these fields since the writing of SQM, this chapter might come across as updated and basic. However, the main goal of this thesis is to focus on the link between QM and RM, and in order to do so, the most basic elements of both QM and RM have been analysed in order to find the link. This was necessary since there are not much established literature about QRM.

In order to say something specific about the QRM name there need to be more data available. Two examples are not sufficient in order to stat the QRM manager is the same as a quality managers.

As a conclusion to this section, it is recommended that further research should be undertaken in the following areas:

1) Implementation in other organisations
2) What the benefits from QM and RM can have from sharing of experience are
3) The QRM model's relation to all of the project requirements
4) The link between quality and accidents

10. APPENDIX

10.1. APPENDIX 1 – DOCUMENT OVERVIEW

	Quality plan	FR05	Functional description
FR05- Project development	X	x	X
FR08- Risk manamgent	x	x	X
FR09– Supply chain management			X
FR20 – Management system			X
GL0275 – Quality assurance activities in Projects			X
GL3000- Handbook for facilities projects[11]	x	x	
HSE01.01en[12]	x	x	
KC1200 - Management system (MS) key controls	X		
WR0002- Intern monitorering og eksternt tilsyn[13]	x	x	
WR0011 – Tillegg til: Behandling av kvalitetsavvik i D&V og A&F[14]	x	x	X
WR1283 – Corporate project reviews	x	x	X
WR2090- Commissioning manual	x	x	
WR2248 – Cost management			X
WR2259 –Project interface, non-conformance, query management	x	x	X
WR2353 – Quality Planning in Investment Projects	X	x	X
WR2359 – Quality System Audits and Examinations in Projects	x	x	X
WR2363 – Mechanical Completion Manual		x	
WR2365 – Risk Management in projects		x	X
WR2374 - Document Management in investment projects			X
WR2404 – Risk management process		x	X

[11] Experied document. Should be updated.
[12] Found in APOS
[13] Experied document. Not planned updated.
[14] By 11th of May 2012, planned withdrawn.

10.2. APPENDIX 2 – TERMS AND DEFINITIONS

Term	Definition/ explanation
Arena review	The Arena process is an independent technical and commercial quality control at Decision Gates (DG), described in WR1283, "Corporate Project Review". This process includes CAR, PER, commercial QC and Arena meeting, but is customised according to size, exposure and risk for each project. The purpose is to ensure that the decision basis meets Statoil's requirements and that the business case and risks are well understood. The project development arena recommends towards the responsible business area (BA) and CEC.
Asset owner	The asset owner is the manager responsible and accountable for the business case and for securing good and consistent investment project decisions.
Asset owner's representative	Person appointed by the Asset owner to follow up the investment project, on behalf of the owner. Normally a person from the same business area as the Asset owner
Brownfield project	Project for modifications on existing facilities.
Capital Value Process (CVP)	Statoil's decision process for investment projects.
Company's representative	The person who at any time is appointed by company to act on behalf of company in all matters concerning a specific contract.
Competence area review (CAR)	Review of a documented decision basis per competence area. Competence area means a grouping of disciplines headed by a chief engineer / chief consultant.
Concept phase	The concept phase shall provide a firm definition of the design basis and select the preferred commercial and technical concept.
Contractor	A supplier in a contractual relationship with Statoil.
Corporate project review	See "Arena review"
Decision Gate (DG)	A predefined point in the project model where Statoil has to make appropriate decisions whether to move to the next phase, make a temporary hold or terminate the project
Decision Gate Support Package (DGSP)	A collection of summary documents that forms the basis for the investment decision
Definition phase	The definition phase shall develop and document the business concept to a level ready for sanction.
Design basis	A document that specifies basic requirements and frame conditions, including data on feed or reservoir conditions, products, capacities, performance, transportation, HSE, operation, maintenance etc.
Examination	Monitoring activities towards Contractors performed by the projects line organisation on behalf of the Project Manager/ Company Representative. Examination activities are an umbrella term for Verifications, Reviews, Inspections and/or Tests.
Experience report	Qualitative experience developed from a project, which summarises and describes the experiences gained during the project.
Facilities	The total systems from well-head to refined products, including equipment, systems and concepts for oil and gas production, processing, treatment, refining, transportation and export.
Feasibility phase	The feasibility phase shall establish and document whether the development of a business opportunity is technical-, operational-, and organisational feasible, and that both economical analysis and relevant stakeholder analysis justify further development
FEED (Front End Engineering Design)	Equivalent to the term "pre-engineering"
Finding	Results of the evaluation of the collected evidence against criteria. Findings can indicate either conformity or nonconformity with the criteria, or opportunities for improvement. This is valid for both Quality System audits and examinations.

Governing documentation	The formalisation of the governance and description of the business processes including requirements that regulate the execution of the business processes and activities.
Greenfield project	Project for completely new facilities
Instruction To Tenderer (ITT)	Tender documents describing the manner in which tenderer shall prepare and submit the tender
Investment Project	Realisation of a business opportunity
Invitation to tender	Company's invitation to tender document submitted to the tenderers. The Invitation to tender consists of the Instruction To Tender (ITT) and the contract documents.
Management system	Organisation, procedures, processes and resources that are necessary to ensure that a task can be executed in accordance with the given assumptions
Mitigating action	Action or activity to reduce the probability (probability and/or consequence) for a threat, or to increase the probability for an opportunity. Each mitigating action shall have an identified liable owner and a defined schedule and deadline.
Non-conformity	The non-fulfilment of (deviation from) a written requirement
Observation	Weakness and/or problem area or opportunity for improvement discovered in the course of an audit or examination, but which is not defined as a non-conformance
PIMS	Project Information Management System used for all investment projects
Project Assignment	A mutual agreement between the Asset Owner and relevant Business Area (e.g. TPD) that describes the basis for planning and execution of a project valid for a specific project phase, including frame conditions, scope, budget, schedule, interfaces, and the principles for hand-over on completion of the project.
Quality	Degree to which a set of inherent characteristics fulfils requirements
Quality and Risk Manager	A person assigned to co-ordinate the project risk related activities within the project.
Quality management	Coordinated activities to direct and control the organisation with regards to quality. Direction and control with regard to quality generally includes establishment of the quality policy and quality objectives, quality planning, quality control, quality assurance and quality improvement.
Quality management system	Management system to direct and control an organisation with regard to quality.
Risk	Variation from the expected outcome or targeted objectives, both positive and negative. Positive outcome: Upside risk. Negative outcome: Downside risk. Comment: Definition of risk can vary from the above based on the context · Risk is the combination of estimated probability and impact.
Risk management	Establish context, identify and analyse risk, evaluate risk, decide action and implement action and follow-up of risk
Self assessment	Review performed by a project to confirm that Statoil and project requirements have been met at defined stages of the project planning and execution
Stakeholder start-up meeting (SSUM)	A meeting with key internal stakeholders at the start of each phase, chaired by the Asset owner. The purpose is ensure common understanding of strategic fit of the business case, the scope of work and necessary work to be performed by the different business areas. This meeting will normally not have the required competence for any detailed discussions.
Technical and operational requirements and guidelines (TORG)	Document issued by a project that specifies all relevant standards, company specific requirements, company guidelines and possibly project specific requirements
Top 10	A list of the most important risks (not necessarily 10)

10.3. APPENDIX 3 – LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
AO	Asset Owner
AOR	Asset Owner Representative
BCES	Business Case Execution Strategy
BCLT	Business Case Leadership Team
CAR	Competence Area Review
CR	Company Representative
CSR	Corporate Social Responsibility
CVP	Capital Value Process
DG	Decision Gate
DGSP	Decision Gate Support Package
DIC	Discipline Internal Check
D&W	Drilling and Well
EFQM	European Foundation for Quality Management
FEED	Front End Engineering and Design
FPSO	Floating Production, Storage and Offloading
FT	Fast Track
HSE	Health, Safety and Environment
Hydro	Hydro ASA
ISO	International Organization for Standardization
ISRS	International Safety Rating System
ITT	Instruction to Tender
JIT	Just In Time
KPI	Key Performance Indicators
OBF	Offshore Brown Field
OGF	Offshore Green Field
PAS	Project Assignment
PD	Project Development
PEOPS	Project Execution and Overall Procurement Strategy
Petec	Petroleum Technology
PI	Plant Integrity
PIMS	Project Information Management System
PMBOK	A Guide to the Project Management Body of Knowledge
PMI	Project Management Institute
PRO	Project department
Ptil	Norwegian Petroleum Safety Authority
QM	Quality Management
QRA	Quantitative Risk Assessment
QRM	Quality and Risk Management
RM	Risk Management
SA	Self Assessment
SCM	Supply Chain Management
Statoil	Statoil ASA
StatoilHydro	StatoilHydro ASA
SQM	Supplier Quality Management
TORG	Technical and operational requirements and guidelines
TPD	Technology, Projects and Drilling
8QM	Eight Quality Management (principles)

10.4. APPENDIX 4 - INTERVIEW GUIDE

First of all will I would like to thank you for taking time to do this interview. In collaboration with my advisors at Statoil, my master thesis is to focus on the relationship between quality and risk management in projects in Statoil. The different phases in the CVP have been exanimated and the nature of each phase have been identified.

The interview will be around 30-60 min. Findings from these interviews will be added to the thesis. None of the answers can be traced back to you. And the this thesis is confidential, meaning that only my professor at NTNU and Statoil can read it. Is that fine with you?

Background:

Name:

Years of relevant experience/ years in Statoil:

Can you give me a short introduction to the projects that you are following? If you are following several, focus on the one that consumes most of your time.

- Type? Fast track?
- The essence of the project.
- Combined DGs?
- How long have you been following this project? Which DG are you working towards?

What is your definition on risk management? Quality management?

QRM

Phases:

What are your deliveries to the project?

What should the QRM do in all the phases? What are more phase specific tasks?

- What are the main difference between the phase that you are in now, compared to the previous or next?
- In this phase, how much focus is there in risk management? Quality management?

How can the QRM contribute to value-adding activities in each phase?

- Is there too much paperwork? Complex processes? Too many requirements?

Roles:

Does the QRM have a good idea what their responsibilities are?

Are there any intersection of areas of responsibility between the QRM and the other roles in the project team?

