



# Master's degree thesis

**LOG950 Logistics**

**An analysis of the planning horizon for logistics activities at the Heidrun Offshore Installation**

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## **PREFACE AND ACKNOWLEDGEMENTS**

This thesis represents our final semester in the MSc in Logistics program at Molde University College. The research problem was first introduced to us in a list with potential master theses topics, provided by the college. We thought the addressed problem and the industry appeared very interesting, so we decided to apply for the suggested thesis. After some discussion with the supervisor we were chosen, and got the project as our thesis.

Writing a thesis in cooperation with a large and important energy company as Statoil is an exciting opportunity that we assumed would give us valuable insight in the Norwegian offshore industry.

The writing of this thesis would not have been possible without the help and support from the Heidrun (HD) organization in Stjørdal, the supply base in Kristiansund and the HD offshore installation in the Norwegian Sea. Especially we would like to thank our contact person at HD, HD's logistics leader Torbjørn Pedersen for introducing us to the HD organization and giving insight and helping us establish contact with HD personnel. We would also like to thank Per Ove Økland, Finn Erik Jakobsen, Gro Krogstad and Atle Hoel for giving us valuable insight and understanding of HD's supply chain and their operations.

This research has given us the opportunity to get an insight in the oil industry by observations of their operational environment. Through several visits at HDs operations centre in Stjørdal we got insight in the activities from the planning and administration onshore. This was followed by visits at the supply base in Kristiansund and a trip offshore to HD where we got a better picture of the supply and offshore operations.

In addition to this we also want to thank all those who contributed to our interviews, at Stjørdal, the supply base in Kristiansund and at the Heidrun offshore installation.

Finally we would like to give our sincere gratitude to our supervisor, associate professor Bjørnar Aas for giving us guidance, constructive criticism and feedback during the process of writing this thesis.

Molde, 25 May 2010

Nikolai Vedde Brathaug and Øyvind Sagbakken

## SUMMARY

The purpose of this thesis was to focus on the planning activities for logistics activities offshore. The idea behind this is to identify the planning horizon for logistics activities offshore, and to better understand the elements that affect the planning horizon. We also wanted to see which benefits an offshore installation would have with an improved planning horizon. The case study used, is the Heidrun (HD) offshore installation, located in the Norwegian Sea. Three research objectives were set using qualitative techniques and an exploratory and descriptive research design.

The first research objective was to *describe the process from planning to execution for activities on HD offshore installation*. We started out with describing the supply chain, including the key members that are emphasized. The HD installation is defined to be the customer in the upstream supply chain, which are operated and controlled from the Heidrun Operations Centre (HD OPS) in Stjørdal. The Drilling & Well (D&W) department is also located in Stjørdal, which controls the D&W operations on HD. How these two departments plan their operations on HD are described step by step. Based on this description, we also identified some sub- processes which are used to describe the planning horizon. These processes are gathered and sequenced in a chronological sequence in accordance with the timeline. The whole idea behind this is to identify the most important processes that affect the planning horizon. The result we got from this is that the theoretical planning horizon for logistical activities at HD, estimates a total of 16 hours.

The second research objective was to *investigate the reasons for the limited planning horizon for logistical activities offshore*. When the planning horizon is identified by sequencing the planning processes chronological, it is possible to identify the processes which are most critical with respect to the planning horizon for logistics activities offshore. Our conclusion in this relation is that the process that is most critical for the planning horizon is when the Loadinglist is ready. The Loadinglist provides relevant logistics information to personnel working with logistics on HD. When they get the Loadinglist, they know with certainty what is shipped offshore, which enables them to plan logistics activities for the incoming shipment. We believe that this information could be available at an earlier stage, leading to an improved planning horizon for logistics activities offshore.

The third research objective was to *explore how the planning horizon for logistical activities offshore can be improved and the potential positive consequences of this*. If the information included in the Loadinglist is available for logistics personnel offshore at an earlier stage, the planning horizon could be improved. To achieve this, both D&W and HD OPS must share logistics information at an earlier stage of the planning process. We conclude in our analysis that the earliest point both departments could share information with required certainty is 1-2 days ahead of the shipment. Based on this statement, we suggested that D&W and HD OPS should share relevant logistics information in a common information system. The goal of this is to give the logistics personnel offshore a better overview over the logistics demand in advance, resulting in an improved planning horizon for logistics activities offshore.

If our suggestion of a new common information system between D&W and HD OPS is implemented, it is important that the information included is correct. To control the quality of the information included in this information system, proactive monitoring of triggers or critical links in the supply chain will help the supply chain to fix problems before they occur. If the information system suggested is implemented and put to use, we believe that the logistics on HD could be planned more efficient. By this we think that HD would:

- Obtain a better coordination of bulk and cargo
- Obtain a better overview of the storing capacity offshore
- Be able to allocate cargo in specified storage areas, before the cargo arrive HD.

Fully utilizations of the benefits above could lead to more quantified benefits for HD in terms of:

- Reduction of laytime for supply vessels
- Reduction in ports of calls to HD
- Greener operations
- Cost reductions

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## 1 INTRODUCTION

There have been written several master theses and a PhD dissertation in earlier years about offshore logistics. Several of these have been written by students from Molde University College in cooperation with the Norwegian energy company Statoil and the offshore installation Heidrun (HD), which has Statoil as operator. The focus in two of these theses has been internal logistics on the HD offshore installation, and causes of delayed supply vessels from the supply base in Kristiansund. In this thesis we are going to look at the planning of logistics activities offshore at the HD installation.

According to Aas 2008, the logistics costs have never limited the operations since Statoil started its logistics activities in the Norwegian Sea in 1995. The reason is that logistics costs are rather low compared to the alternative costs which could be shut down of production or delayed drilling operations. In the later years the focus on the costs in the petroleum industry have increased, leading to costs focus on all of Statoil's business units, including the logistics activities. This means that the focus on the logistics planning through the supply chain has increased. *“Logistics planning is an activity where the goal is to find an intelligent way to coordinate and guide the use of logistics resources”* (Aas and Wallace 2008, page 21).

After discussion with our supervisor and contact person at HD, we realized that the planning horizon for logistics activities offshore is limited today. We also got some confirmation about this when we participated on an offshore logistics conference, where it seemed that the whole petroleum industry had the same apprehension. The industry concluded the reason to be lack of information sharing through the supply chain. Based on this we decided to go deeper into the fact that the planning horizon is limited, and how an improved planning horizon for logistics activities offshore will benefit an offshore installation like HD. HD performs both drilling and well activities and production simultaneously. This is something which complicates the logistics as HD need equipment and personnel for both drilling & well and production operations. These operations are very different with regard to the type of equipment needed, and have a dissimilar uncertainty in demand.

We have identified and described the processes leading to today's planning horizon, analyzed the planning process and found where information could be shared on an earlier stage in the supply chain. With a goal of finding ways to improve HD's planning horizon for logistics activities offshore. Our incentives to do this is to show the benefits an installation like HD would achieve with better control over their logistics planning.

It is also important to clarify that the performance of logistics activities in the HD organization is satisfactory today. HD does not suffer from bad logistics performance in today's situation. Despite this, HD's management, our supervisor, and several actors in the offshore industry realize that the potential for improved logistics performance are significant. We hope that this thesis would contribute with analyses and suggestions that could contribute to further research within this specific area. An outline for the thesis follows.

In Chapter 3 our research methodology and an introduction to the theoretical framework are presented. Chapter 4 and 5 gives an introduction to the organizations involved with HD and how they are organized related to each other. Chapter 6 gives a description of the planning process for the two main departments at HD, which gives the basis for finding today's planning horizon and how it can be improved, which will be presented in Chapter 7. Chapter 8 shows the benefits HD would have with an improved planning horizon. Chapter 9 is the last section where we give the conclusion and the recommendations in accordance to our research objectives provided in Chapter 2.

## **1.1 SOME CLARIFICATIONS THAT WILL ASSIST THE READING PROCESS**

Before reading this thesis, we think it would be proper to give some clarifications. This is proposed to support the reader in the reading process.

Abbreviations are used frequently in this thesis. This is also normal practice in the oil industry. Based on our own experiences, this often leads to confusion in the reading process. Some of the abbreviations are used in the offshore industry in general, and some are made by us to simplify the writing. To give an example; Heidrun operations centre are abbreviated as HD OPS. In Appendix A all the abbreviations are given alphabetically.

The term planning horizon is also frequently used. As stated in the introduction, the research area is about the planning horizon for logistics activities offshore at the HD offshore installation. We think this is a long description, which are unnecessary to repeat every time we use this term. So, when we write planning horizon, we refer to the planning horizon for *logistics activities offshore*. Similar, when we refer to the Heidrun offshore installation, we use HD. All figures, charts and tables not referenced are our own.

## 2 RESEARCH PLAN

In our thesis, we will look at how the planning of the logistics activities at the HD offshore installation is done. This provides a necessary basic knowledge to understand how the planning horizon for logistics activities is limited today. In this relation, we define planning horizon to be the actual time the logistics personnel have to plan their activities offshore. This research is an empirical study of how the planning activities are executed, and how this affects the planning horizon for logistics activities offshore. An empirical approach is a concept that describes information that is generated from observation, experience or experiments (Dictionary.com 2010). The empirical data used are based on our own observations and experience.

### 2.1 *Research objectives*

- **Describe the process from planning to execution for activities on HD offshore installation.**
  - By the planning process from planning to execution we mean activities executed offshore related to the departments Heidrun Operations Centre (herby denoted as HD OPS) and Drilling & Well (herby denoted as D&W).
  
- **Investigate the reasons for the limited planning horizon for logistics activities offshore.**
  - By logistics activities offshore we mean activities as cargo handling, backload handling, allocating containers to the right storage place, bulk handling, and coordinating all deck and crane operations.
  
- **Explore how the planning horizon for the logistics activities offshore can be improved and the potential positive consequences of this.**
  - By improved planning horizon we mean the extra time the logistics personnel offshore could have to plan their activities. We want to find where in the supply chain improvements could be done and how this should be done. The possible gains will also be important to identify.

## 2.2 *Research questions*

- **How is the planning process for the different departments in the HD organization?**

When offshore activities are planned onshore, this generates demand for logistics activities throughout the upstream supply chain (herby denoted as SC). When the plans are ready, the planning of the logistics activities starts. The logistics planning is based on the plans made for the different activities that are executed offshore. In this relation, it would be convenient to see how these planning processes are in the different departments in the HD organization. This will help us to see if there are any differences in the planning process between the departments. The purpose is to describe the whole process from the engineer's plan the activities, to the equipment are sent back from HD. We also hope this will provide necessary information to identify the planning horizon.

- **What is the actual planning horizon for logistics activities offshore today?**

The planning horizon is a result of the information available about the planned execution of logistics activities. We wanted to understand how the actual planning horizon is by interviews of key personnel in HD's SC, and by own observations. One important observation is to map when the logistics personnel offshore get relevant logistics information. By this we mean information about which equipment that is on each shipment, how load carriers are placed on the supply vessel, and where equipment should be allocated offshore. In this relation, it is important to have a clear picture of how long the actual planning horizon is.

- **What are the main drivers that increase/decrease the planning horizon?**

One of the factors that affect the planning horizon is the uncertainty HD experiences with respect to operations and weather. During operations on an offshore installation as HD, unexpected incidents occur. This leads to changes in the original plans, which affect the planning horizon. Weather conditions are also impossible to control, and often leads to changes in original plans. One problem that arises in this case is how to deal with the uncertainty in demand. One approach is to use quantitative methods to illustrate the

uncertainty. However, we decided not to use this approach, because of the complexity of this problem. The data collection and development of a proper mathematical model is to time demanding to develop. A quantitative approach also requires ingoing knowledge about mathematical modeling and quantitative methods, which are not our discipline. Our approach is to use qualitative methods to assist us with this type of problem. Supply chain management (herby denoted as SCM) theory will be used to illustrate these aspects.

- **Identify critical links in the supply chain that can affect the planning horizon.**

In the thesis, we define critical links in the SC as elements that are critical for the SC to work properly. The SCM theory outlines that monitoring critical links in the SC, is a proactive method to avoid potential problems in the SC. Important factors that will be investigated with regard to this, is how the different actors in the SC communicate, and how the information is shared. SC in this relation is limited to the upstream SC. Key personnel in HD's SC are also important factors that can contribute to a well working SC, where knowledge sharing and experience are important. The last point we will look into is the tools used to plan and execute the logistics within the SC. By identifying the critical links, the awareness of this could be improved.

- **How will an improved planning horizon affect HD.**

One of the main goals is to see if HD could have an improved planning horizon. We think that a longer planning horizon would generate several benefits for HD offshore installation and the HD organization as a whole. With a longer planning horizon, logistics personnel on HD could plan their operations better. We think that this could lead to savings generated by;

- Safer and more effective logistics operations offshore
- More efficient cargo allocation offshore
- Better control on HD's storage capacity offshore
- Reduced lifting operations
- Better coordination of bulk and cargo loading/unloading
- Reduced laytime of supply vessels
- Greener operations
- Cost reduction



## **2.3 Boundaries**

### **Boundary 1:**

The main focus in this thesis is the Heidrun result unit (see section 4.5.1). We also include a part of the D&W department which is responsible for planning and carrying out drilling and well operations on HD offshore installation. The D&W activities are not subordinated the Heidrun result unit. Links to other internal and external units have been followed to such an extent that it has helped us with better understanding of the unit in focus. By this we mean the supply base in Kristiansund and Statoil Marine.

### **Boundary 2:**

We have only focused on the planning horizon for logistics activities offshore. By this we include the planning process for both departments D&W and HD OPS. This means that planning activities for projects and revision stops are not included.

### **Boundary 3:**

Only the upstream supply chain for HD is included in this thesis. This is most relevant concerning the planning of logistics activities offshore.

### **Boundary 4:**

The booking and planning of personnel are restricted to the D&W department. D&W is the most challenging department concerning personnel booking, because of the large amount of personnel from suppliers and the large uncertainty in their operations. In HD OPS the uncertainty are lower and a larger amount of the personnel are on a fixed schedule. As a consequence of this, we have restricted us to only the D&W department.

### **Boundary 5:**

The management of the return logistics from HD is only included to that extent it is relevant for our research. The return logistics process is described, but not included in our recommendations.

### 3 METHODOLOGY

This chapter will give a description of the methodology we have used to write this thesis. As research design we have chosen to use an exploratory research design in the initial stage before applying a more descriptive research design when defining the research questions. In the last part of this chapter we will give a short introduction to HD's supply chain and the theoretical framework we used to reach our research objectives and answer our research question.

#### 3.1 *EXPLORATORY RESEARCH*

Exploratory research design is typically used when you want to explore a field with no or little prior research (Churchill and Brown 2004). The exploratory research design is often used when the character of the problem is unclear or coarse (Selnes 1999). This research design was chosen because we wanted a flexible method to assist us during our research process as our progress was affected by the knowledge we got on the way working with this thesis (Figure 3-1). Throughout our research we got a better understanding of what we were looking for, and what sources we needed to do our research. As a result, we ended up using sources we never thought about in the initial stage of the research.

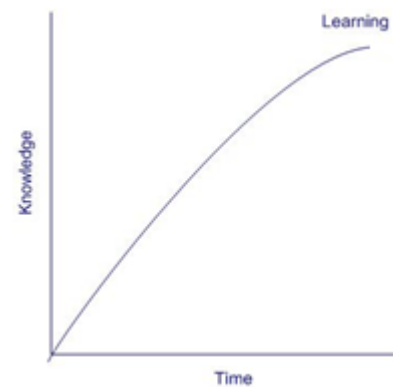


Figure 3-1 Learning curve

#### 3.2 *DESCRIPTIVE RESEARCH*

Descriptive research differs from exploratory research by having a clear opinion about what variables/concepts that explains the phenomena in your research and you also have a pretty clear hypothesis about how the variables varies each other. After we have explored the research area, we used a more descriptive research design. Descriptive research design is used not only to describe the situation, but also explain and understand why it is so (Churchill and Brown 2004).