How do you make sure that you deliver what is required?

- Do you have your own to-do- list? A not-to-do list?

What are your main areas of responsibility? Think big.

When you run into problems in your work, who do you seek advice form?

Overall quality management in Statoil

Is there a logic link between quality and risk management?

- Is there anything that the different disciplines can teach one and other?

How can Statoil get a stronger quality culture?

- Statoil have chosen not to recertify their ISO-certificate, but they still continuous to set high demands to their contractors. Why?

Risk:

What do you feel are the biggest challenges that the QRM faces when it comes to risk management?

- Communication? Is the project well informed about the risk picture?

10.5. APPENDIX 5 - RAMMEFORSKRIFTEN

«§ 7Ansvar etter denne forskriften

Operatøren og andre som deltar i virksomheten er ansvarlig etter denne forskriften. Den ansvarlige skal sikre at krav som er gitt i helse-, miljø- og sikkerhetslovgivningen, blir etterlevd.Operatøren skal påse at alle som utfører arbeid for seg, enten personlig, ved ansatte, ved entreprenører eller underentreprenører, etterlever krav som er gitt i helse-, miljø- og sikkerhetslovgivningen.I tillegg til de pliktene som rettighetshaverne og eierne av landanlegg har etter enkelte bestemmelser i denne forskriften, er disse ansvarlige for å påse at operatøren etterlever krav som er gitt i helse-, miljø- og sikkerhetslovgivningen.

Arbeidstakerne har plikt til å medvirke jf. arbeidsmiljøloven § 2-3 og brann- og eksplosjonsvernloven § 25.» (Petroleumstilsynet, 2011)

10.6. APPENDIX 6 – GOVERNING DOCUMENTS AND RELEVANCE

Document code	Name	Findings	Relevant to
FR05	Project development		Project mgmt. system Doc. for experience transfer Self-assessment
WR2353	Quality Planning in Investment Projects		Project mgmt. system Quality plan(ink.gov doc) Monitoring program Doc. for experience transfer Self-assessment
KC1200	Management system (MS) key controls		Project mgmt.. system
GL3000	Handbook for Facilities Projects	Withdrawn	Quality plan(ink.gov doc)
WR0002	Internal monitoring and external supervision	Withdrawn	Monitoring program
WR1283	Corporate project reviews		Monitoring program
WR2359	Quality System Audits and Examinations in Projects		Monitoring program System for control and follow-up of non-conformities
WR0011	Tillegg til: Behandling av kvalitetsavvik i D&V og A&F	Norwegian	System for control and follow-up of non-conformities
WR2259	Project interface, non-conformance, query management		System for control and follow-up of non-conformities
WR2090	Commissioning Manual		System for control and follow-up of non-conformities
WR2363	Mechanical Completion Manual - Amended for the US and Mexico		System for control and follow-up of non-conformities
FR08	Risk management		Risk register with mitigating actions
WR2365	Risk Management in projects		Risk register with mitigating actions
WR2404	Risk management process		Risk register with mitigating actions

10.7. APPENDIX 7 – RISK TECHNIQUES

Table 6 : Risk techniques and application to project phases (Pritchard, 2005).

Technique	Project Phase			
	Concept	Development	Implementation	Closeout
Expert Interviews	+	+	+	+
Planning meetings	-	o	+	+
Risk practice methodology	+	+	+	+
Documentation reviews	+	+	+	+
Analogy comparisons	o	+	+	+
Plan evaluation	-	o	+	+
Delphi technique	+	+	o	-
Brainstorming	+	+	o	o
Crawford slip method	+	+	o	o
SWOT analysis	+	o	o	o
Checklists	o	+	+	+
Risk breakdown structure	o	+	o	o
Root cause identification and analysis	+	o	o	o
Risk register/tables	-	o	+	+
Project templates	o	+	+	+
Assumptions analysis	+	+	o	o
Expected monetary value	-	+	o	o
Estimating relationships	-	-	-	+
Network analysis	-	+	+	o
Rating schemes	+	+	+	+
Urgency assessment	o	o	+	o
Data quality assessment	-	+	o	o
Risk modelling	+	+	+	+
Sensitivity analysis	o	o	o	o
Monte Carlo simulations	-	+	+	-
Risk factors	-	o	+	+
Risk response matrix	-	+	+	+
Performance tracking	-	+	+	+
Risk reviews and audits	-	-	+	+

\+ = Relative weak, - = Relative weak, o = Average

Table 7: Risk techniques and its applications (Pritchard, 2005)

Technique	Predominant/Secondary Use					
	Risk Management Planning	Risk Identification	Risk Quantification	Risk Qualification	Risk Response Planning	Risk Monitoring and Control
Expert Interviews	s	p	s		s	
Planning meetings	p	s	s		s	
Risk practice methodology	p		s	s		
Documentation reviews	s	p				s
Analogy comparisons		p	s	s	s	
Plan evaluation		p				s
Delphi technique	s	p	s	s	s	
Brainstorming		p			s	
Crawford slip method		p			s	
SWOT analysis	s	p			s	
Checklists	s					p
Risk breakdown structure	s	p	s			s
Root cause identification and analysis	s	p	s		s	
Risk register/tables	s	s	s		s	p
Project templates	p		s			s
Assumptions analysis		p	s	s		
Expected monetary value				p		
Estimating relationships	s			p		
Network analysis		s		p	s	
Rating schemes	s		p	s		
Urgency assessment			p		s	p
Data quality assessment			s	p		
Risk modelling	p		s			
Sensitivity analysis		p	s		s	
Monte Carlo simulations				p		
Risk factors	s		p			
Risk response matrix	s				p	
Performance tracking	s					p
Risk reviews and audits	s					p

p = Predominant use

s= Secondary use

Table 8: Risk analysis technique Selection Matrix (Pritchard, 2005, p.58)

	Resource Requirements					Applications							Outputs		
Technique	Cost (resource-months)*	Proper facilities and equipment	Implementation time (months)*	Ease of use	Time commitment	Project status reporting	Major planning decisions	Contract strategy selection	Milestone preparation	Design guidance	Source selection	Budget submittal	Accuracy	Level of detail	Utility
Expert interviews	0.1 -3	Y	0.1-3	E	S	H	H	M	H	M	H	L	L-H	M	H
Planning meetings	0.1-1	Y	0.1	E	S	H	H	L	L	H	L	M	M	H	H
Risk practice methodology	0.1-3	N	0.1-3	M	M	H	M	L	L	NA	NA	M	H	H	H
Documentation reviews	0.1	Y	0.1	H	S-M	H	H	L	L	H	M	H	L-H	L-H	H
Analogy comparisons	0.2-2	Y	0.2-2	M	S	L	H	H	L-M	M	H	L-M	L-M	L-H	M
Plan evaluation	1-1.5	Y	0.2-1.5	M	H	H	H	NA	L	M	L	L	H	H	M-H
Delphi technique	0.2-0.5	Y	1-2	H	S	M	H	H	L	H	L-M	NA	H	H	H
Brainstorming	0.1	Y	0.1	H	S	L	L	NA	NA	H	NA	NA	L	L-H	H
Crawford slip method (CSM)	0.1	Y	0.1	H	S	L	L	NA	NA	M	NA	NA	L	H	H
SWOT analysis	0.1	Y	0.1	H	S	NA	M	NA	NA	L	NA	NA	L	L	H
Checklists	0.1	Y	0.1	H	S	M-H	L	L	L	NA	M	NA	H	M	H
Risk breakdown structure	0.1-0.5	Y	0.1-0.5	M	M	H	M	NA	NA	M	H	NA	M-H	M-H	H
Root cause identification and analysis	0.1	Y	0.1	H	S-H	H	M	L	NA	M	M	NA	M-H	H	H
Risk registers/tables	0.1-0.5	Y	0.1-3	H	S	M	M	L	NA	L	L	L	H	H	H
Project templates	0.5	Y	0.5	E	M	H	H	H	H	H	M-H	L	M	L-H	H
Assumptions analysis	0.1	Y	0.1	H	M	M	H	H	M-H	H	M	H	M-H	L-H	H
Decision analysis– Expected monetary value	0.5-1	Y	0.2-0.6	M	S-M	M	H	H	M	M	M	M	L-H	L-H	M
Estimating relationships	0.1-3	Y	0.1-3	E	M	L	L	L	NA	NA	NA	H	L	L	L
Network analysis	0.1-3	Y	0.1-3	H	S-M	H	H	M	H	M	H	L	H	L-H	H
Program evaluation and review technique (PERT)	0.1-3	Y	0.1-3	H	S-M	H	H	L	H	L	NA	NA	H	L	H
Other diagramming techniques	0.1-3	N	0.1-3	E-H	M	NA	M	NA	L	H	L	L	M	H	H
Rating schemes	0.1-1	Y	0.1-0.2	H	S	L	M	L	NA	NA	L	L-H	M	H	H
Urgency assessment	0.5	Y	0.2-0.5	H	M-H	L	H	NA	L	L	L	L	H	L	H
Data quality assessment	05.-1	Y	0.1-0.5	L	H	L	M	NA	NA	L	L	NA	H	H	L
Risk modeling	0.1	Y	0.1	H	S	M	H	M	NA	L	NA	M	H	L	L-H
Sensitivity analysis	0.1-0.5	Y	0.1-0.5	H	M	NA	H	M	NA	M	M	M	M-H	M	H
Monte Carlo simulations	0.2-0.4	N	0.2-0.5	E	M	L	H	NA	NA	M	L	L	L	L	L
Risk factors	0.1-0.4	Y	0.1-0.5	E	S	M	M	NA	NA	L	L	M	L-M	L	H
Risk response matrix	0.1-0.2	Y	0.1	H	S-M	NA	M	M	NA	M-H	M-H	L	H	H	H
Performance tracking	1.5	Y	1.5	M	M	H	H	M	M	H	M	M	M	M	H
Risk reviews and audits	0.1	Y	0.1	H	S	H	H	L	NA	M	L	H	H	M-H	H
	N = No (Not normally available) Y = Yes (Normally available) E = Easy H = Heavy M = Moderate S = Slight					H = High M = Medium L = Low NA = Not applicable							H = High M = Medium L = Low		

10.8. Appendix 8 - The Eight Quality Management Principles in a PRO Statoil Context

Successful use of the eight quality management principles will ensure that we achieve quality in our projects.