### **3.3 DATA COLLECTION**

Our data collecting for this thesis has been from both primary and secondary sources.

#### **3.3.1 Primary data**

This is first hand data that do not exist and you have to collect yourself. Our primary data is collected by the use of interviews, doing direct observation and through informal discussion with personnel within HD and their supply chain members.

##### **3.3.1.1 Interview**

In our research we had interviews with key personnel in the Heidrun organization both onshore and offshore (See APPENDIX B). HD has its main activities offshore in the Norwegian Sea with supporting functions in Stjørdal and Kristiansund. To get inside knowledge about the HD organization we have travelled between the locations onshore and carried out a trip offshore to interview key personnel with regard to our research problem. The interviews were well prepared, and we used an interview guide to structure the interviews (See APPENDIX C).

##### **3.3.1.2 Direct observation**

Through our visits we have had direct observations by being in the environment when it is operative. We have been offshore and followed the crane operator unload the supply vessel in rough weather, seeing the limitations that can appear in this environment. We have observed coil tubing operations on deck, leading to blocking off large areas of the storing deck offshore, and limited crane activities because of personnel working in the area. We also got inside knowledge in how an offshore installation as HD is operated.

##### **3.3.1.3 Informal discussion**

Through our visits we have had informal discussion with key personnel in the HD organization. Our experience is that these informal discussions often gave us valuable information that did not occur during the interviews, and contributed to improve our knowledge and understanding.

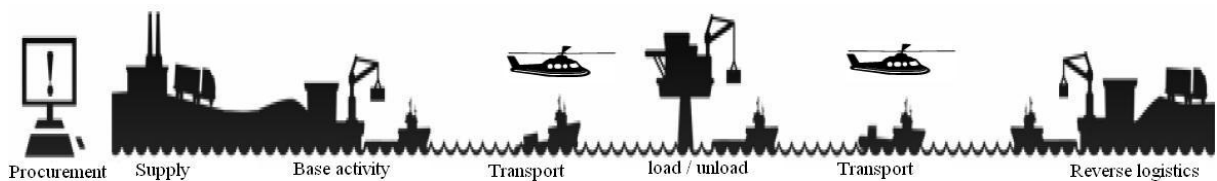
#### **3.3.2 Secondary data**

Secondary data are data that already exists, and can be used as they are or modified to our use. Secondary sources we have used are Statoil's internal databases like Entry, which is Statoil's intranet. Statoil's operating software and daily supporting operating tools (the operating tools will be elaborated in section 5.5.1.2). Earlier written PhD and master theses

in this area have also been used in our research, for referencing and in order to provide an industry insight and by this constitute a foundation for our work.

### **3.4 INTRODUCTION TO HD'S SUPPLY CHAIN AND THEORETICAL FRAMEWORK**

In this section we will give a short introduction of HD's SC, and the theoretical framework we used to reach our research objectives and answer the research questions. This section is made to give the reader a short introduction to the theory and the methodology used in the HD case on an early stage.



**Figure 3-2 Supply Chain for an offshore installation like HD (Nygård 2006)**

Figure 3-2 shows how Statoil see their physical SC for an offshore installation like HD. There is need for onshore support from procurement, and supply services in terms of transportation and supply bases. Supply vessels and helicopters are needed to supply HD with equipment and personnel both ways.

In this thesis we will focus on the upstream logistics of HD's SC. According to Aas and Wallace (2008), "downstream logistics" is defined as bringing oil and gas to onshore customers (distribution) while supplying the offshore drilling and production units with necessary supplies is defined as "upstream logistics" (supply). HD's supply chain and the theory applied will be elaborated further in Chapter 5.

A supply chain is a set of organizations directly linked by one or more of the upstream and the downstream flows of products, services, finances and information from a source to a customer. Managing a supply chain is supply chain management (Mentzer et al. 2001).

The theory to support us in reaching our research objectives is based on the SCM profession and we will link our solutions to integrated operations (herby denoted as IO).

IO is a project that goes on in cooperation with several actors within the petroleum industry, directed by the Norwegian petroleum industries association ([www.olf.no](http://www.olf.no)). IO and its practices, way of thinking and solutions are used actively in this thesis. In the next section an insight to IO are given.

### **3.4.1 Integrated Operations (IO)**

Over the past few years the oil industry has been exposed to a rapid development of information and communication technology, as well as advances in the fields of automation, sensor technology and other standalone technologies. These advances, in association with the evolution of new operational concepts and work practices are often referred to as IO on the Norwegian Continental Shelf (Oljeindustriens Landsforening 2010a). IO in the petroleum industry refers to a new approach to solving challenges of having personnel, suppliers and systems offshore, onshore and in different countries (Statoil 2010a). IO involves using real time data and new technology to remove the divides between disciplines, professional groups and companies, IO removes physical boundaries between people leading to improved collaborations. Implementation of IO has lead to a stronger focus on safer and more efficient operations, and condition monitoring leads to a decrease in downtime.

Key elements of IO:

- Improved information sharing.
- Collaboration through real time data transmission and video conferencing.
- Improved HSE, operations could be executed remotely from the operation.

## 4 ORGANIZATIONS

In This chapter we will give an introduction to the organizations involved in HD's operations. There are many organization involved to support HD in their operations offshore in the Norwegian Sea (see Figure 4-1). We have chosen to include only those relevant to decision making concerning HD's logistics. We give the presentation of the organization in a hierarchic way, starting with Statoil ASA as the operator at HD, and round off with the offshore installation.

We start with the Statoil ASA organization showing the six business areas Statoil ASA is divided into, before we focus on the business area that contains our research area which is Exploration and Production Norway (herby denoted as EPN). Within EPN we are focusing on three business units, their organizational structure and relation to HD.



Figure 4-1 The Norwegian Sea and the Heidrun field (Dankertsen 2005)

## 4.1 STATOIL ORGANIZATION

Statoil ASA consists of six business areas; two staff and support divisions and corporate communication. Each division is headed by one executive director who reports directly to the CEO (see Figure 4-2).

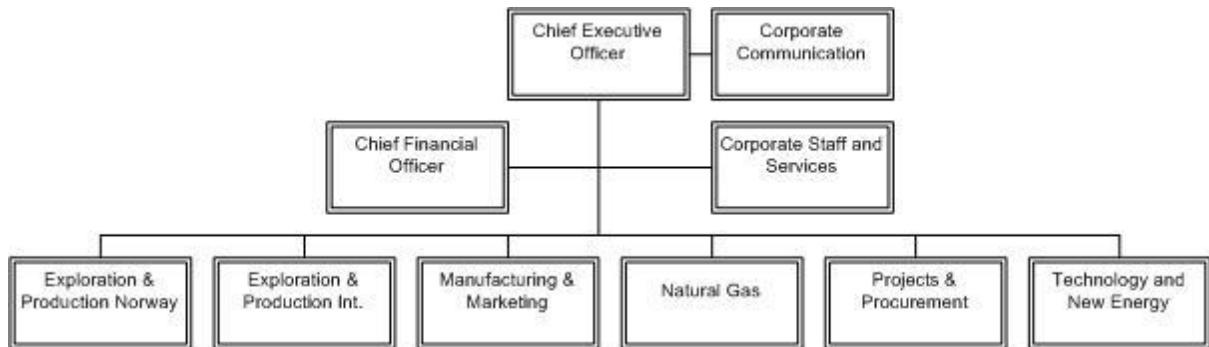


Figure 4-2 Organizational chart for Statoil ASA (Statoil 2010b)

### International Exploration and Production (INT)

INT is responsible for exploration and production outside the Norwegian Continental Shelf. A major part of Statoil's future growth is expected to come from this business area. In 2008 INT produced 24% of Statoil's total equity of oil and gas, with production in 12 countries. INT's share of total production is expected to rise significantly in the future. INT also have exploration licenses in 23 countries located in North America, Latin America, Africa, Europe, Middle East and Asia. The international business is divided into four geographic regions, two from Oslo, one from Stavanger and the last in Houston, Texas (Statoil 2010c).

### Natural Gas (NG)

NG is responsible for transportation, processing and marketing of pipeline gas and LNG worldwide. Statoil account for 80% of the total gas exports from Norway, and are responsible for technical operations for the majority of onshore plants and export pipes in the processing and transportation systems for Norwegian gas (Statoil 2010d).

### Manufacturing & Marketing (M&M)

M&M operates in 11 countries and are responsible for Statoil's transportation of oil, refining, retail business and marketing of natural gas in Scandinavia and for sales of crude oil and refined products (Statoil 2010e) .

**Projects & Procurement (P&P)**

P&P are responsible for planning and executing all development projects, and major modifications. This business area is also responsible for the procurement division in Statoil. There are 1100 employees in P&P. P&P is divided into six clusters; Project controls, Project management, Procurement, International procurement, Onshore facilities and Offshore Norway (Statoil 2010f).

**Technology & New Energy (TNE)**

TNE have seven entities; Early phase and concept development, Global exploration technology, Sub-surface technology, Marine technology and operations, Process and processing technology, research and development and New energy. In the New energy entity carbon capture and storage is an important part of Statoil's commitment to improving the environment (Statoil 2010g).

**Exploration & Production Norway (EPN)**

Statoil ASA's business area for EPN is the world's largest coherent offshore organization with approximately 9000 employees. EPN consists of seven business units (Statoil 2010h):

- Exploration
- Reserve replacement development
- Operations West
- Operations North Sea
- Operations North
- Drilling and Well
- Operational development

**4.2 RESEARCH AREA**

The research are for this thesis is limited to three of the seven business units in EPN; Operational Development, Drilling and Well and Operations North. Within Operational Development we are focusing on the *supply base in Kristiansund* (section 4.3.1), *Statoil Marine* (section 4.3.2) and *Air Transport* (section 4.3.3). In the Drilling and Well business unit we are focusing on *Drilling and Well North* that is located in Stjørdal and is involved in D&W operations concerning HD (section 4.4) The last business unit is Operation North (section 4.5), where we are focusing on the Heidrun field and the Heidrun result unit (section 4.5.1).



### 4.3 ORGANIZATION LOGISTICS AND EMERGENCY

Statoil’s Logistics organization, Logistics and Emergency sorts under Operational Development shown in Figure 4-3. It is within this unit we find the Supply base, Statoil Marine and the Air Transport.

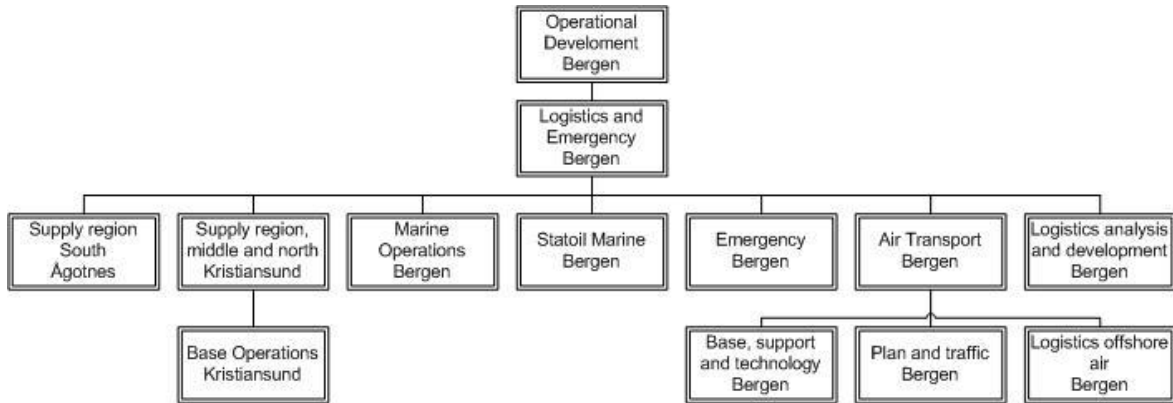


Figure 4-3 Organizational chart for Operational Development (Statoil 2010A)

#### 4.3.1 Supply Base Kristiansund (SBK)

Statoil operated fields in the Halten/Norland area are served from the supply base in Kristiansund (herby denoted as SBK).The supply base is operated by the company Vestbase (www.vestbase.com) which serves almost all the oil companies that operate in the Norwegian Sea. Vestbase provides the infrastructure (buildings, quays etc) and Statoil have outsourced all logistics operations including packaging, testing of equipment, inventory and onshore load/unloading to Vestbase.

##### 4.3.1.1 Supply Vessels

Today Statoil charters three supply vessels which they use to serve the offshore installations in the Norwegian Sea by using a fixed scheduled supply vessel pool. Each vessel can serve between 3-5 installations on each trip, and each installation has on average three visits of a supply vessel each week. The HD offshore installation has three visits a week; Tuesday, Thursday and Saturday (see Figure 4-4).

	NJA	AKS	DSB	HEI	SCA	NJB	DRU	KRI	TRL	ASA	ASB	TOA	ASC
Mon	X					X			X	X	X	X	
Tue		X	X	X	X								
Wed	X												
Thu		X	X	X	X								
Fri	X					X			X	X	X	X	X
Sat		X	X	X	X		X	X					
Sun													

**Figure 4-4 Fixed supply pool Kristiansund**

The vessels have an average speed of 12 knots, and uses normally 12 hours to reach HD as the first installation in the fixed route. The sailing time for the supply vessels leads us back to our research question concerning the planning horizon for logistics activities offshore today; this will be elaborated further in section 7.1. From time to time other installations have priorities. Then you have changes in the schedule and the arrival times will differ from the fixed schedule. This can be monitored by the installations using the Vessel Traffic Management information System (herby denoted as VTMIS) (See section 5.5.1.2).

### 4.3.2 Statoil Marine (SM)

Statoil Marine (herby denoted as SM) is located in Bergen and is subordinated the Logistics and Emergency unit. Statoil Marine is responsible for follow up supply vessels after the departure from the supply base and sea surveillance of Statoil operated gas and oil fields. When a vessel is in transit between two installations Statoil Marine is monitoring the progress. This information is shared with all logistics actors in the chain through their access to VTMIS. Below we list up some key roles and responsibilities for SM related to our research problem.

- Sea surveillance of vessels on collision course or drifting objects, for Statoil and other operators according to agreements.
- Vessel coordination of vessels going back and forth between supply bases and installations.
- Be “single point of contact” for vessels under sailing.
- Updating SAP VTIMS for all vessels sailing for Statoil.
- This information is used to monitor the vessel progress by the logistics team offshore so they know when the vessel arrive HD (see APPENDIX P).

- Provide vessels and installations with weather services.
- Weather information is used by the logistics team to support them in executing safe lifting operations concerning weather limitations offshore. At HD they can operate the cranes unloading vessels in winds up to 35 knots and significant wave height of 4 meters (Oljeindustriens Landsforening 2010b).

### **4.3.3 Air Transport**

All personnel going offshore to HD are transported by helicopter from a helipad located in Kristiansund, and the transit time is approximately 70-80 minutes. Helicopters are also used to transport equipment offshore, but only if urgent demands offshore arise. Normally all equipment are transported with supply vessels, also due to the size of the supplies. In addition to the transport helicopters, HD is the base for the search and rescue (SAR) helicopter in the Norwegian Sea. In section 6.3 we will give a more detailed description of how HD's air transport is organized within D&W.

## **4.4 DRILLING & WELL**

D&W has the following roles, responsibility and tasks in Exploration and Production Norway:

- Environment, health and safety (EHS) for their own operations.
- Responsible for drilling from all the fixed and mobile -installations on the Norwegian Shelf.
- Responsible for exploration drilling in Norway and Internationally (USA and Mexico, personnel).
- Well maintenance and light well intervention.
- Drilling plans for fixed and mobile rigs.
- Estimates time and costs for well projects including risk management.
- Contractor for maintenance and modification of their own drilling installations.

Drilling & Well North are located in Stjørdal, and are responsible for all drilling and well activities in Operation North (See Figure 4-5).

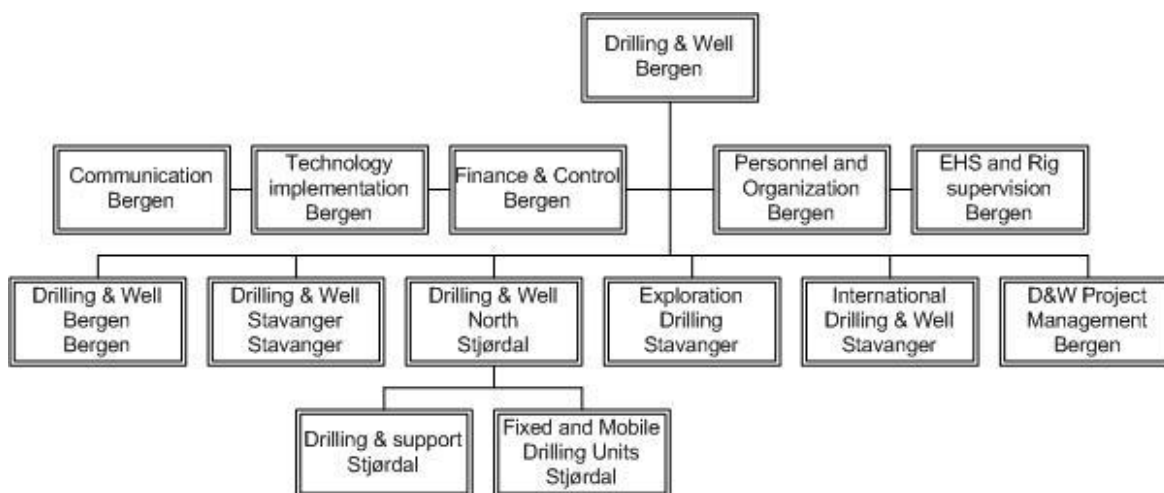


Figure 4-5 Organizational chart for D&W Statoil ASA (Statoil 2010B).

### 4.5 OPERATIONS NORTH

This business unit includes all activities in the Norwegian Sea and the Barents Sea. This business unit is operated from Statoil's department at Stjørdal. The producing fields in Operations North, and the average oil and gas production for all the fields are shown in Table 4-1. Operations North is today responsible of 21.5 percent of the total oil and gas production for Statoil's activities in Norway, and this is expected to increase in the following years.

Area	Share	On stream	License expiry	Producing wells	Average production*
Åsgård	34.57%	1999	2027	37	124.8
Kristin	55.30%	2005	2033	12	92.4
Norne	39.10%	1997	2026	12	26
Mikkel	43.97%	2003	2022	3	21
Snøhvit	33.53%	2007	2035	6	17.1
<b>Heidrun</b>	<b>12.41%</b>	<b>1995</b>	<b>2024</b>	<b>34</b>	<b>13.8</b>
Njord	20.00%	1997	2021	8	12.9
Urd	63.95%	2005	2026	5	5.8

Table 4-1 Production of oil and gas in Operations North (Statoil 2008)

(\* Million barrels of oil equivalent/year)

### 4.5.1 Heidrun Result Unit

HD is located in Operation North, and are organized as a result unit (see Figure 4-6). The Heidrun result unit consists of a PETEK group, Heidrun operation centre (herby denoted as HD OPS) and the offshore installation together with the supporting functions consisting of a human resource (HR), finance, control and license administration (F&C) and an environment, health and safety group (EHS).

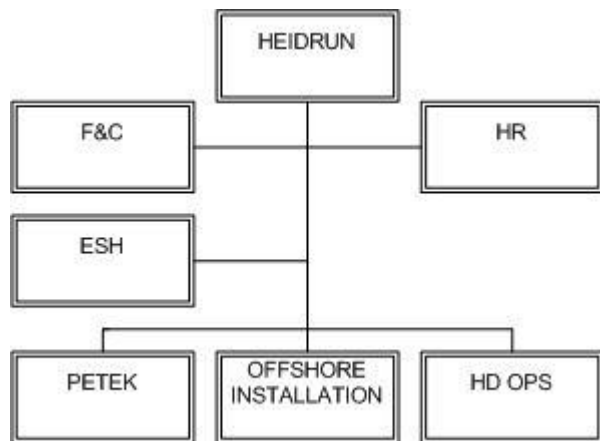


Figure 4-6 Organizational Structure for Heidrun result unit (Statoil 2010C)

#### 4.5.1.1 PETEK

Every offshore installation operated by Statoil has a dedicated PETEK group responsible for ripening off new D&W targets, well planning, carrying out activities according to an approved work program, reservoir optimizing and follow-up. PETEK's leader reports to HD's leader.

#### 4.5.1.2 Heidrun Operations Centre (HD OPS)

HD OPS are responsible for operations concerning HD OPS; safety of personnel, environment and material. All the operational planning for HD except D&W and revisions stops is done at HD OPS. HD OPS are the owner of all the operational plans at HD, and are responsible for updating and making sure that the plans at all time are available for the relevant users.

### 4.5.1.3 HD Offshore Installation (HD OFF)



Figure 4-7 HD Offshore Installation (MC-Forumet.no 2010)

The Heidrun field is located in the Norwegian Sea, 175 km from the coast of middle-Norway. There are planned 76 wells at the main field; 51 producing wells, 24 water injectors and one gas injector. The ocean depth is 350 m and the reservoir is located 2 300 meters beneath sea level and the reservoir size is 50 sq.km. The energy reserves on Heidrun were proven in spring 1985 by ConocoPhillips, which were operator in the exploration and development phase. The licenses for the Heidrun field are shown in Table 4-2. There has been production on the Heidrun field since 18 October 1995, from a floating

platform with a concrete hull. This was the first and largest platform of its kind in the world. The platform is a combined production and drilling platform, and they also has its own well intervention tower for maintenance of wells. Heidrun’s northern segments are using subsea installations and came in production august 2000. The well stream from the Heidrun reservoirs is a mixture of oil, gas and water. Some of the gas from Heidrun is sent through pipes (Haltenpipe) to Tjeldbergodden (see APPENDIX D) and the rest is sent by Heidrun Gas Export through Åsgård Transport to Kårstø.

The oil is transported directly to tank ships using a loading buoy, which is possible using a technology called Submerged turrent loading (see APPENDIX E) (Statoil 2006). The tankers maintain a shuttle service between the Heidrun field and the crude oil terminal at Mongstad,

Partner	Share
Petoro	58.16%
ConocoPhillips	24.31%
<b>Statoil ASA</b>	<b>12.41%</b>
Eni Norge	5.12%

Norway and Tetney, United Kingdom. The operations organization at Stjørdal serves as the interface between everyone involved with the field inside and outside Statoil.

To summarize this chapter we have made Figure 4-8, giving the reader an overview before getting deeper into the organization and HD's SC in the next chapter. In the following chapter we will describe HD's SC network, the communication links internally and externally, HD's business processes and SCM components. This is done with the support of literature from the SCM profession.

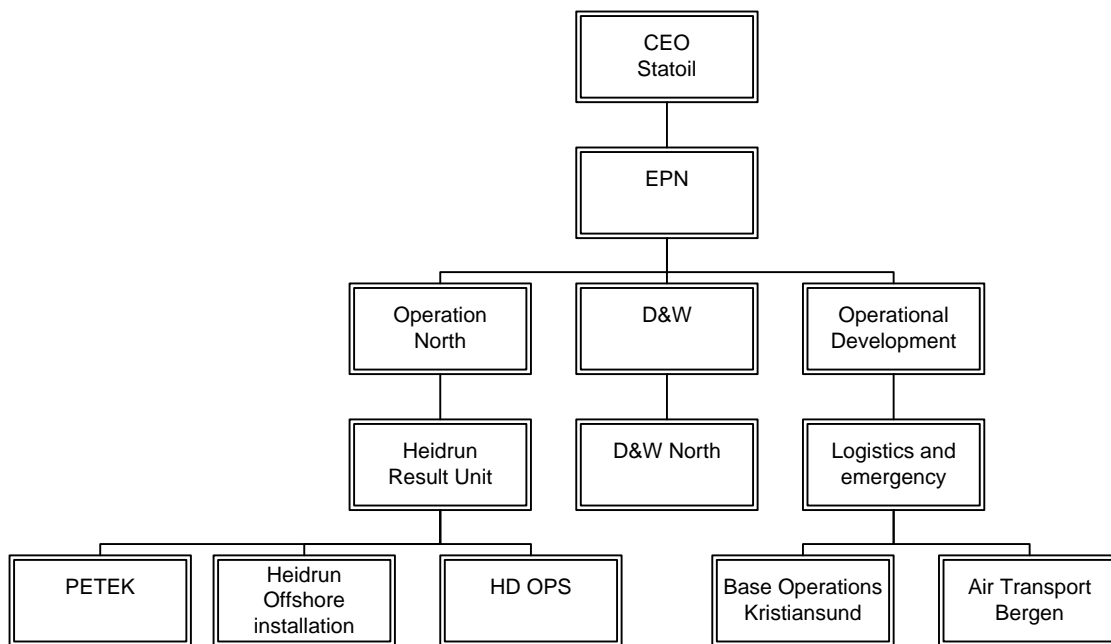


Figure 4-8 Overview HD

## 5 SUPPLY CHAIN

### 5.1 *THEORETICAL FRAMEWORK*

In the thesis we chose to use the SCM theory as the main theoretical framework. We will also supplement this with some theoretical inputs about logistics planning. The research area is related to the upstream supply chain for the HD organization, with main focus on the planning horizon. As mentioned in Chapter 3, Integrated Operations has provided several improvements for Statoil and HD. It is also known that it is a goal to develop and extend the use of IO. IO also represents several issues in SCM, where we can point out aspects as information sharing, improved communication platforms and sharing of real time data. These aspects are also factors that need to be considered in relation with the research questions stated. Issues as information availability, how information are shared, and how potential problems in the SC could be avoided are elements that are deduced from the research questions. The theoretical framework available within the SCM concept will assist us to describe and analyze the SC to find possible suggestions for improvements.

SCM is a term with several different definitions. It was first used by a U.S industrial consultant in the 1980's, and has developed during the two last decades to be a well known and used term. We are focusing on the view Douglas M. Lambert has on SCM, below we give a SCM definition which is the definition developed and used by the members of The Global Supply Chain Forum (University 2010).

“Supply Chain Management is the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.” (Lambert 2008, p. 2)

The main purpose with Lamberts framework is to build theory and to develop normative tools and methods for successful SCM practice. We will adopt some of Lamberts ideas, and use these to suggest potential improvements within HD's SCM.



In the following section we will focus on HD's SC from an SCM perspective, based on Douglas M. Lambert's framework. This will be illustrated based on theory, and we will give examples of how this theory is used in practice.

In the previous chapter all the members from Statoil in HD's SC was described. This illustrated how different departments are organized, and where HD is in Statoil's hierarchy. In this section, we describe how the different departments in HD's organization cooperate internally across departments, and externally with suppliers. This will be done by describing the SC network, based on the framework offered by Lambert, Cooper and Pagh (1998). The main components will be the SC network structure, the Business processes and the SC management components. In the SC integration part we will illustrate how HD's organization communicates internally and external through the SC. This will be illustrated by figures that shows how the internal and external integration in HD's SC are.

## 5.2 THREE COMPONENTS IN THE SCM CONCEPT

According to Jespersen and Skjøtt-Larsen (2005), SCM can be divided into three components which are tightly interconnected. These components are:

- The Network structure
- The Business processes
- The Management components

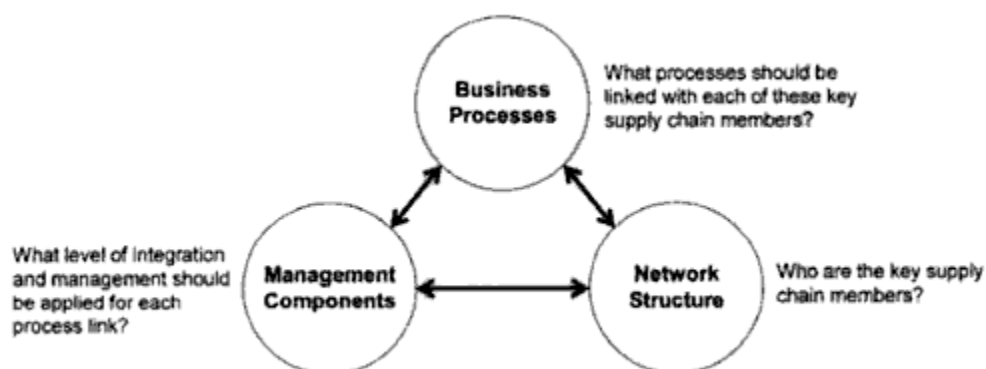


Figure 5-1 Components in the SCM concept (Lambert, Cooper, and Pagh 1998)

Figure 5-1 illustrates the inter-related nature of SCM and the need to proceed through several steps to design and successfully manage a SC. Based on Figure 5-1; we will describe

the components in order to relate the theory to the research questions. First we will describe the network structure of HD's SC.

### 5.3 SUPPLY CHAIN NETWORK STRUCTURE

According to Lambert, Cooper and Pagh (1998), one of the key elements of managing the SC is to have an explicit knowledge and understanding of how the SC network structure is configured. From HD's point of view, the SC represents the communication links and material flow from the supplier to the end customer which in this case is HD. Included in this, the network structure shows the communication links, and how the different members of the SC are positioned relative to each other to reach the objectives set for the SC (Lambert, Cooper, and Pagh 1998).

In our network structure presented in Figure 5-2 we show the connections within the SC of HD. From the figure we see that HD is served by its service suppliers and suppliers like e.g. Bring, Odfjell drilling, Schlumberger, Halliburton, B&J, Baker Hughes and Linjebygg Offshore. In 2009 HD was served by approximately 580 different suppliers. This is coordinated by the HD offshore installation, D&W and HD OPS in Stjørdal, the supply base in Kristiansund, SM located in Bergen, and the company Bring as the land transport provider.