- Customer focus.
    - Be aligned with the Asset Owner and the stakeholders expectations
- Leadership
    - Create and maintain a culture for quality, valuing precision, compliance and excellence
- Involvement of people
    - Ensure involvement of people at all levels in the project to utilize their abilities
- Process approach
    - A desired result is achieved more efficiently when related activities and resources are managed as a process
- System approach to management
    - Identify, understanding and interrelated processes as a system contributes to the project's overall performance should be a permanent objective
- Continual improvement
    - Continual improvement of the project's overall performance should be a permanent objective
- Factual approach to decision making
    - Effective decisions are based on the analysis of data and information. In Statoil we keep track of and handle risks, using an efficient risk management system
- Mutual beneficial supplier relationships
    - A project and its suppliers are interdependent and mutually beneficial relationships enhance the ability of all to create value

Deliver projects with precision, compliance and excellence and with continuous improvement to our processes.

10.9. APPENDIX 9 – QUALITY SYSTEM AUDIT AND EXAMINATIONS IN PROJECTS

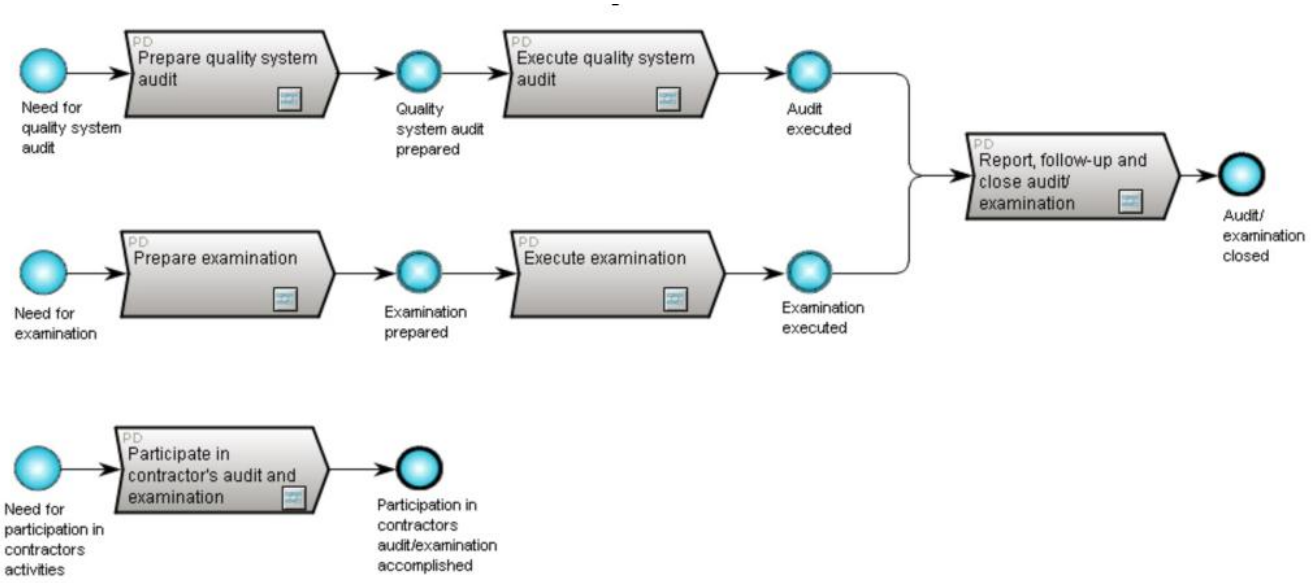


Figure 48 : WR2359 Quality System Audit and Examinations in Projects

10.10. APPENDIX 10 - RISK MANAGEMENT PROCESS

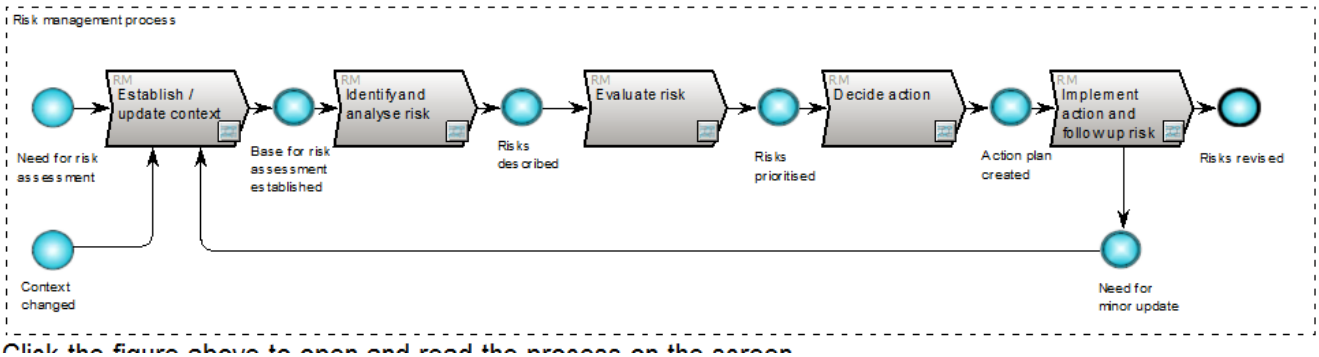


Figure 49 : WR2404 Risk management process

10.11. APPENDIX 11 – FAST TRACK PROJECTS

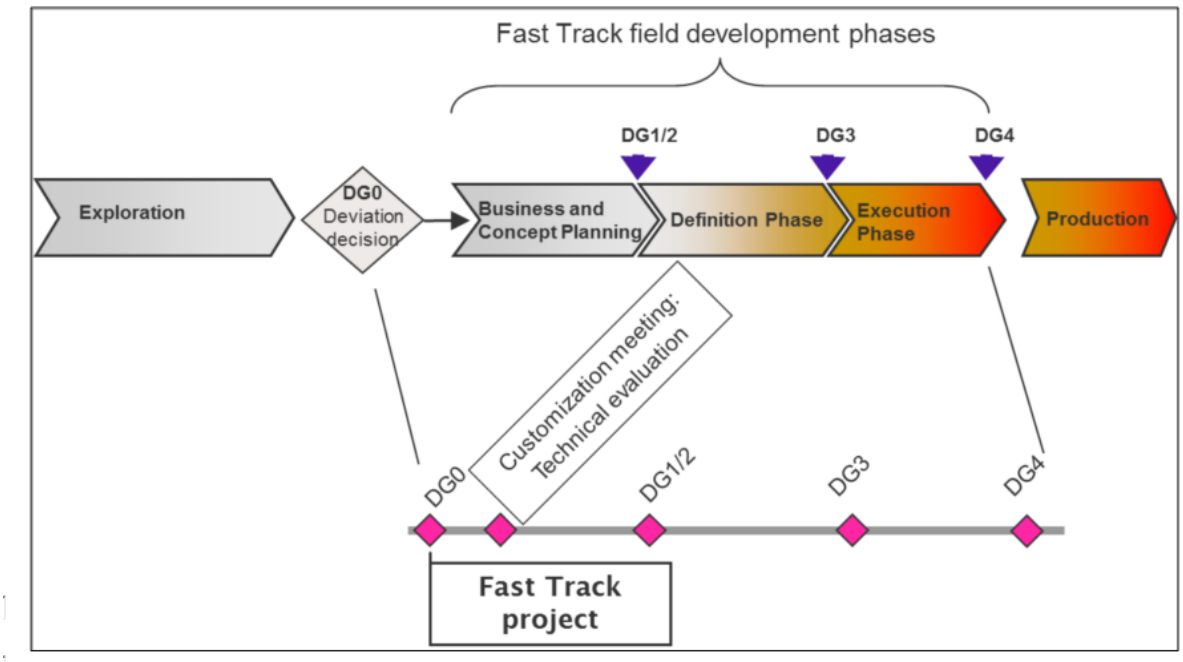


Figure 50 : Fast Track project. FR02- Petroleum technology and IOR

10.12. APPENDIX 12 - COMPLIANCE AND LEADERSHIP MODEL

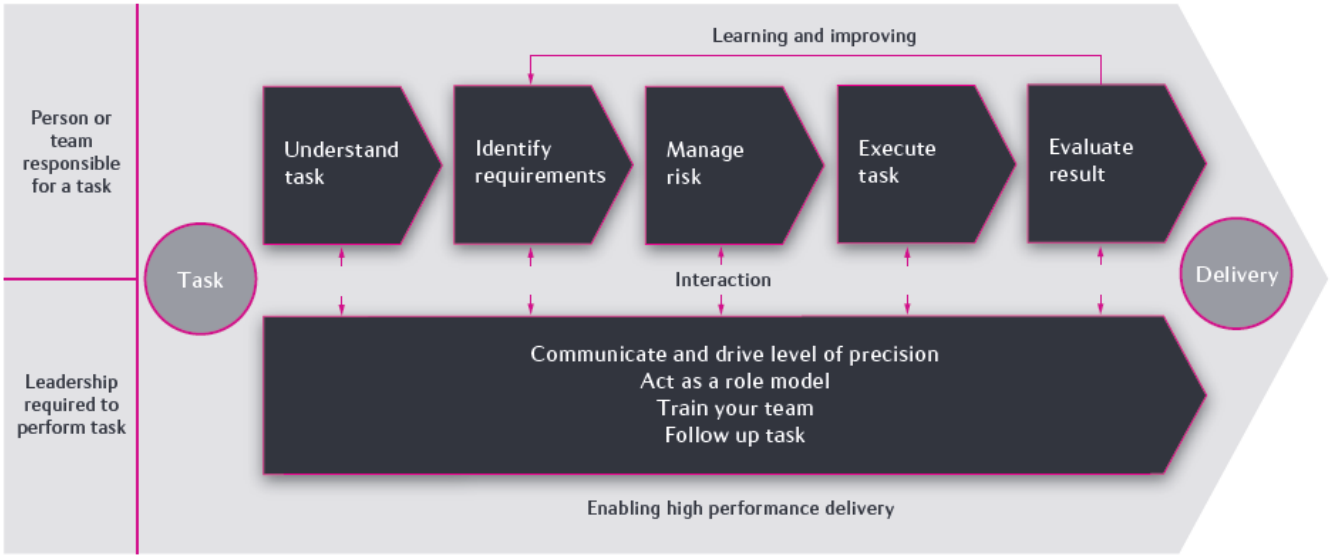


Figure 51 : Compliance and Leadership Model (Statoil, 2011, p.34)

10.13. Appendix 13 – Risk Matrix in Statoil

	0-1%	1-5%	5-25%	25-50%	50-100%	Health/Safety 1)
Minor						Medical treatment, injury or work related illness with need for treatment or with temporary health effect
Moderate						Other injury or work related illness that result in brief absence or restricted/substitute work or some functional impairment. Medically manageable.
Serious						Serious injury or work related illness with absence from work, restricted work or permanent health effects. High level of medical treatment, serious functional impairment.
Severe						1-3 fatalities on workforce. Serious injury /illness on 3rd party. 1-3 Serious, work related illness or exposure resulting in significant life shortening effects/ fatalities
Major						Several workforce fatalities (4 or more), larger parts of an installation/plant and/or fatalities for neighbors. Fatalities include work related illness w/ significant life shortening effects. Major accidents.

Figure 52 : Screen shot from an information e-mail sent by Mads Hembre, 5. December 2011.

10.14. Appendix 14 – Risk Identification work process in Statoil

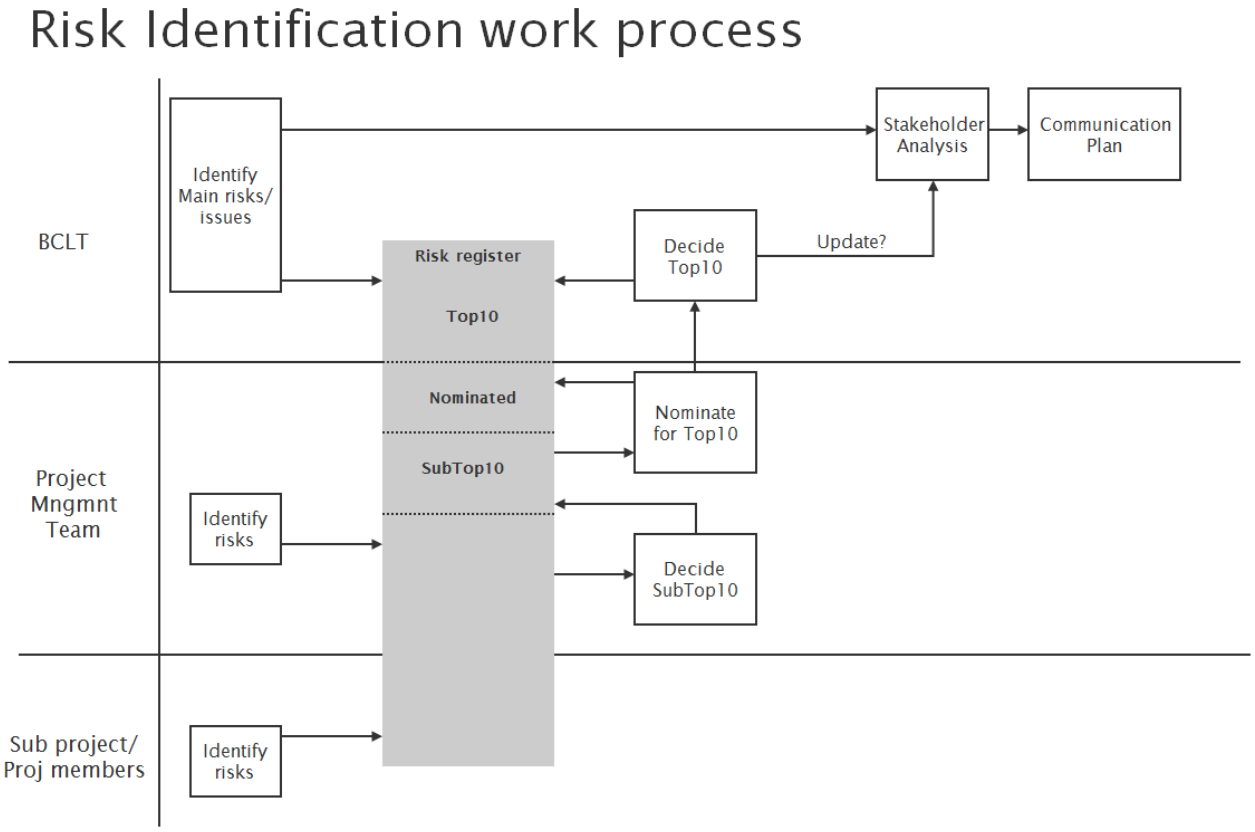


Figure 53 : Screen shot from ppp-presnteation made by Terje Fjerdingen, 2010-04-27.

10.15. APPENDIX 15 – GENERATION OF "TOP 10 RISK LIST"

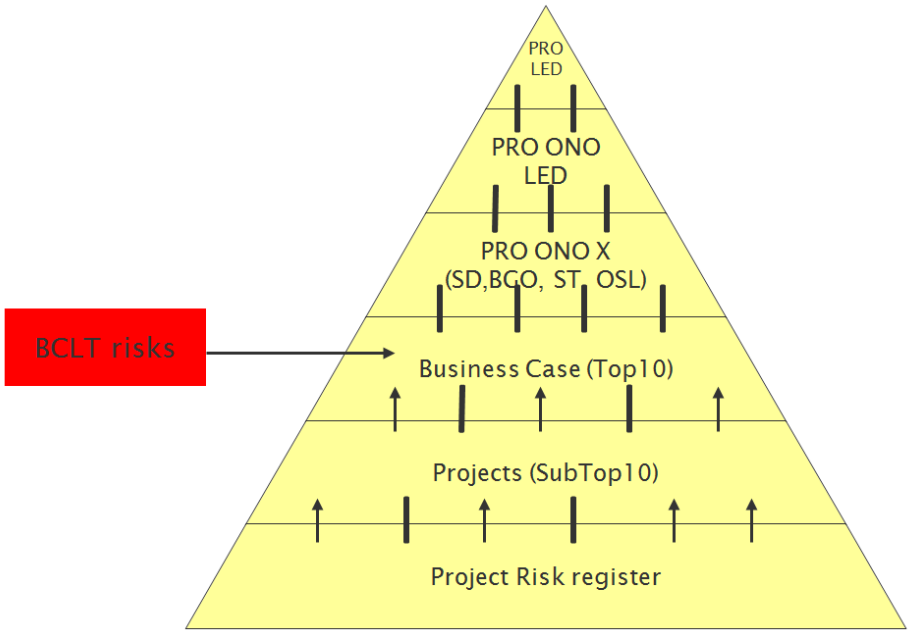


Figure 54 : Screen shot from ppp-presnteation made by Terje Fjerdingen, 2010-04-27.

10.16. APPENDIX 16 – THE TOTAL RISK PICTURE

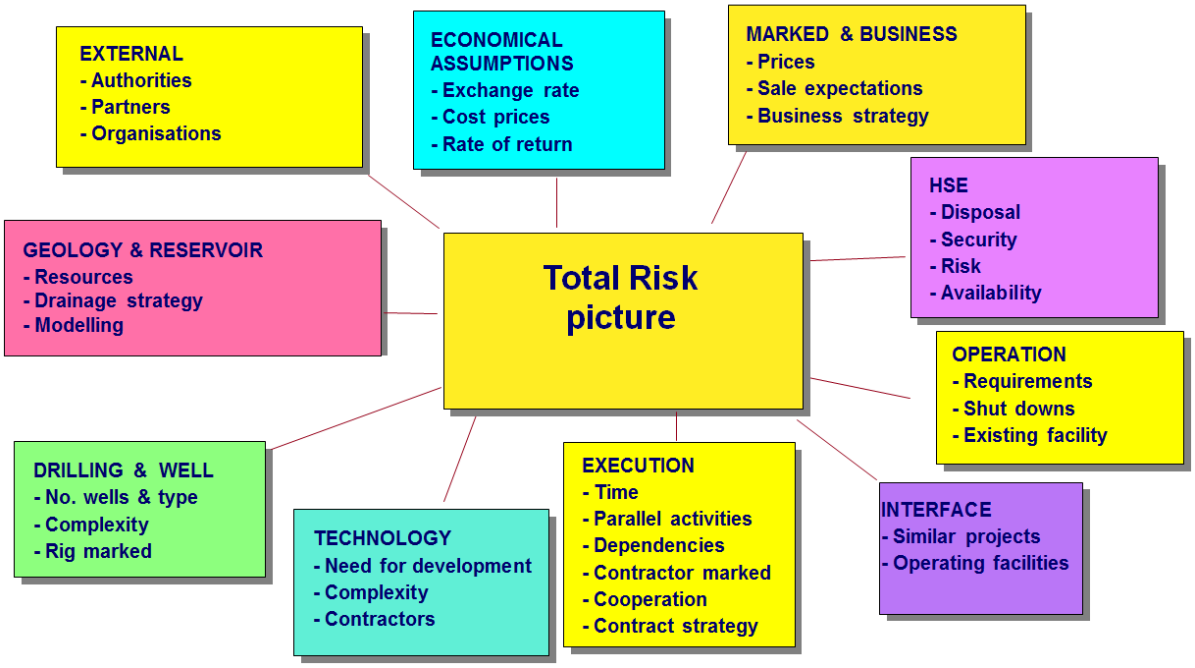


Figure 55: Screen shot from ppp-presnteation made by Terje Fjerdingen, 2010-04-27.