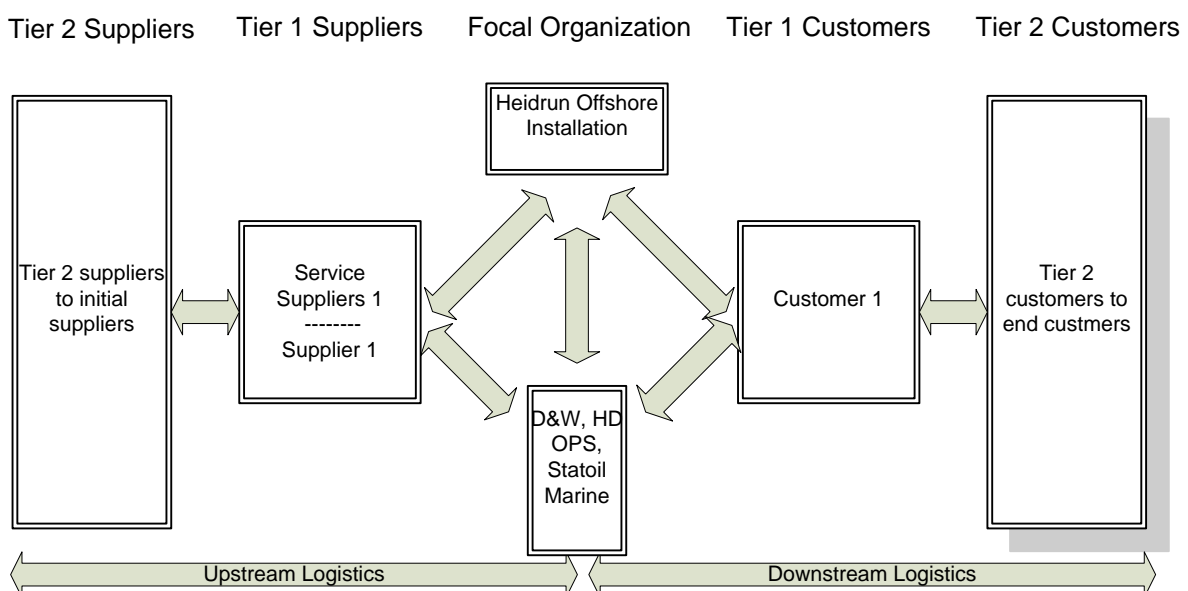
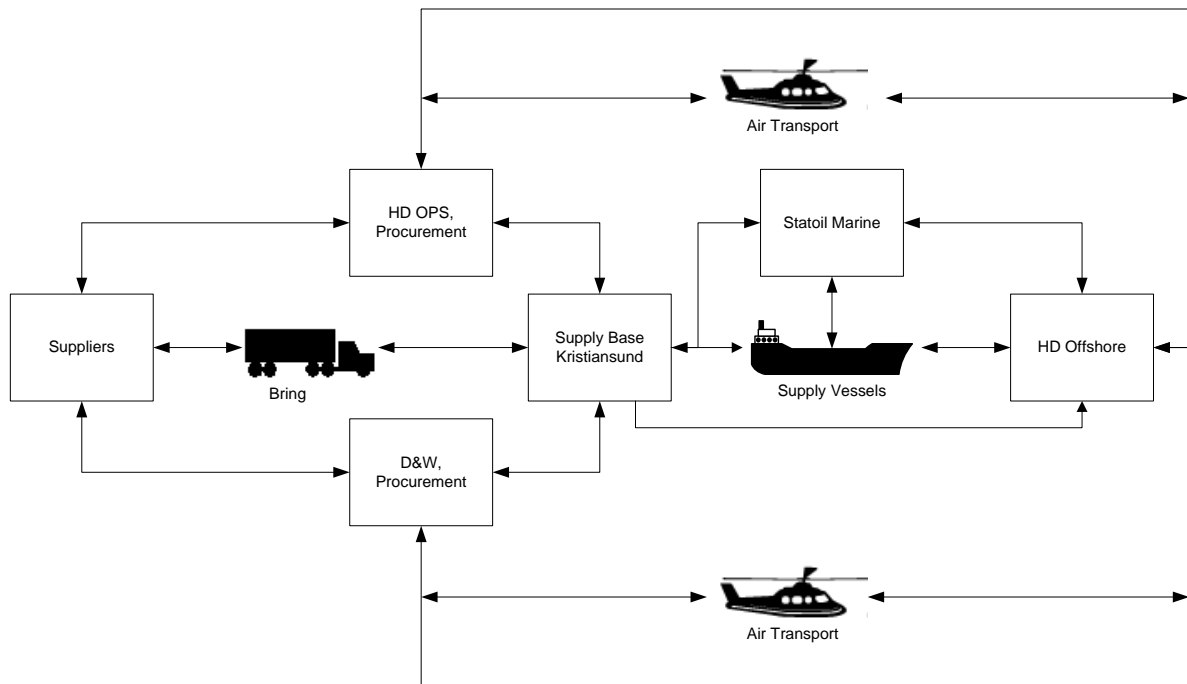


Figure 5-2 Supply Chain Network Structure

Figure 5-2 describes the SC very roughly. In this thesis, we focus only on the upstream SC. The downstream SC is the chain from the oil is produced on HD to the finished product are delivered to the end customer. In the upstream SC, HD is the end customer. To get a better understanding of how the SC network is structured, we include the whole SC in this figure. From the left side of the figure, the tier 2-n suppliers are placed. This is suppliers that either supplies the focal firm directly, or trough tier 1 suppliers. Tier 1 suppliers are the most important service suppliers and suppliers for the focal firm, e.g. Bring who provides the land transport. HD is placed in the middle of the figure, and is defined as the focal firm. Departments in the HD organization as D&W and HD OPS are seen as a part of the focal firm. Customers of the HD organization are placed next in the figure, and these are oil and gas refineries. They process the crude oil and gas into finished petroleum products as gas, diesel, paraffin and other products. Tier 2-n customers in this relation are the retailers which sell the final products to the end costumers as you and me.

### **5.3.1 Focus area and key members**

Our scope of research limits us to the upstream logistics of HD; therefore the customers will not be in our focus. Figure 5-2 shows only where the HD organization and their suppliers are placed within the SC, and not how the communication between the different actors is organized. In Figure 5-3 we present a more detailed picture of the communication links from the suppliers to the HD offshore installation. It is important to notice that this is a simplified picture and only shows the main communication links between the actors in the upstream supply chain.



**Figure 5-3** Communication links in the upstream supply chain

The demand for supply is created at the HD offshore installation and then the need is communicated to the suppliers through D&W and the HD OPS departments. Administration and coordination between HD and the suppliers is done between HD OPS for operations and maintenance, planned maintenance and production. Similar, administration and coordination between HD and suppliers for D&W operations is done by the D&W department. At the same time the information is communicated with SBK. Transport between suppliers and SBK is done and coordinated by Bring Logistics. Further the supply base coordinates the supply vessels in communication with SM in Bergen. A more detailed description of the communication process will be given in section 5.6.

### 5.3.2 Key Personnel

In the previous section we described the SC network and its key members. In each department described, there are key personnel responsible for carrying out the logistics planning. We will now mention all key personnel that are included. The arrows indicate how the communication between the key personnel is. Following, we will describe the key personnel in the departments D&W (Figure 5-4) and HD OPS (Figure 5-5).

### 5.3.2.1 Key personnel in D&W

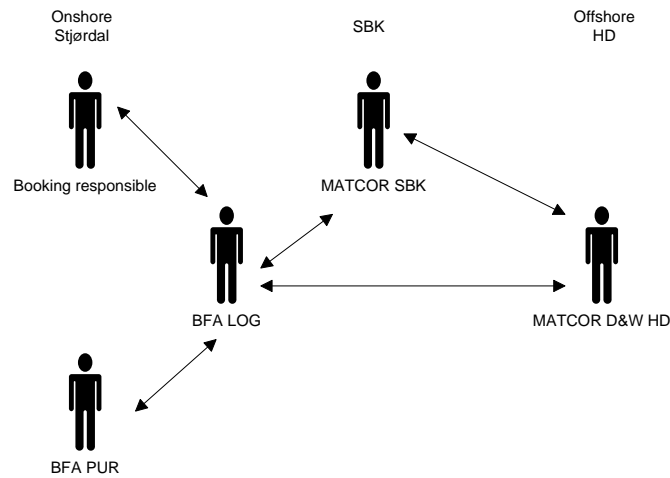


Figure 5-4 Key personnel in D&W

#### Booking responsible D&W

The person who is responsible for the personnel booking is located at the D&W department in Stjørdal. Booking responsible D&W has the responsibility of coordinating the personnel and helicopters concerning the D&W department, including internal and external personnel from suppliers.

#### Drilling Supply Responsible (BFA LOG)

Function as a material coordinator for the D&W department. BFA LOG has the responsibility for the demand concerning D&W logistics. Functions as a contact point towards other persons in the SC, which have a responsibility according to deliveries and the logistics flow concerning D&W equipment.

#### Drilling Purchasing responsible (BFA PUR)

Responsible for procurement within framework contracts in D&W. There is also a purchaser that is responsible for procurement outside framework contracts.

#### Material coordinator supply base in Kristiansund (MATCOR SBK)

MATCOR SBK is the material coordinator at the supply base in Kristiansund. He handles the equipment concerning the D&W department, and enters information about the equipment into the planning tools and allocates them to the correct shipment to be sent offshore. MATCOR SBK is responsible for the follow-up of the logistics flow of all

equipment going to HD concerning D&W. In special cases if there is urgency he do the same for the HD OPS department, but this is normally done by personnel from the supply base (Vestbase).

### Material coordinator drilling & well Heidrun (MATCOR D&W HD)

This is D&W's material coordinator which is placed offshore. MATCOR D&W HD is employed by the company that has the drilling contract at HD.

### 5.3.2.2 Key personnel HD OPS

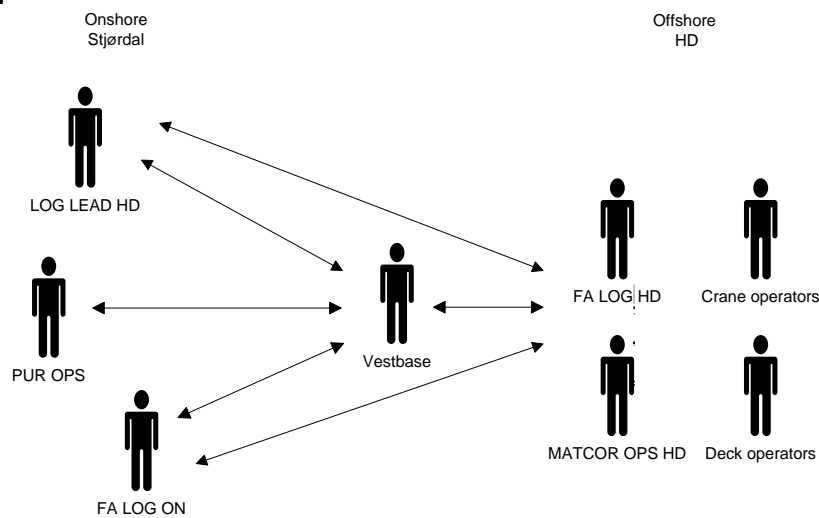


Figure 5-5 Key personnel HD OPS

#### Logistics leader (LOG LEAD HD)

HD's logistics leader is organized into HD OPS and reports to the HD OPS Leader. The logistics leader has the responsibility for HD's logistics recourses. To be able to do this he is dependent of being offshore regularly. It is the logistic leader's responsibility to secure optimal utilization of supply services to HD by follow-up the flow of goods in the logistics chain, supply base, supply vessels and the offshore installation, including co-ordinate logistics personnel on/offshore.

#### Field manager logistics onshore (FA LOG ON)

FA LOG onshore (herby denoted as FA LOG ON) reports to the logistics leader. FA LOG ON is responsible for the operational logistics planning related to HD OPS logistics. He organizes and executes HD OPS and HSE meetings with HD. To be updated on HD's

logistics demand, he needs to be close on D&W, SM and SBK. FA LOG ON is responsible for quality assurance for the logistics processes and the material flow.

**Purchaser OPS (PUR OPS)**

Is responsible for perform a pro-active coordination, planning and execution for the procurement related to HD OPS.

**Field manager logistics offshore (FA LOG OFF)**

FA log offshore reports to logistic leader onshore and is the installations contact person for SM, SBK and supply vessels. Attend in meetings related to logistics, function as the link to the D&W department offshore by attending their morning meetings offshore to be updated on their logistics demand. Has responsibility for the logistics team offshore and interplays with the installation manager.

**Material coordinator OPS Offshore (MATCOR OPS HD)**

Has the overall responsible for the storehouse at HD and is in charge of ordering containers, stationary compressors onshore and ordering of helicopter fuel. Has close collaboration with FA LOG OFF to solve tasks in the logistics team. This collaboration is used to communicate how the allocation of load and backload shall be solved.

**Deck operators**

They support the crane operators in lifting operations offshore. They are responsible for setting up barriers to secure the area where the lifting operations takes place, if needed. Individual in charge of overview and follow-up load and backload in collaboration with FA LOG OFF and MATCOR OPS HD, including having the total overview over in/outgoing load together with FA LOG OFF.

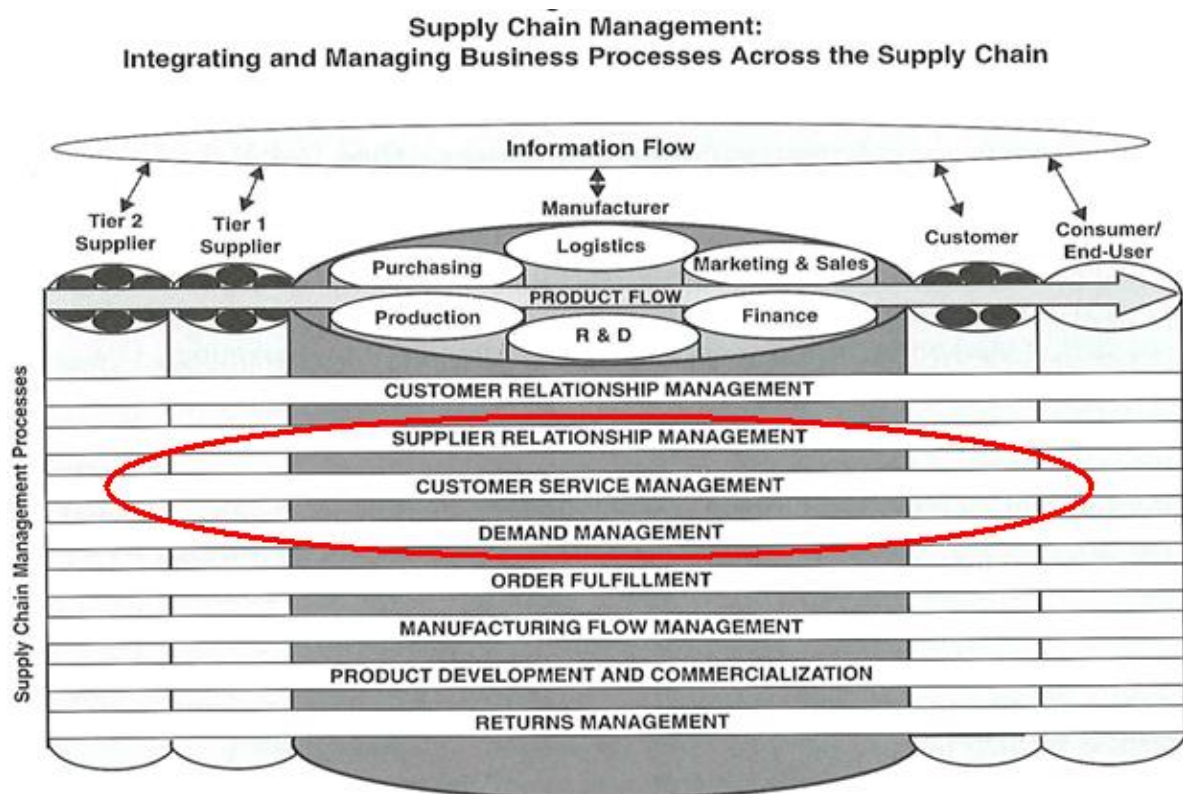
**Crane operators**

The crane operators are responsible for handling all in and outgoing goods to HD, including internal movement of goods. Under crane operations, the crane operator leads the lifting operations and has close communication with the deck team and the supply vessel to solve the lifting operations in an efficient and safe way.

Now that the network structure and the key personnel in HD's SC related to logistics is given, we go on in the next section to elaborate on the second SCM component which is Business processes.