10.17. APPENDIX 17 – THE STATOIL VALUES (STATOIL, 2011, P.12-13)

Courageous
• Be imaginative and ambitious, and stimulate new ideas
• Use foresight, and identify opportunities and challenges
• Challenge accepted truths and enter unfamiliar territory
• Make clear demands on each other and push for constructive change
• Understand and manage risk

Open
• Be truthful and act with integrity
• Be curious, work together and share experience
• Promote and value diversity
• Communicate in a precise way, give and accept constructive Feedback
• Bring up ethical issues and challenges immediately

Hands-on
• Deliver on promises
• Continuously develop sound expertise, demonstrate commercial awareness and customer orientation
• Strive for simplification and clarity, and focus on value-adding activities
• Act decisively and be loyal to decisions
• Show dedication and endurance, follow through and pay attention to important details

Caring
• Cause zero harm to people and prevent accidents
• Reduce the negative impact of our activities and products on the environment
• Act within the law and comfortably within our own ethics policy
• Demonstrate social responsibility and contribute to sustainable development
• Respect the individual, help others to succeed and contribute to a positive working environment

10.18. APPENDIX 18 – DECISION GATE SUPPORT PACKAGE

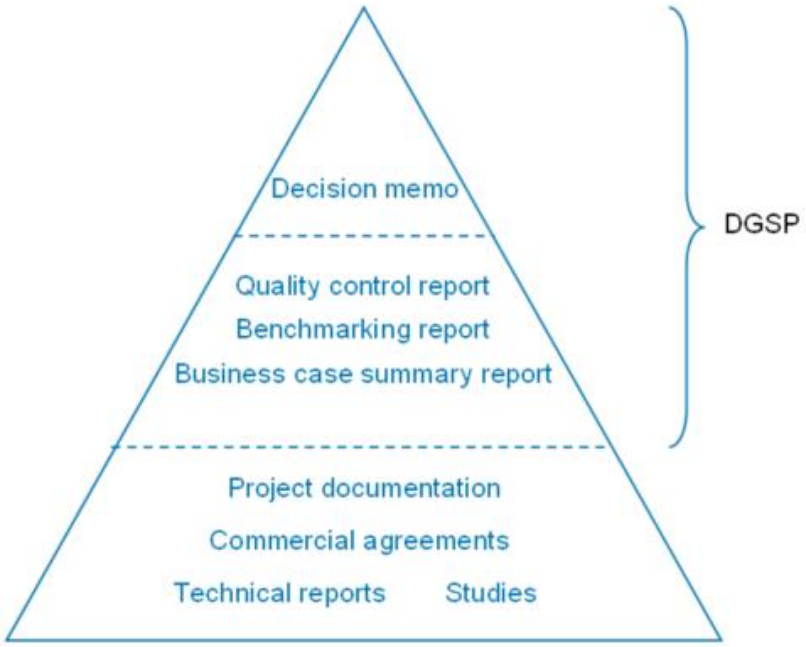


Figure 56: Structure of information including Decision gate support package (GL3000, p.9)

10.19. APPENDIX 19 – SUB-PROCESSES

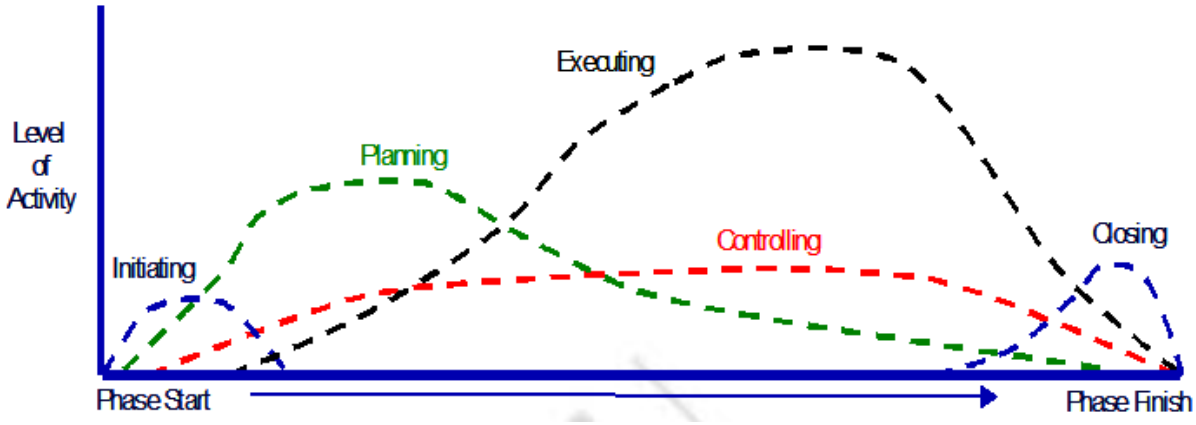


Figure 57 : Overlap of Sub-processes in a project phase (GL3000, p.12)

10.20. APPENDIX 20- PRE-STUDY REPORT

QUALITY AND RISK MANAGEMENT IN PROJECTS

PREFACE

This report is the pre-study report of the master thesis – *Quality and risk management in projects,* written at the Norwegian University of Science and Technology (NTNU), department of Production and quality engineering, spring 2012.

This master thesis is written in close collaboration with Statoil ASA, department for Quality and risk management at Stjørdalen, Norway.

1. PROBLEM DESCRIPTION

1.1 BACKGROUND AND MOTIVATION

Both quality management and risk management are well established field, and a combination of these are not common. In Statoil ASA there are a department that works towards assuring quality by reducing risks in projects. This department is called Quality and risk management.

This master thesis will analyse the links between classical quality management and risk management, and pros and cons of a combined quality and risk management approach in projects.

1.2 STATOIL ASA

Statoil is an international energy company with operations in 34 countries with more than 20 000 employees over the world. With more than 35 years of experience from the oil- and gas production on Norwegian shelf, Statoil are using technology and innovative business solutions to meet the needs for energy in the world. The main office is located in Norway. Statoil ASA is listed in the New York Stock Exchange and on the Oslo Stock Exchange.

When Statoil measures their performances, not only are the figures of importance. The way that the results are being reached is as equal important. By having a valued based performance, high ethical requirements and regulations will lead to a higher personal integrity.

Health, Safety and Environment (HSE) requirements within Statoil are held to a high level. One of Statoil's goals is to fill the worlds need for energy. This is necessary to achieve an economical and a social development. Parallel with this work Statoil are working towards fighting the global climate changes.

A safe and efficient business got the highest priority in Statoil. Statoil are known for their monitoring systems for technical safety and safety programs. Statoil strongly believe that accidents can be prevented, and it is the company's responsibility to reduce the business activities impact on the environment. Statoil have a goal for zero harm to human life.

1.3 MAIN OBJECTIVE

The main objective of the master thesis is to deliver a report that deal with the following topics:

- A literature study in the fields of "quality management"," risk management" and "quality and -risk management".
- Describe and analyse Statoil's models for "quality and risk management".
- Describe and analyse how "quality and risk management" works in practice in a number of selected projects in Statoil.
- Identify weaknesses and strengths with Statoil's model for "quality and risk management".

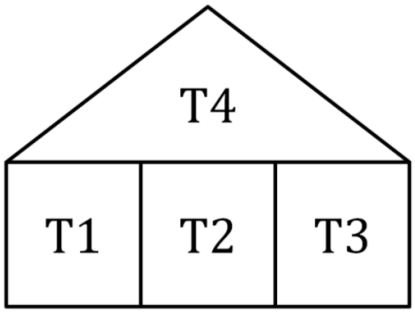


Figure 1 :Illustration of the relationship between the different tasks

The report shall be delivered on the 11th of June 2012.

2. PROJECT DESCRIPTION AND DELIMITATIONS

The master thesis shall be performed as a project, with focus on project planning and control. During the project a pre-study, a progress report and a final report shall be handed in.

The thesis has 4 different tasks. The task are presented and analysed below, including delimitations where it is applicable.

2.1 TASK 1

"Review relevant literature on «quality management», « risk management» and "quality and risk management". If possible, the thesis should include models for "quality and risk management"."

Approach: This task will be part of the foundation for the rest of the thesis. There are existing toolboxes available for both of quality and risk management, some of these should be mentioned briefly (maybe as a list), but there is no point in going in-depth in all of them. There are a lot of similarities in quality and risk management, and one objective of this task is to build a strong foundation so that the following tasks can be done. The literature search will be a parallel activity to task 2 and task 3 (see appendix B), so that any additional information that becomes clear future out in the project can be added into the literature search part if necessary.

Delimitations: As mentioned earlier, both quality and risk management are well established fields, and to map everything is not humanly possible. Only the key similarities will be mapped, and only a restricted number of articles and books will be covered.

2.2 TASK 2

"Describe and analyse Statoil's model for "quality and risk management". Focus on relations between quality and risk."

Approach: The bases for this task can be found in guiding documents provided by Statoil. The way that Statoil does business is a core activity in organization, making this task of great importance for this master thesis.
Delimitations: The key words quality, risk and project management will be a delimitation factor in this task.

2.3 TASK 3

"Describe and analyse how "quality and risk management" is performed in some projects in Statoil. Use tools from quality management to do these analyses. Focus on the relation between quality and risk. "

Approach: To get an understanding of how quality and risk management is performed in projects in Statoil, I will be following a project called Njord Bravo To Shore (NBS), and its biweekly risk meetings and biweekly management meeting. In addition I will be involved in some tasks linked to the Business Case.

Survives and interviews will be executed as part of the analyses.

Delimitations: One of the sentences in the task is " Use tools from quality management to do these analyses". After a discussion with my advisor at NTNU, we have come to the conclusion that this not to be taken literally, rather a general analyses of the question in hand. The focus will be on the relationship between quality and risk.

This task will contain observations made during my involvement in the projects in Statoil. It is important for me to keep in mind that a lot of the information that I got access might be of highly relevance to the specific projects, but not to the master thesis. It is important that I am able to isolate what is essential information to the master thesis. This is important not only because the master thesis is to be as short and precise as possible, but there is a lot of sensitive information linked to the project that need to be kept within the company.

2.4 TASK 4

"Based on the three points above, the candidate shall analyse strengths and areas of improvement of Statoil's model for "quality and risk management". Based on this analysis, the candidate is to suggest an improved model for Statoil's "quality and risk management". "

Approach: A comparison of the results from task 2 and 3 will be presented here. If gaps are present this is the foundation for the suggested improvements.
The improved model does not only include improved suggestions liked to the guiding documents in Statoil, but also the quality and risk managers role in a project.

Delimitations: Only focus on quality and risk management in Statoil, with a special focus on the relationship between risk management and quality management.