#### 5.4 BUSINESS PROCESSES

Business processes encompass the activities and flows of information that are connected with conducting equipment and services through HD's SC. Lambert's view of the SC shows how functions are integrated in a firm, as well as other firms in the SC (Lambert 2008). This is illustrated in Figure 5-6.



**Figure 5-6 Supply Chain Management: Integrating and Managing Business Processes Across the Supply Chain (Lambert 2008)**

From this figure we can see the key business processes which was identified by The Global Supply Chain Forum (University 2010). Each of these processes has both strategic and operational sub- processes. The strategic processes provide how the processes should be implemented, and the operational processes provide the detailed steps for implementation. The strategic process is necessary to integrate with other actors in the SC, and the operational process is where the daily activities take place. A successful SCM implementation requires all eight processes described in Figure 5-6. All of these business



processes are relevant to some extent for our research questions. However, we are focusing on those we regard as most relevant for our research questions.

We have pointed out three business processes that will be described, which relates to the upstream supply chain for HD. These are *Supplier Relationship Management*, *Customer Service Management* and *Demand Management*. In the following, these business processes will be described.

#### **5.4.1 Supplier Relationship Management**

The *Supplier Relationship Management* process provides the structure for how relationships with suppliers will be developed and maintained (Lambert 2008). This process is important when choosing suppliers, and when developing relationships. More important suppliers may be integrated in the focal company's processes to achieve benefits for both parts. Suppliers are also important actors in a SC. How information is shared between the focal firm and suppliers could be decisive to the performance for the focal firm. In HD's SC several suppliers are of high importance. In relation to the research questions, this process is important related to information sharing through the SC, where suppliers have an important role. This will be exemplified in section 7.2.1.

#### **5.4.2 Customer Service Management**

From the name, *Customer Service Management* is a process that focuses on the customer service. The key differentiating factor between the traditional customer service activity and the *Customer Service Management* process is that the process is primarily proactive (Lambert 2008). This means that the process is monitoring the SC proactively. One of the purposes with this process is to develop triggers that can detect possible problems in the SC. Monitoring critical links in the SC are an essential factor to achieve this. The awareness of this process is important to be able to respond to situations before they negatively impact the customer, which in our case is the HD offshore installation. In HD's situation, the most efficient way of monitoring the SC proactively is by having an efficient system for information sharing. This process will be used to describe strategic elements which are important to carry out in HD's SC. Examples of how it could be used are given in section 7.4. We think that the management of this business process will be important in order to achieving a longer planning horizon.

### 5.4.3 Demand Management

*Demand Management* is the SCM process that balances the customer's requirements with the capabilities of the SC (Lambert 2008). This includes forecasting demand, and synchronizing it with other activities as procurement, production and capacities of the distribution system. *Demand Management* contributes with finding ways of reducing variability, and to improve the flexibility in the SC by development of contingency plans and achieve better planning of information flow. The goal of *Demand Management* is to meet the customer demand in the most efficient way (Lambert 2008). In section 7.3 we will use this business process to identify operational sub- processes that could be improved. The idea with this is to compare the business processes in D&W and HD OPS, to see if it is possible to integrate some of the sub- processes to approach Lamberts view of successful SCM. The goal of this is to have logistics information available earlier, which could result in an improved planning horizon.

All these three business processes are linked towards how HD could manage the process from planning to execution in a best possible way. One of the research questions aims to find the main drivers that increase or decrease the planning horizon. We apply a qualitative approach to investigate this, by identifying business processes that affect the planning horizon. One example of this is to proactive monitor the SC to develop triggers that detects potential problems in the SC. This could also be linked to the next research question which is to identify critical links in the SC. Similar; the uncertainty that appears in different relations could be reduced by increasing the flexibility of the SC by balancing the customer requirements with the capacity of the SC.

The suppliers also play a key role in HD's SC. Information flow from the HD organization to the suppliers is important. This determines how the suppliers are able to satisfy HD's demand in a best possible way. In Chapter 7 we will analyze HD's SC, and identify sub- processes that could be linked to Lambert's *Supplier Relationship Management, Customer Service Management and Demand Management (Lambert 2008)*.

As we already have mentioned, all the other business processes also relevant to our research question, but not as relevant as the once we have chosen to go deeper into. We will now provide a short explanation for that.

The focus area is the upstream SC for HD (see Figure 5-2). This means that we define HD to be the end customer. *Customer Relationship Management* is related to the relationship between the SC and the end customer. In our case the HD offshore installation is a part of Statoil and the HD organization. Therefore we will not go into this process. The other four business processes as order fulfillment, manufacturing flow management, product development and commercialization and returns management are also relevant for our research. Several of these processes are interconnected with each other, meaning that it could be difficult to choose some of them. When determining which processes to include in our thesis we have weighted the processes that are most relevant from our research questions. The order fulfillment process aims to minimize the delivered cost together with satisfying the customer demand. Aspects to consider in this relation are selection of suppliers, tax rates and other factors that affect the costs. Manufacturing flow management is the business process that includes all activities necessary to obtain manufacturing flexibility in the SC. We think these processes would be easier to implement in a manufacturing environment. Product development and commercialization is the process that provides the structure for developing and bringing a product to a new market. This is mostly relevant if new products are put in production, and not relevant in our case. Returns management is also highly relevant in our case, but because of limitations set in 2.3, we do not include this.

As mentioned in the beginning of this section, all eight business management processes needs to be implemented to achieve successful SCM. By using only three of them, the risk of not succeeding is present. Even tough, we think we have included the most relevant processes related to our research questions.

## **5.5 SUPPLY CHAIN MANAGEMENT COMPONENTS**

According to Lambert, Cooper and Pagh (1998) management components are the managerial variables by which the business processes are integrated and managed across the SC. This is the third element in Lamberts framework. These management components apply to all of the SCM processes, and are necessary to successful implement and carry out implementation of SCM processes. Management components in the SC can be divided into two components. The first group is discussed in section 5.5.1 and is the *structural*

*components* which include planning, control methods, knowledge management, workflow structure, organization and SC structure and communication structure. The second group is discussed in section 5.5.2 and is about *behavioral components* that include management methods, power and leadership, risk and reward, culture and attitude and trust and commitment.

### **5.5.1 Structural Management Components**

According to Lambert (2008) the structural components consist of:

- Planning
- Control Methods
- Workflow structure
- Organization Structure
- Knowledge Management
- Communication Structure

All of these structural management components are not relevant related to our research problem. We will focus on the structural components; *planning, organization structure, knowledge management and communication structure*. The organization structure is described in Chapter 4, and the communication structure will be described in section 5.6. Control methods are not included because this requires profound knowledge about control metrics and Key Performance Indexes (KPI's) used by the HD organization. This is something that we have not focused on during the work with this thesis. Workflow structure will also be rejected in this part. Workflow structure determines how and where the work within the SC is executed. The goal of this is to streamline the SC in order to minimize total costs, by using value stream mapping. In our case, this is too comprehensive to include with respect to the time available with this thesis. In the following, the two remaining management components; knowledge management and planning will be described.

### **5.5.1.1 Knowledge management**

Knowledge management refers to the acquisition storage, and distribution of information and expertise that is required for operating the company (Lambert 2008). In our research we are looking at the intra- and inter-organizational sharing of knowledge in the SC. By intra we mean knowledge management within the Statoil unit we focus on, and by inter-organizational we mean knowledge sharing between the focal organization and the external organization.

One of the tools used to share knowledge within Statoil, including the HD organization, is APOS. APOS is functioning as the governing documents at HD. Every job that are going to be done at HD are described in APOS, containing the information about how the job should be done and the qualification needed in order to do the job as safe as possible. All Statoil personnel have access to APOS. Formal competence of the employees working with logistics related issues are important. Further, education and in-service training of employees are something HD's organization is focusing on. Several of the logistics personnel offshore have started on further education within logistics and SCM. This will raise the formal competence level among those who do that, which again can lead to an improved formal competence level in the logistics department on/offshore. Later we will point out in which relation knowledge management should be used.

### **5.5.1.2 Planning**

#### **Logistics planning within SCM**

When discussing the planning component within structural management, we will describe elements that are essential in the planning process in the HD organization. The different departments at HD use different planning tools, and they have different time horizon in their planning. However, before doing this, we will elaborate some about logistics planning. The theory foundation for this is the article "Management of logistics planning" by Aas and Wallace (2008).

*"As a result of safety concerns as well as enormous shortage costs, Statoil's primary objective for its logistics planning is to ensure that customers' requirements are met, and in a safe way"* (Aas and Wallace 2008, p. 32).

As a consequence of Statoil focusing in meeting customer's logistics demand, there is little focus on optimizing the logistics within the SC HD operates in.

In this section we will introduce the model presented in Figure 5-7 by Aas and Wallace (2008) and show its relevance to our research. The main purpose is to show that executions, (which in our case e.g. could be low utilization of supply vessels and unnecessary lifts offshore) and planning are substitutes, and that HD's solving capability and the availability of information concerning logistics information complements each other. We think this model is a good way of showing this, and the model has relevance for our research. The model also show the interplay between resources allocated to planning and what you are able to achieve with focus on improving your planning.

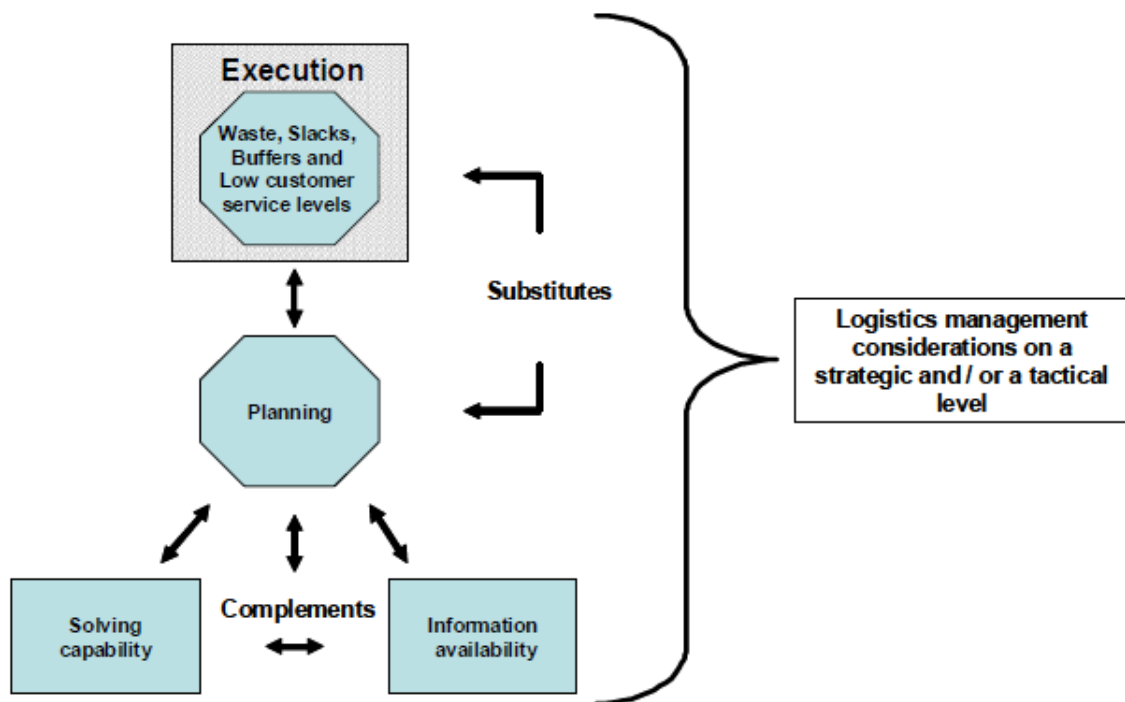


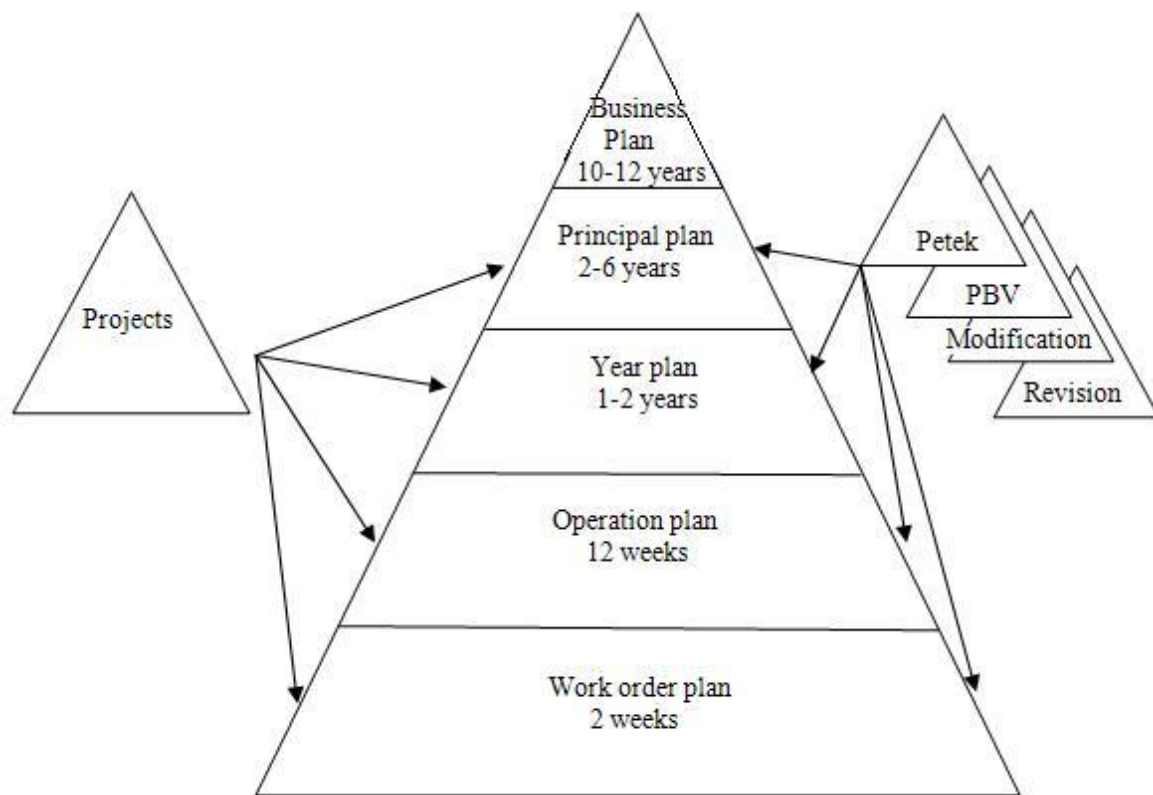
Figure 5-7 Relationships in logistics planning (Aas and Wallace 2008)

From the model we see that if HD manages to get an improved planning of their offshore logistics, the improved effort used on planning substitutes low utilization of supply vessels and unnecessary lifts offshore. The main purpose is to show that getting better plans of the logistics operations concerning both D&W and HD OPS, would lead to more efficient use of HD's logistics resources.

To improve the planning horizon for logistics activities offshore, HD must be able to make better logistics plans. HD needs improved solving capability and information availability

to improve their logistics planning. From the model we see that these are complements of each other, meaning “your chain is not stronger than your weakest link”. In other words HD needs to be able to collect and transform the relevant logistics information within their SC to a format that could be used by logistics professionals and software. This would lead to an improved logistics plan built on the logistics information.

Planning exists at many levels as well as in all functional areas within an organization (Lambert, Stock, and Ellram 1998, p 549). Generally there is three levels of planning; strategic, tactical and operational (Lambert 2008). We are focusing on the operational planning. By operational planning we mean daily planning of the operations affecting HD.



**Figure 5-8 Planning structure for Statoil offshore installations (Statoil 2010C)**

Figure 5-8 shows the vertical planning structure for Statoil offshore installations. We are focusing on the operational planning that is the operational plan and the work order plan.

On daily basis there are used several planning systems to support operational planning. We are only focusing on those relevant to support logistics activities and we will now continue by describing these planning tools individually, before we in the end of the section provide a figure showing where in the SC these tools are used.

- **Need list**

The Needlist is used in the D&W department. This is used to have a complete overview over all equipment needed for a D&W project. The list includes each activity in the project, and which equipment that are needed for the specific activity. It also includes the name of the supplier, together with the estimated date the equipment is needed. The Needlist is a part of the drilling plan for a specific project. All personnel with access to HD's internal team site, has access to the need list.

- **Laste, Leie, Log (LLL)**

This is the tool the BFA LOG in HD's D&W department use to manage the daily logistics. LLL is the software used to coordinate the departure for all equipment needed in D&W operations at HD (see APPENDIX G). The information from the LLL is the main information source for the MATCOR SBK, which use this information to plan the receipt, preparation and dispatch of goods passing through SBK. The MATCOR D&W HD also uses LLL to be informed about when equipment arrive HD. All personnel in the HD's D&W department have access to LLL.

- **Project planner**

The Project planner is the main planning tool for executing D&W projects. This plan is updated daily. This plan includes all information about the operational progress for the project. The D&W manager offshore is responsible for updating the plan daily. All personnel involved in the daily operations of a D&W project has access to this tool (see APPENDIX H).

- **Personnel onboard (POB)**

This is a spreadsheet containing the information about the personnel that are onboard HD at any time. This tool is used to support the planning of personnel offshore. The drilling manager, BFA LOG and the booking responsible has access to the POB (see APPENDIX I).



- **Dedicated aviation Within Common information (DaWinci)**

DaWinci is the tool used for planning and booking of personnel going offshore. In this software, the booking responsible registers all information about personnel going offshore. Further, flight plans, passenger lists, cargo lists and sleeping accommodations offshore are information that is included in DaWinci.

- **SAP ERP**

System analysis and Program development (SAP) is the enterprise resource system (ERP) – system used in Statoil including the HD organization. Below we will give examples of software and planning tools used in the logistics planning at HD based on SAP.

- **Vessel traffic management and information system / SAP (VTMIS)**

VTMIS are used for planning vessel traffic to and from the installations. This software is also used by marine coordinators in SM to give their customers (e.g. HD) the possibility to monitor the progress of the vessels supporting their demand offshore. The routing of the vessels is planned by using VTMIS, prior to departure from SBK. HD's personnel can monitor the position of the vessels and get updated time estimates of arrival to each installation offshore. All personnel in HD's organization have access to VTMIS.

- **Work order plan SAP (AO plan)**

The work order plan is used to plan all the work orders in HD OPS. The AO-plan has the overview over all the work orders that are going to take place the next 14 days at HD. The plan is based on needs reported offshore. The work orders are rated by priority due to importance set in cooperation between HD's field managers and the planner. The personnel with access to the AO plan are all personnel with planning responsibility in the HD organization.

- **eBoB / SAP**

eBoB is used in the planning and purchasing part of a D&W project. This system is a module in SAP, which are used by the D&W engineers, the BFA purchaser and the suppliers. During the planning process in a D&W project, eBoB is used to integrate the suppliers in Statoil's procurement and logistics process for all D&W activities. First the D&W engineer creates a network in eBoB. This network

includes all necessary activities in a project. For each specific activity in the network, the suppliers fill in information about equipment needed prices etc. Further the BFA purchaser goes into the same activity and creates a purchase order (hereby denoted as PO). When the PO (see APPENDIX M) is created in eBoB, the supplier receives the PO electronically, or sent manually by BFA purchaser. eBoB are also used in tracking of equipment. D&W engineers, BFA purchasers, MATCOR SBK, MATCOR D&W HD and the suppliers have access to eBoB.

In Figure 5-9 we show where in the SC the different tools are used in the planning of the logistics. A more detailed description of the communication links in the SC is described in section 5.6. The communication between HD OPS and booking responsible for personnel in HD OPS is not specified because we have limited this thesis to only include personnel logistics for the D&W department.

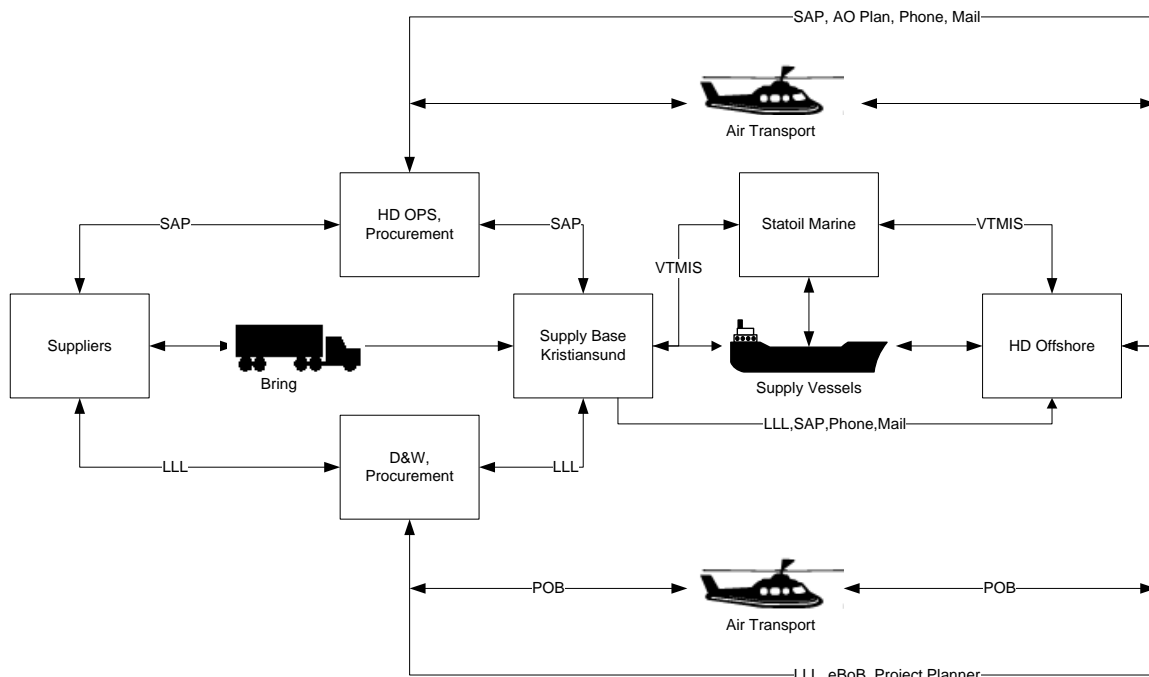


Figure 5-9 Communication links with specified communication tools

## 5.5.2 Behavioral Management Components

The behavioral management components are less tangible than the structural management components (Lambert 2008), but they are essential for a successful implementation of the business processes. Often when business processes are implemented, the focus is on the structural management components. This often leads to failure, because even if the structure is in place, the behaviors are not encouraged.

Lambert (2008) lists 5 behavioral management components:

- Management Methods
- Power and Leadership
- Risk and Rewards
- Culture and Attitude
- Trust and Commitment

Related to our thesis, all of the behavioral management components are relevant. However, because of time limitations and our knowledge about all these components were limited, we decided to focus on those we knew the most; *Power and Leadership* and *Culture and Attitude* components. The three remaining management components contain how the managers manage the SC, how they use rewards to the employees, and how critical trust and commitment between the employees are.

### 5.5.2.1 Power structure / Power and Leadership

Traditionally the problem in a SC is to determine who has the power in the SC. In HD's case with Statoil as the operator the power structure is pretty clear.

Concurrent that exploration of oil and gas is Statoil's core business process, indicates that HD is in a position to dictate and set demands for their suppliers in the SC. In reality this means that HD is in a position to make the rules of the game. This is a unique position to be in. In the end all costs are paid by HD so HD has an incentive and also due to its resources the possibilities to do changes leading to a more optimal SC. It is also a question of how Statoil and HD carry out the power they possess in the SC. Instead of continuously aiming against individual profit, the whole SC should work together to reach individual goals, according to the SCM idea. As a leading actor in the SC, Statoil is in the position to affect how this is done. Similar, if business process between actors in the SC could be

integrated, Statoil should be an initiative- taker to achieve this, playing out the SC manager role.

### **5.5.2.2 Culture /Culture and Attitude**

From our interviews and observations and earlier studies we state that the D&W department is a prioritized activity at HD. As a results the personnel working in this engineering department is higher valued and has a higher status then the supporting activities like logistics and the maintenance and operations divisions. An example is the cost of having a stop in the drilling activities, if there are capacity problems on the helicopter or sleeping accommodations, D&W personnel are prioritized above people from other divisions. The most obvious reasons for this is the uncertainty the D&W department experience during their operations, and the enormous shortage costs related to D&W operations. As a natural result of this, they often are prioritized over other actors in the HD organization. We also observe that the management of HD has more focus on the logistics as a support activity.

Another observation is that it seems to be a higher competence level of the personnel working with engineering and technical aspects of HD's operations compared to personnel that works with supporting activities as logistics. This is probably an observation that holds for most companies.

## **5.6 SUPPLY CHAIN INTEGRATION/COMMUNICATION STRUCTURE**

One of the most powerful sources of competitive advantage is cooperation between firms that belongs to the same SC (Sadler 2007). SC integration can be classified into intra integration and inter-organizational integration. Elements that will be emphasized in this section are how the different actors communicate, and how they share information. In the next section we will describe the communication links more detailed, and try to show the integration in the SC, both internal and external.

### **5.6.1 Internal Integration**

We have chosen to illustrate the internal integration within D&W and HD OPS separated before we give an illustration of the integration between D&W and HD OPS in the last part of this section. We have chosen to do this because the two departments are physical separated onshore and have little to no links between them in their daily operations. It is first when we get to the offshore installation there is some integration between the two departments. This is done because we think this will give a better understanding and overview of the inter-organizational integration at the HD organization.

#### **D&W**

The integration between the members of the D&W department concerning logistics is mainly maintained through the BFA LOG. In the D&W department there is a lot of uncertainty related to the operations. As a consequence they need to make changes in the logistics fast; these changes are updated by BFA LOG in the LLL. The main communication tool between the D&W team onshore and the MATCOR SBK and D&W offshore is the LLL where all the changes in requirements are updated daily. MATCOR SBK registers the equipment when it arrive SBK in LLL so the equipment can be shipped as planned. Changes in the D&W operations are communicated to the BFA LOG indirectly through teleconference meetings between onshore and offshore personnel within D&W. Therefore we consider BFA LOG in D&W as a critical link in HD's responsive SC. The progress of the vessels and their goods can be monitored through SM's VTMS by the whole HD organization. Figure 5-10 illustrates the main departments/positions affecting the logistics related to D&W and the electronic integration between them.

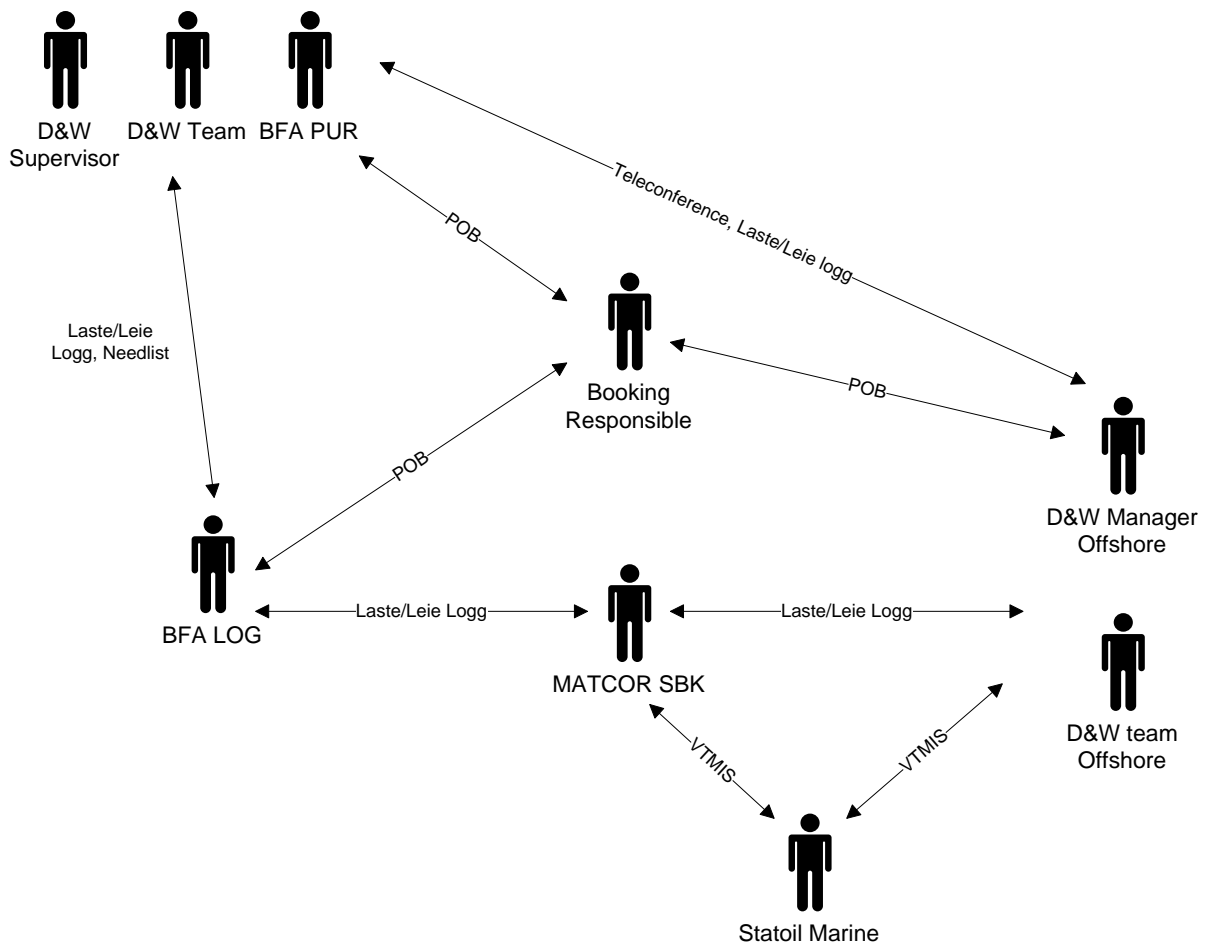


Figure 5-10 Internal integration D&W

## HD OPS

In the HD OPS department there is less uncertainty than the D&W department. As a consequence of this the planning and communication can be done with a longer time horizon. In HD OPS the electronic integration is mainly done through SAP. The HD OPS team in Stjørdal, MATCOR SBK, MATCOR OPS HD and HD OPS team offshore are electronic integrated mainly through SAP. MATCOR HD SBK functions as a link between Vestbase at SBK and the HD organization onshore and offshore. Handling of daily logistics is mainly done by Vestbase, only when sudden demands from HD occur, the MATCOR SBK is involved. Changes in the AO-plan are communicated through the 24 hour meeting (see section 6.2) between HD OPS personnel both onshore and offshore, these changes are made in SAP. The progress of the vessels and their goods can be monitored through SM's VTMS by the whole HD organization. Figure 5-11 illustrates the main departments/positions affecting the logistics related to HD OPS and the electronic integration between them.