2.5 Ranking of Priority

After a the delimitation analysis above, it have become clear that the different task differs in ranking in priority, both in terms of establishing a strong foundation for task 4 and for basis for evaluation. Below is a figure that illustrates the ranking of priority for the four tasks.

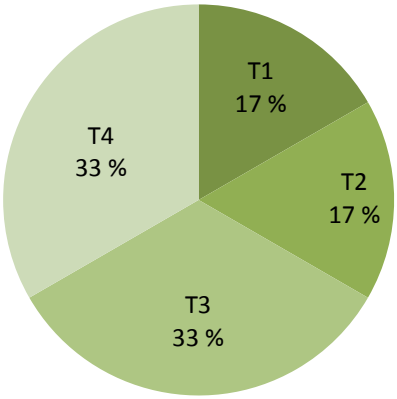


Figure 2 : Ranking of Priority

3. Scope of Work

The master thesis counts for 30 credits during the spring semester. Each study week has 48 available hours, and the master thesis goes over 20 week, resulting in a resource of 960 hours. The project period is from the 16th of January 2012 to 11th of June 2011, including one week Easter holiday.

3.1 Work packages

The project is divided into the following work packages (WP):

- WP 1 - Pre-study report
- WP 2 - Literature search
- WP 3 - Main report
- WP 4 - Data collection
- WP 5 - Project mgmt.

The resources linked to the different WP differ. WP 3- *Main report* is the biggest one, as this is the master thesis report. This work package includes all the formalities, all the task writing and complication. A lot of the work done in task 1- *Literatures study* is done in WP 2, but the completion is done in WP 3. A similar situation can be found in regards to task 3. The input in to task 3 is established in WP 4- *Data collection.* WP 5 – *Project mgmt.* is the smallest WP, but also the WP that expand over the longest time period.

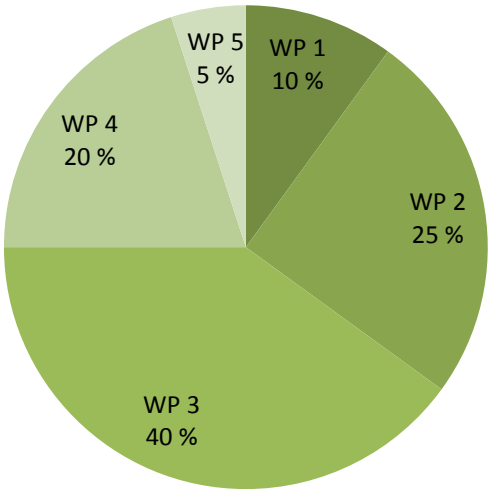


Figure 3 : Distribution of Resources

3.2 MILE STONES

The milestones in this project are

- 6th of February: Deliver pre-study report
- 28th of March: Complete literature study
- 20th of April: Complete data collection
- 11th of June: Hand in master thesis

3.3 PROGRESS MEETINGS

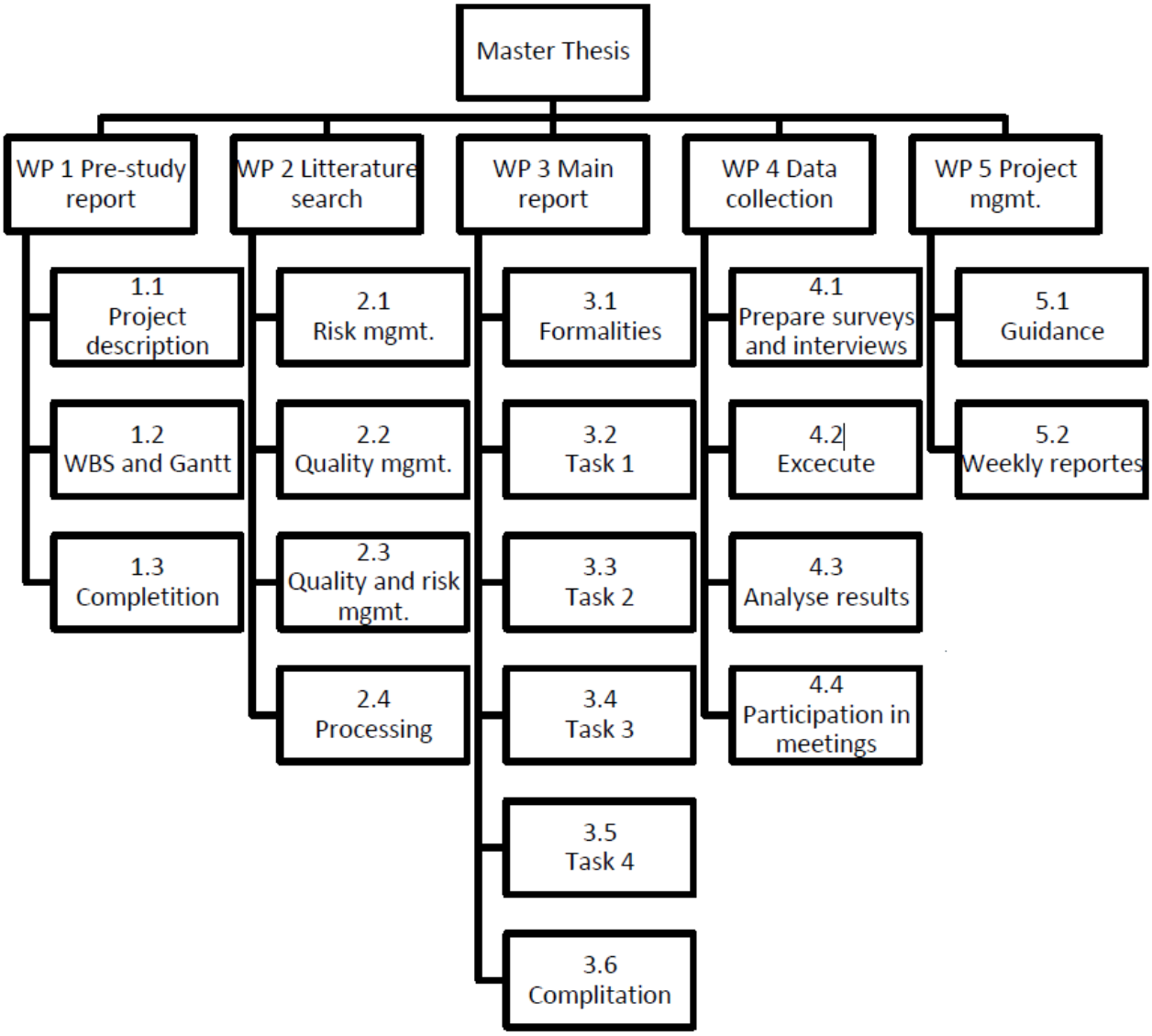
To get input and motivation, meeting with my NTNU supervisor, Bjørn Andersen, will take place when needed. Every Wednesday I will be at Statoils location, disusing the master thesis with my advisor at Statoil, Tom Fagerhaug.

In addition, a short weekly progress report will be will be produces where I sum up last week's work, the challenges I have faced and the plan for the following week.

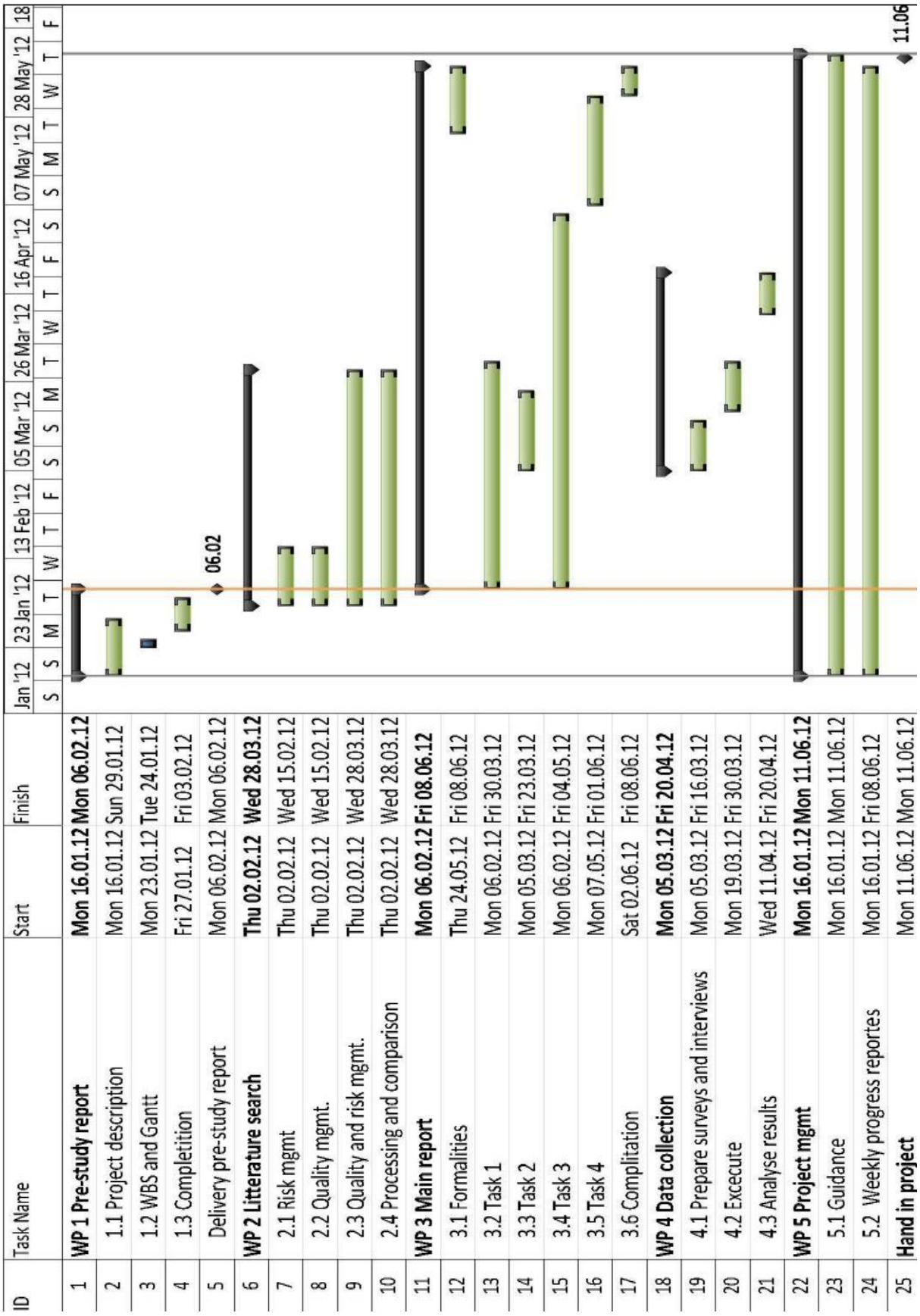
3.4 WORK METHOD

The project will be performed with close cooperation with Statoil ASA. The project's foundation is based on a literature study with the key worlds quality and risk management. To get a deeper understanding of quality and risk management, I will be following a project at Statoil in an interesting phase. Supplementary information will be gathered through interviews, dialogues and governing documentation form the company. Based on experiences made during the project assignment, task 1 will be conducted in parallel with the other tasks.

APPENDIX A- WORK BREAKDOWN STRUCTURE



APPENDIX B- GANTT



10.21. APPENDIX 21 – PROGRESS REPORT 1

1. PREFACE

This report is a compulsory activity part of the master thesis – *Quality and risk management in projects,* written at the Norwegian University of Science and Technology (NTNU), department for Production and quality engineering, spring 2012.

The objective of this report is to show the progress that has been done in according to the pre-study report, deviations from the progress plan and an explanation to the deviations. In addition a list of actions of how to mitigate these deviations will be presented.

This report is the first of a sequence of two.

2. SCOPE

The literature study have 2/3 of the same search word as the project assignment – *Supplier Quality Management,* resulting in that some of the chapters of the literature is strongly influenced by the results presented in the project assignment..

In the original plan for task 2 was not supposed very time consuming. Some of the questions raised in task 2 have been answered in the same project assignment mentioned above. What I did not take into consideration in the planning phase was the amount of changes made in many central governing documents. New procedures for document control and new governing documentation result that task 2 have to be done from the ground up.

Task 3: Both of the projects that that I am following at Statoil have had the first mounts of the master thesis have immature scopes, are untraditional projects (known as fast track). This have resulted that a lot of time spent on grasping the constant changing scope rather than focusing on the QRM role. Ways of changing these untraditional projects into a positive attribute to the master thesis have been developed.

3. TIME MANAGEMENT

In the pre-study report a Gantt chart was developed. In this report an updated version of the Gantt chart is presented. The updated Gantt chart contain an rough description about the situation.

During the planning of execution of the thesis, some factors was not integrated and included. My extra job as a student assistant and extra curriculum one week course in Prague was properly not integrated into the Gantt chart presented in the pre-study report.

In the planning of the progress for the master thesis my student assistant job was estimated to be 100 hours equality divided over the whole semester, and not concentrated into the first 8 weeks of the semester. Consequently, some delays to the project have accorded.

Task 1:

According to the original Gantt chart both the task *2.1 Risk mgmt.* and *2.2 Quality mgmt.* should have been completed. This is not the case, as I have decided not to fully close the literature search until the interviewing process is closed. Task 1 is approximately 75% finished, where the main contributor to focus is now to process and complete the literature search.

Task 2:

Task two is marked in red in the Gantt chart, which means that it has been delayed. On the contrary task 2 has a good progress of 75% completed.

Task 3:

Task 3 is only 25% completed. This has leaded to a small delay in task *3.4 Task 3.* This has resulted in that the task *4.1 Prepare surveys and interviews* have been moved 10dayes ahead. To mitigate this effect, some work associated with the preparer of the interviews will be performed during the Easter holiday.

4. MILESTONES

The old milestones presented in the pre-study report were:

- 6th of February: Deliver pre-study report
- 28th of March: Complete literature study
- 20th of April: Complete data collection
- 11th of June: Hand in master thesis

Additional milestones stated in the Gantt chart:

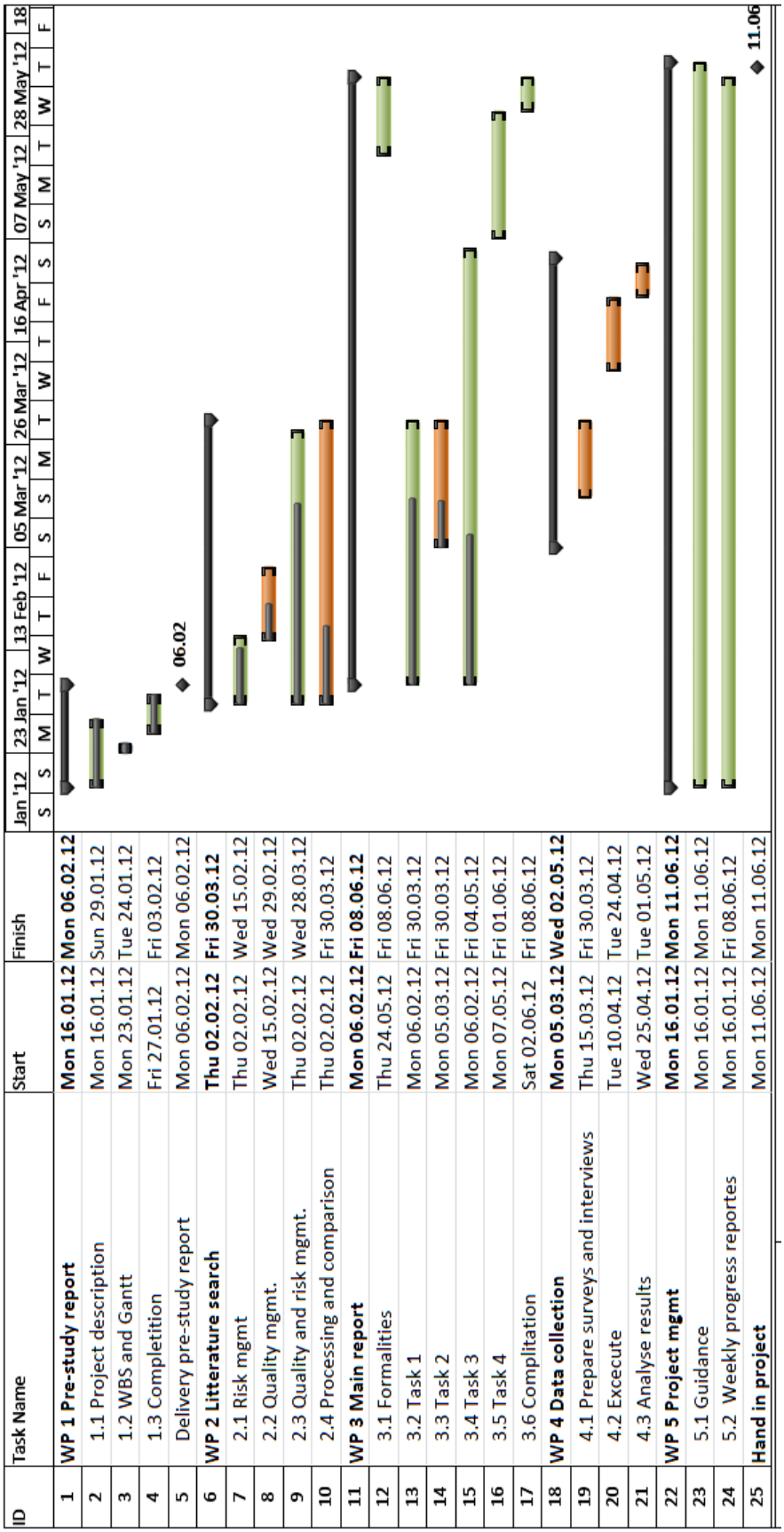
- 16th of January: Project start
- 23th of March: Complete task 2.

To reduce the impact of the deviations on the progress of the thesis work, the following new milestones have been defined. Changes according to the pre-study are marked in red:

- 16th of January : Project start
- 6th of March: Deliver pre-study report
- 15th of March: Deliver Progress report 1
- 30th of March: Complete task 2.
- 30th of March: Complete literature study
- 2nd of May: Complete data collection
- 4th of May: Deliver Progress report 2
- 1st of June: Complete task 4
- 11th of June: Hand in master thesis

These milestones are also updated in the Gantt chart, which is shown on the last page of this report.

5. UPDATED GANTT CHART



ID	Task Name	Start	Finish
1	**WP 1 Pre-study report**	**Mon 16.01.12**	**Mon 06.02.12**
2	1.1 Project description	Mon 16.01.12	Sun 29.01.12
3	1.2 WBS and Gantt	Mon 23.01.12	Tue 24.01.12
4	1.3 Completition	Fri 27.01.12	Fri 03.02.12
5	Delivery pre-study report	Mon 06.02.12	Mon 06.02.12
6	**WP 2 Litterature search**	**Thu 02.02.12**	**Fri 30.03.12**
7	2.1 Risk mgmt	Thu 02.02.12	Wed 15.02.12
8	2.2 Quality mgmt.	Wed 15.02.12	Wed 29.02.12
9	2.3 Quality and risk mgmt.	Thu 02.02.12	Wed 28.03.12
10	2.4 Processing and comparison	Thu 02.02.12	Fri 30.03.12
11	**WP 3 Main report**	**Mon 06.02.12**	**Fri 08.06.12**
12	3.1 Formalities	Thu 24.05.12	Fri 08.06.12
13	3.2 Task 1	Mon 06.02.12	Fri 30.03.12
14	3.3 Task 2	Mon 05.03.12	Fri 30.03.12
15	3.4 Task 3	Mon 06.02.12	Fri 04.05.12
16	3.5 Task 4	Mon 07.05.12	Fri 01.06.12
17	3.6 Complitation	Sat 02.06.12	Fri 08.06.12
18	**WP 4 Data collection**	**Mon 05.03.12**	**Wed 02.05.12**
19	4.1 Prepare surveys and interviews	Thu 15.03.12	Fri 30.03.12
20	4.2 Excecute	Tue 10.04.12	Tue 24.04.12
21	4.3 Analyse results	Wed 25.04.12	Tue 01.05.12
22	**WP 5 Project mgmt**	**Mon 16.01.12**	**Mon 11.06.12**
23	5.1 Guidance	Mon 16.01.12	Mon 11.06.12
24	5.2 Weekly progress reportes	Mon 16.01.12	Fri 08.06.12
25	**Hand in project**	Mon 11.06.12	Mon 11.06.12

10.22. APPENDIX 22 – PROGRESS REPORT 2

1. PREFACE

This report is a compulsory activity part of the master thesis – *Quality and risk management in projects,* written at the Norwegian University of Science and Technology (NTNU), department for Production and quality engineering, spring 2012.