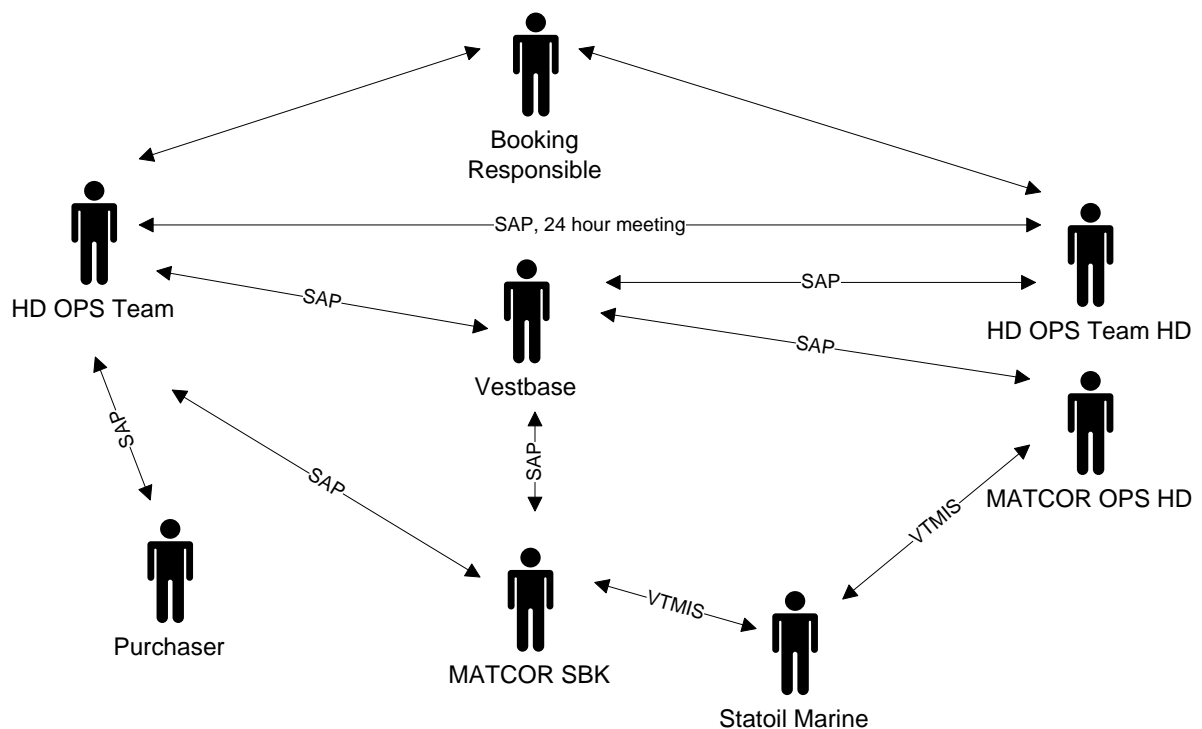


Figure 5-11 Internal integration HD OPS

### 5.6.2 Integration between D&W and HD OPS

Onshore the D&W and HD OPS are separated in different locations and have little to no communication on the daily basis. Only in some occasions, HD OPS has contact with MATCOR SBK. This is when sudden demands from HD occur, and urgent shipments are required. Even though, we have not included this link in Figure 5-12. As mentioned above there is little integration between D&W and HD OPS onshore, but out on the offshore installation there are some differences from onshore. On the daily morning meeting between the D&W managers onshore and offshore and the FA LOG OFF is present to be updated on the changes according to logistics from day to day, this is done through teleconference meetings. In addition MATCOR D&W HD and MATCOR OPS HD are sharing office offshore, so they have contact on a daily basis.

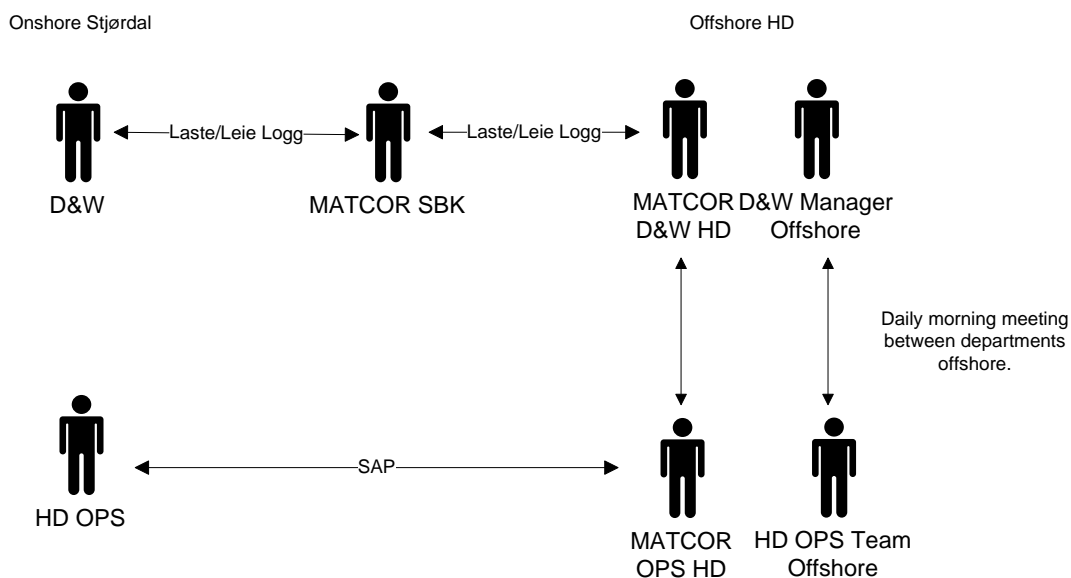


Figure 5-12 Internal integration D&W and HD OPS

### 5.6.3 Inter-organizational integration

In this context, inter-organizational integration is all physical integration and contact between the focal organization and external organizations (suppliers).

In the daily operations it is BFA LOG and the D&W team that has most contact with service suppliers in the D&W department. Some of the most important suppliers are present in Statoil's facilities at Stjørdal. There they are integrated in the D&W department so they can follow the daily operations through videoconference meetings with HD. They are also integrated in the procurement process through the SAP module eBoB (see section 5.5.1.2). The suppliers that are not present at Statoil's facilities are only integrated by the



information given by BFA LOG. This includes snapshots of LLL and a copy of the Needlist sent by mail. In Figure 5-13, the HD OPS department is included. From this department, communication between suppliers is done by the HD OPS group and the purchaser. There are no suppliers present in Statoil's facilities as they are in the D&W department. Most of the communications are done by phone and mail. At the HD offshore installation, the suppliers are integrated in the fact that they are present on HD. The cooperation between the focal company and the suppliers are of high importance on HD, and therefore integration could be seen as a necessity. Daily meetings and communication between the personnel on HD are examples of the integration between the focal company and the suppliers. MATCOR D&W HD and MATCOR OPS HD also have contact with service supplier's onshore (not shown in figure).

Telephone and mail are used frequently between the actors in addition to the tools included in the figure

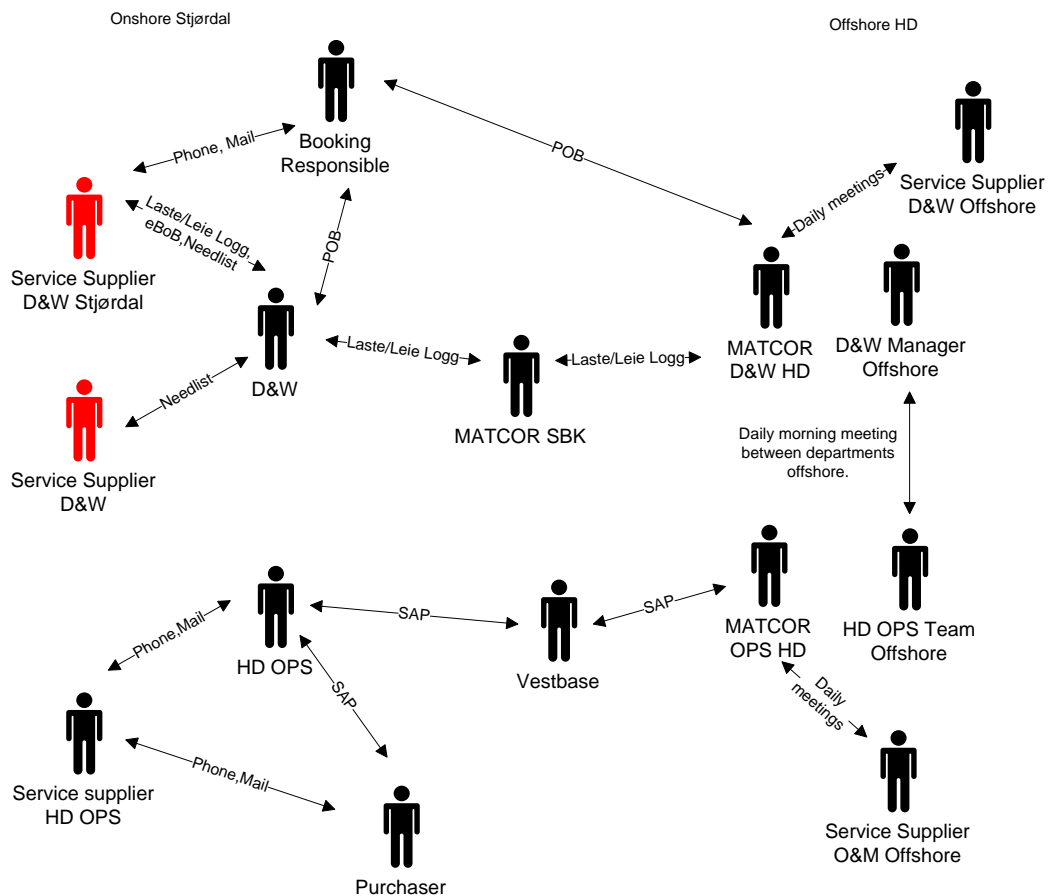


Figure 5-13 Inter-organizational integration HD

## **6 PLANNING AT HEIDRUN**

In this thesis we are investigating how HD can improve their planning horizon, and how this will benefit HD. In order to achieve that, we need to know how the planning for HD is executed today. We will use this chapter to describe the process from planning to execution for operations within D&W and HD OPS. The planning process for personnel needed on HD is also described.

To operate the equipment HD needs qualified personnel. This means that the coordination between equipment and qualified personnel is challenging and important for the operations at HD. This is very relevant for D&W where there is high uncertainty and changes arise on short notice. Because of limitations set in section 2.3 we have chosen to focus on D&W concerning linking of personnel and equipment, even though this also concerns HD OPS on a more infrequently basis as a result of lower uncertainty in their operations .

Next we will describe how D&W and HD OPS execute the process from the demand for a job or equipment is needed on HD, to the job are executed and equipment returned from HD. To get the whole picture of the offshore logistics planning at HD, we start the description where the demand arises both in D&W and HD OPS. In D&W the demand often starts when a new well is planned or need maintenance, in HD OPS the demand often starts with need for maintenance or equipment that needs to be changed.

In general the planning at HD is organized in the following way; Principal plan (2-6 years), year plan (1-2 years), operational plan (earlier called 60-days plan, 12 weeks) that functions as a plan over priorities and coordination of activities and resources for the next quarter, and the work order plan (2 weeks), see section 6.2 (Statoil 2010C).

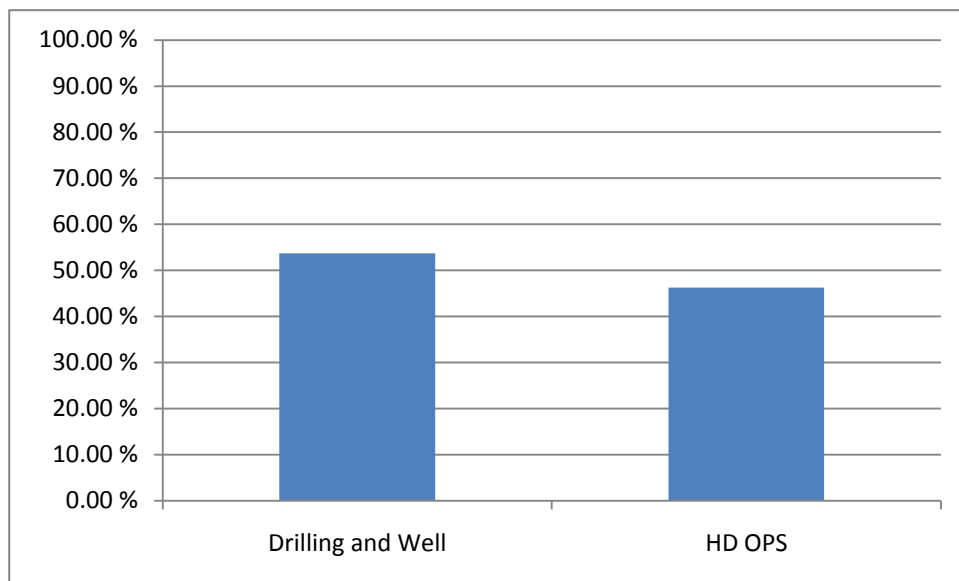
### **6.1 PLANNING PROCESS AT DRILLING & WELL**

The D&W activities on HD are necessary to maintain the daily production rate of oil and gas. Today, there are over 50 wells that have different purposes as producing oil and gas and as water and gas injectors at the installation. In the future, more wells are needed so the production of oil and gas can continue at HD in the future. To be able to utilize the

reservoir and to improve the lifetime of the installation, there are comprehensive plans for maintenance of existing wells, and drilling of new ones.

D&W operations are complex and technical operations that are supported by detailed D&W plans. From a logistics point of view, the D&W activities are quite challenging. Most of the equipment used in these operations is expensive rental equipment from external contractors. A result of this is that HD does not want equipment to arrive offshore before the day they plan to use it, to avoid unnecessary rental costs. This, combined with high uncertainty in the operations ensures that the logistics are comprehensive and complex.

In Chart 6-1 the distribution of the total outbound tonnage to HD are presented. From this we see that D&W related cargo stands for 53, 71% of the total outbound tonnage. This chart is based on numbers from 2009, where the D&W activities have been lower than earlier years.

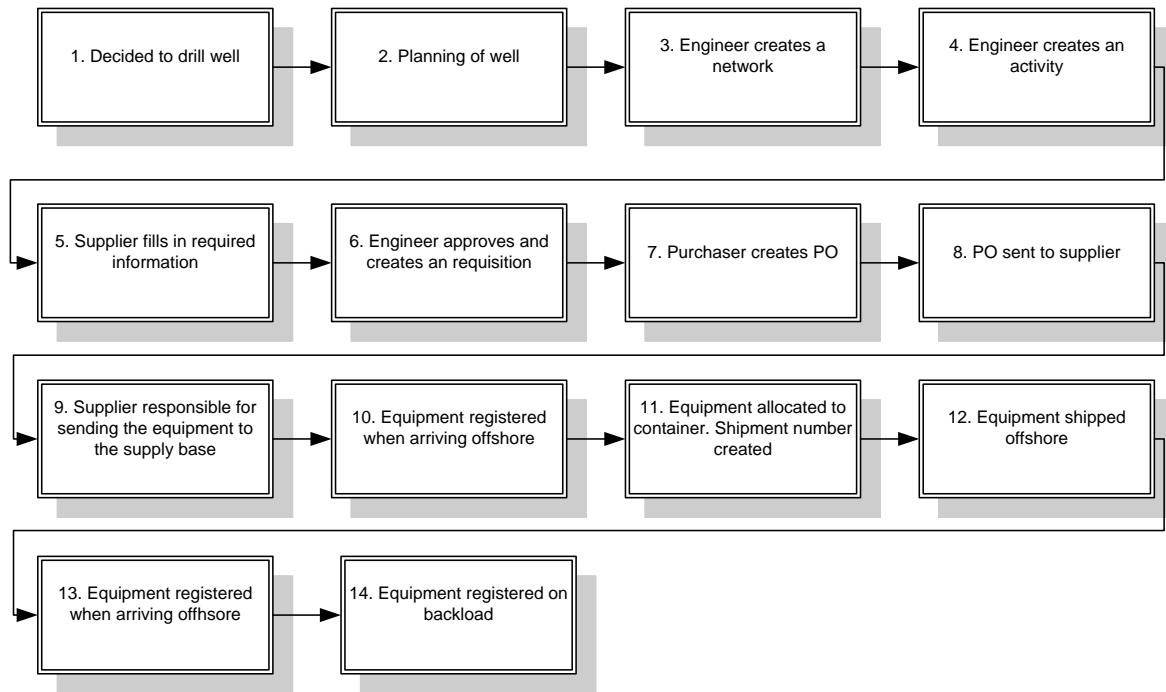


**Chart 6-1 Total outbound tonnage to HD 2009 (Statoil internal)**

In 2009, the total outbound tonnage to HD was 205 770 tons. One thing that is not included in the chart is all equipment related to projects on HD. Tonnage related to projects was about 40 tons in 2009, which corresponds to about 0,02% of the total outbound tonnage.