The objective of this report is to show the progress that has been done in according to the pre-study report, deviations from the progress plan and an explanation to the deviations. In addition a list of actions of how to mitigate these deviations will be presented.

This report is the second of a sequence of two.

2. SCOPE

In compliance with my advisor at Statoil, Tom Fagerhaug, some changes have been made to the focus of this thesis. The changes where mainly on task 3, which again had an influence on task 2 as well. The main reason for this were that my background information about the Statoil system where not solid enough to produce a good thesis aligned with the previous theme. This background requires years of experience from the Statoil system and PRO to be able to see all the links in this complex system. The value of the thesis will also benefit from the adjustment, both in terms of a less vague topic and a better written thesis.

The new formulation for task 3 is
"Describe and analyse how "quality and risk management" is performed in different project phases in some projects in Statoil."

The original plan was that I was to follow some projects in Statoil to see how the QRM role where executed. This have now been set aside, because all of these project where in the early phases of the projects, and not widely spread. To give more focus on the project phases.

3. TIME MANAGEMENT

In the *Pre-study report* and the *Progress 1 report* a Gantt chart was developed. In this report an updated version of the Gantt chart is presented.

Task 1:
The literature search is now completed.

Task 2:
As mentioned in Scope, some changes were made accruing to task 3, which had an influence on task 2 as well. Consequently this task where not finished according to the time limit set in *Progress 1.* However, this task is now completed accruing to the new focus of the thesis.

Task 3:
Due to the changes made, this section is not following the new time schedule made in *Progress 1* neighed. However, all of selected interviewees have been booked, and 70% of the interviews are finished by this date. All of the interviews will be completed by 14th of May.

Task 4:
This task set out to sum up all the findings from the previous tasks. Some findings are already noted down, but the finalization and analyses are not completed.

4. MILESTONES

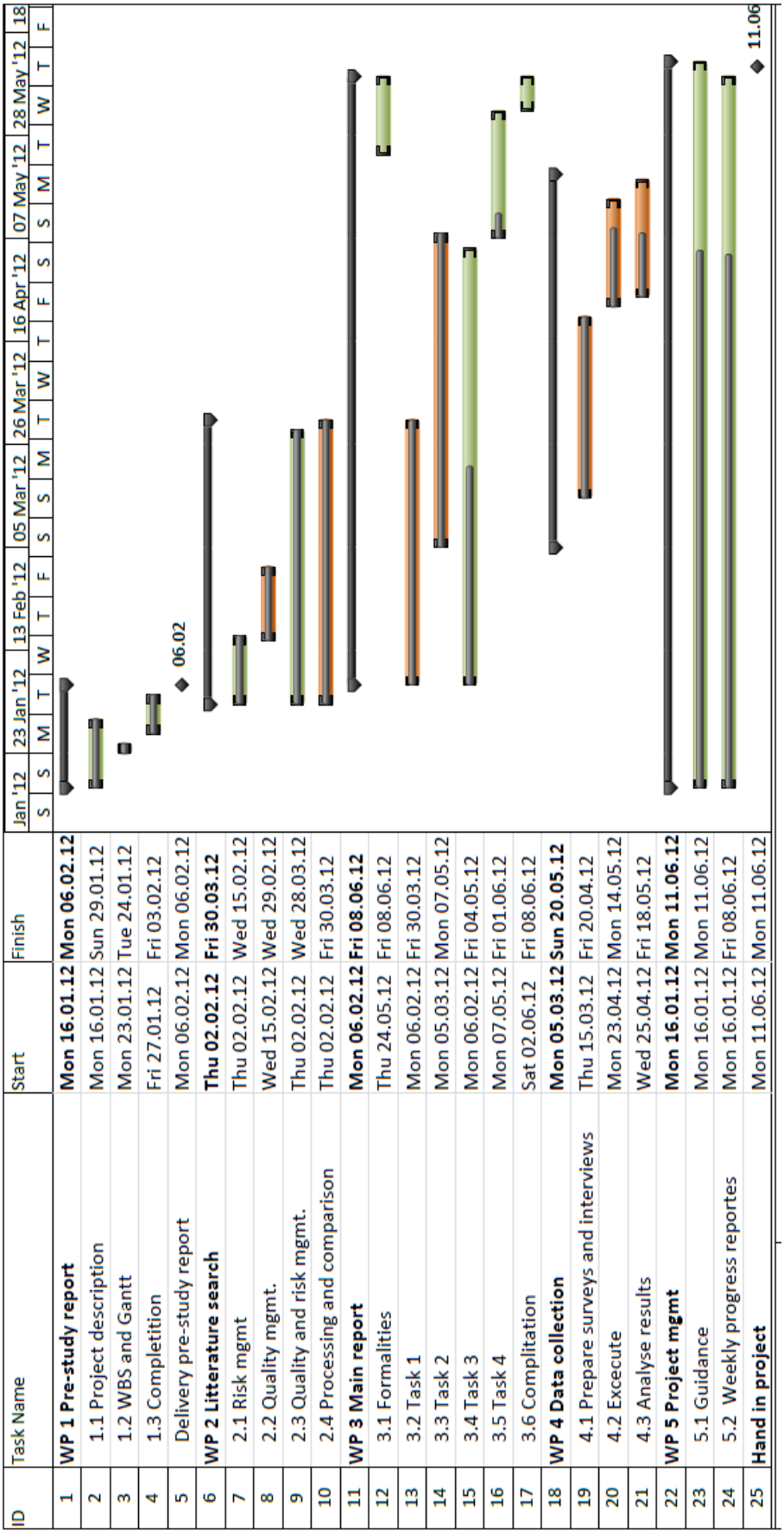
The milestones defined in *Progress 1* were:

- 16th of January : Project start
- 6th of March: Deliver pre-study report
- 15th of March: Deliver Progress report 1
- 30th of March: Complete task 2
- 30th of March: Complete literature study
- 2nd of May: Complete data collection
- 4th of May: Deliver Progress report 2
- 1st of June: Complete task 4
- 11th of June: Hand in master thesis

The deviations from this planed progress is marked in red below. In addition an updated Gantt chart is shown on the next page.

- 16th of January : Project start
- 6th of March: Deliver pre-study report
- 15th of March: Deliver Progress report 1
- 7th of May: Complete task 2.
- 30th of March: Complete literature study
- 14nd of May: Complete data collection
- 7th of May: Deliver Progress report 2
- 1st of June: Complete task 4
- 11th of June: Hand in master thesis

5. UPDATED GANTT



ID	Task Name	Start	Finish
1	**WP 1 Pre-study report**	**Mon 16.01.12**	**Mon 06.02.12**
2	1.1 Project description	Mon 16.01.12	Sun 29.01.12
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9	2.3 Quality and risk mgmt.	Thu 02.02.12	Wed 28.03.12
10	2.4 Processing and comparison	Thu 02.02.12	Fri 30.03.12
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16	3.5 Task 4	Mon 07.05.12	Fri 01.06.12
17	3.6 Complitation	Sat 02.06.12	Fri 08.06.12
18	**WP 4 Data collection**	**Mon 05.03.12**	**Sun 20.05.12**
19	4.1 Prepare surveys and interviews	Thu 15.03.12	Fri 20.04.12
20	4.2 Excecute	Mon 23.04.12	Mon 14.05.12
21	4.3 Analyse results	Wed 25.04.12	Fri 18.05.12
22	**WP 5 Project mgmt**	**Mon 16.01.12**	**Mon 11.06.12**
23	5.1 Guidance	Mon 16.01.12	Mon 11.06.12
24	5.2 Weekly progress reportes	Mon 16.01.12	Fri 08.06.12
25	**Hand in project**	Mon 11.06.12	Mon 11.06.12

10.23. APPENDIX 23 – EXPERIENCE REPORT

This final progress report is written as an experience transfer report, written in order to share some experiences made by the author of this thesis, concerning the process and project execution of this master thesis. The customers of this report are the reader of this thesis, and future master thesis students.

Throughout this thesis, not only have the relevant theory been identified, valuable learning about the process have been made. One of main findings from the work with this thesis is that thing never go how you plan them to be. Of course should the progress of the work be properly planned. The aim of planning is not to follow the plan by its details, rather to identify challenges that might arise and solutions to these challenges. Moreover, the plan established in *Progress Report 2* was followed.

To educate is more than being able to read courses and memories scientific approaches. Being an educated person, one should be able to transform information from literature and data collection into specific cases or problems in the real life. Being able to solve someone's problems with help of literature and experiences is an important skill that my education has though me.

In order to have a successful execution of the thesis, one should be close to the source of information. Be at the Statoil's locations at least 50% of the time, and try to coordinate to be present when your Statoil informants are there. Use this experience as an exercise of the transaction from student life into working life. I have during the spring gone from a six day week with six to seven hours each day, to a five day week with eight hours. This has thought me to be more efficient with my time.

Planning and execution of interviews are a time consuming activity. I think that the end result have been better if some informal interviews have been done early in the process in order to identify the main issues of the problem. By doing this the quality of the literature review will increase as it will be more suited the concrete issue. This is especially important when addressing such as a wide area of literature as this thesis has. In addition, the execution of main interviews should have started sooner, because in these some new issues are bound to merge.

When planning the interviews, it is important to remember that the subjects are humans (often very busy in addition), and do not expect that the times that fits you best will correlate with the interviews. You need to be flexible, because they are giving you some of their valuable time.

Nobody is going to help you if you do not ask, and nobody will hold your hand along the way. The path is yours to define, and it is your own responsibility to keep on that path and do not make too many detours.

Some of the issues addressed in this thesis and their discussions might come across as simplistic. However it is important that somebody discuss issues that seems obvious, in order to create a common understanding.

11. REFERENCES

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