Next we give a description of the process within the D&W department from the decision to drill a well is given, to the equipment used in that operation are sent in return to SBK (see Figure 6-1).

**Description of the processes from planning to execution in the D&W department:**



**Figure 6-1 Description of the process from planning to execution in the drilling and well department**

**Explanation of the figure:**

**1. The decision of drilling the well is made.**

This is a strategic decision which is made by the management in Statoil, which includes:

- Exploration and production Norway
- Operations North
- Management of Heidrun organization

The decision of drilling a well is taken when there is a need for a new well. Different areas of usage of wells: Production wells, water injector wells and gas injector wells.

## **2. Planning of well.**

The planning of each well is done by D&W engineers employed by the D&W department in operations north. During the planning process, the engineer works together with geologists to investigate the different layers in the ground. This is done so the well path could be decided in a best possible way. Further, the engineers create a detailed drilling plan, which includes detailed procedures of the operation and equipment needed during the operations. Based on this plan, they create a Needlist which is an overview over all equipment needed during the operations. There is also made an overview over all suppliers that are supporting the drilling operations, either by equipment or by personnel. An example of a Needlist is included in Appendix F.

## **3. Engineer creates a network in eBoB (SAP).**

When organizing the purchasing and logistics activities concerning a D&W operation, the responsible engineer creates a network in SAP. This network represents a module in SAP where all information about the different equipment and personnel are gathered. An example of an activity that a network represents in SAP is the drilling phase of a well. Usually there are created three different networks for a complete well. First there are the P&A operations, then the drilling phase and further the completion phase. The same system is also used in well intervention programs.

## **4. Engineer creates an activity.**

When the network is created, the engineer creates an activity for each job that is needed. An example of a job is when they need to gather data down in the well. Then they use wireline logging. This could be done by Schlumberger, and includes both equipment and personnel. The activity is representing one supplier at one specific job.

## **5. Supplier fills in what is needed to finish the operation in the activity.**

Now, when the activity for the job is created, the supplier is responsible for filling in the necessary equipment and personnel needed into the activity. They are also responsible for including back up equipment.

**6. Engineer approves the activity (after supplier has filled in the information).**

When the supplier has filled in everything needed in the job, the engineer checks if everything is included. If something is missing, the supplier has to add or change the mistakes. When the engineer has approved the activity, he creates a requisition.

**7. Purchaser creates a Purchase Order.**

After the engineer has created the requisition and released this, the purchaser can find the requisition in SAP. In SAP, BFA PUR can see everything that the engineer and supplier have included. BFA PUR is responsible that the right contract or frame agreement is used. If there is no contract or frame agreement, a contract has to be made. This is done by a contract coordinator. The usual process in this case is to send a request for quotation (RFQ) to three possible suppliers. If eBoB is used, all information that should be included in the PO is already there. The only thing BFA PUR is responsible to include is the delivery date. BFA PUR also makes sure that the right currency is used, and ensures that the rest of the information is correct. If everything is correct, BFA PUR creates a PO. This document is a binding confirmation of the order, and BFA PUR has to include delivery date, delivery conditions etc in this document. We differ between PO's for personnel services, and PO made for equipment.

**8. PO is sent to supplier.**

After the PO is created, BFA PUR sends the PO to the supplier. He also includes the information about the PO in Laste Leie Loggen (LLL). The person who is responsible for including the information is BFA LOG. The information he includes in LLL is information about the equipment as supplier, number of lifting operations the equipment requires, PO number, and shipment date from the supply base. The PO is either sent manually by mail, or automatically through eBoB.

**9. Supplier is responsible of sending the equipment to SBK.**

When the supplier has the purchase order, the supplier starts to prepare to deliver the equipment to SBK. The final delivery date is agreed between the supplier and BFA LOG. This is adjusted in accordance with the progress in the D&W operations. When the delivery date at SBK is set, the equipment are prepared and packed into carriers. When everything is ready, the supplier sends information about the shipment included in a delivery ticket (herby denoted as DT) to BFA LOG. BFA LOG includes the DT (see

APPENDIX K) in LLL, so that other actors in the SC could get information about the equipment. Statoil has an agreement to use BRING as the preferred transporter, so everything sent from suppliers is sent with BRING. The contact and follow up of the suppliers is done by BFA LOG.

#### **10. Equipment registered when arriving at the supply base.**

When the equipment arrives at SBK (before 10:00 every day when there are shipments) (see APPENDIX N), the people working at Vestbase unload the trucks. The DT is handed over to MATCOR SBK. When MATCOR SBK has the DT, he goes in to SAP, and the specific PO that the DT is attached to, and registers the equipment received at SBK. Further, MATCOR SBK includes the information about the incoming equipment in to SAP. For each shipment going out from SBK, there is generated two shipment numbers. One shipment number is for the equipment regarding HD OPS, and the other number is for all the equipment for the D&W activities.

#### **11. Equipment allocated to container/carrier.**

When the shipment numbers are generated, a loading list is generated automatically. MATCOR SBK includes the information about the incoming equipment into this loading list. Further, he allocates the generated deliveries into a cargo carrier. This is done to allocate different equipment to specific containers.

#### **12. Equipment shipped offshore.**

When the loading list is finished, and all equipment is put into their respective container, the MATCOR SBK hand the loading list over to people working in the Statoil Terminal at SBK. They are responsible of allocating the equipment on a supply vessel. The loading operations are done by Vestbase, with the personnel on the supply vessels as responsible for where the equipment is placed on the vessel.

#### **13. Equipment registered when arriving offshore.**

When the equipment arrives offshore, MATCOR D&W HD looks up the shipment number and marks the different deliveries as received in SAP (eBoB). MATCOR D&W HD is responsible for assuring that the right persons get the correct equipment on HD.

#### **14. Equipment registered on backload.**

When the D&W teams offshore are finished using the equipment, MATCOR D&W HD is responsible for sending this back onshore (backload). The personnel using the equipment alert MATCOR D&W HD when they are finished using it. Further MATCOR D&W HD includes this into the backload manifest. The backload manifest is a list of all equipment that is sent back onshore. After the backload manifest is created, MATCOR D&W HD creates return messages in SAP, and deliveries where he allocates the equipment to containers. He also physically attaches yellow patches on every container (backload), so the logistics crew can identify the backload. Expensive rental equipment is important to send backload as fast as possible. Equipment like this has first priority on the backload list. All backload sent onshore has to be reported to SM before 10am on the day the supply vessel departs SBK.

In the next section a process description are given for HD OPS. This is to show the differences between D&W and HD OPS concerning the process from planning to executions for activities on HD.

### ***6.2 PLANNING PROCESS AT HEIDRUN OPERATIONS CENTRE (HD OPS)***

The HD offshore installation performs D&W operations simultaneous as they have production of oil and gas. This makes HD to a complex installation in terms of planning and coordination of all the activities offshore. In general D&W has first priority (cost issue) if an overlap in activities arises. This has to be considered in the planning process for the HD OPS division at HD. All the Operations & Maintenance and Planned Maintenance planning for HD are performed at HD OPS (see section 4.5.1.2) Figure 6-2 shows the planning process at HD OPS.



### Description of the processes from planning to execution at Heidrun OPS department:

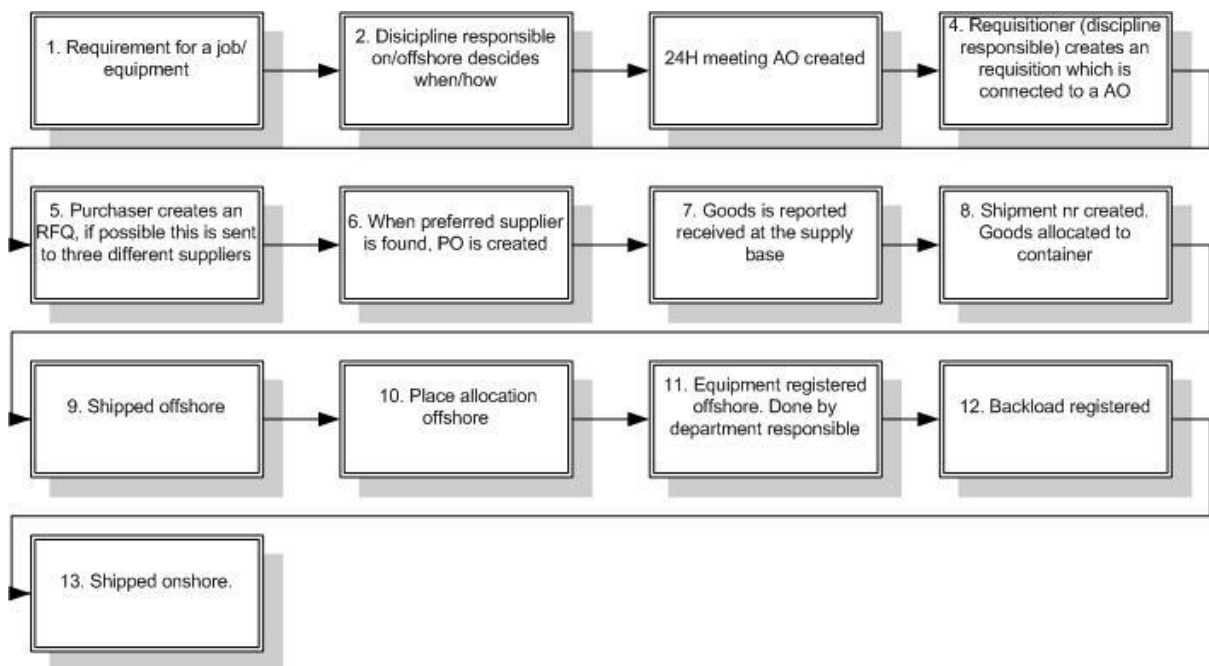


Figure 6-2 Planning process at Heidrun OPS

#### 1. Requirement for a job/equipment

On an offshore installation like HD some equipment from time to time needs maintenance or to be replaced. HD is divided into several departments, where each department has an operational system responsible (see APPENDIX J). When a department finds equipment in their area that needs maintenance or be replaced, a requirement for a job/equipment is made (Notification).

#### 2. Discipline responsible on/offshore decides when/how

When a demand for a requirement arises, this is reported. When the requirement is confirmed, it is sent to responsible discipline that create a notice in SAP with the description of the requirement

#### 3. 24H meeting work order (AO) created

AO is a description of a certain job that is planned; given estimated numbers of hours needed on the work, as well as the personnel and material needed. The use of AO connects the cost of a material to a job, which again is connected to a budget. Material used in an AO could be for maintenance or a modification job (Følsvik and Horky 2005). *Each AO contains a unique AO number so it can be tracked in SAP.*

At OPS HD they have a meeting called 24-Hour meeting every week day at 10.30 am. Personnel both onshore and offshore attend this meeting using a video conference system. On the 24-H meeting all the field managers and the planner attends. In this meeting they go through a list of all the new notifications made the last 24 hours. For each notification there will be made an AO if the demand is genuine. The priority for the different AO will vary, some is urgent and other can be postponed for months. Collectively in the meeting they discuss and set the priority of the notification and make the AO in SAP. In this process the planner at HD OPS is responsible for coordinating all the AO's into the relevant AO plan. The AO plan will be locked for adjustments every second Thursday with a time horizon of 14 days. This is possible to do in HD OPS because there is less uncertainty in their operations according to D&W. With this planning system personnel at HD can track each AO in SAP from origin to execution of the AO.

**How the AO's are prioritized.**

A priority stairs (marked with dark blue in Figure 6-3) is used as a tool to get a picture of the priorities and the execution of the AO's on every Statoil installation and for reporting of maintenance results.

The 24-H meeting is used to:

- Quality assurance for notifications according to having the right priority/criticality and description.
- Secure that deviation in relation to criticality is documented according to existing procedures.
- Allocate tasks according to criticality and availability of resources and competence.
- 24H meeting shall secure right priority on tasks.
- AO shall be executed according to priority. The focus shall be on the left side of the stairs in Figure 6-3 (marked with dark blue).
- 24-H meeting shall provide for synchronizing between priority and execution time.

Priority	SAP std pri on notifications					Execution	Final priority on AO				
	HIGH	MED	LOW	WPRI	WCRI		HIGH	MED	LOW	WPRI	
Priority H (5D)	27	5	6	12	34	Number of days executed	5	59	191	63	118
on M (30D)	25	59	29	162	30		23	217	107	101	
work L (180D)	6	15	46	118	180		2	101	122	84	
orders WP (360D)	3	2	2	289	360		0	5	23	16	

Figure 6-3 Priority for AO (Statoil 2010C)

**4. Requisitioner (discipline responsible) creates a requisition which is connected to an AO.**

A requisition is made by the discipline responsible, which is connected to the respectable AO found in the AO plan.

**5. Purchaser creates a request for quotation (RFQ) if possible; this is sent to three different possible suppliers.**

The next step is to make an RFQ for the material and/or personnel needed in the AO. Tenders for the quotation is invited to bid, normally there are at least three suppliers involved in a quotation. This is to get the best possible offers in terms of Statoil quotation norms; still fulfilling HD's requirements.

**6. When preferred supplier is found, purchasing order (PO) is created.**

When the quotation is over and the preferred supplier is chosen, a PO containing the requirement for the AO is made in SAP. At this stage there could be two different scenarios; HD has a contract/frame agreement with the supplier that the equipment/personnel are comprised by or not. If they have a contract/frame agreement HD's own purchaser can make the PO. If not, the PO has to be made by the category responsible purchaser.

**7. Good is reported received at the supply base.**

Similar with equipment from the D&W department, equipment are received at the supply base by Vestbase engaged by Statoil. The time limit for goods arriving the same day as departure is 10 am at FBK. This is because the equipment has to be tested so only fully functional equipment is sent offshore. This process is done by Vestbase at SBK. Vestbase does all the physical handling of the goods. E.G. if the goods are sent on pallets the equipment must be repacked to offshore containers/baskets. If the goods are sent in containers/baskets ready to be sent offshore, Vestbase is responsible for finding certificate and checklists from the DT from the supplier. This process must be done before the goods can be checked out offshore. In HD OPS, Vestbase takes deliveries on PO's in SAP and checks if the goods are going directly to HD or is to be stored at SBK. (See section 6.1 for D&W)

### **8. Shipment nr created. Goods allocated to container.**

The load carriers are typed into SAP so the Loadinglist can be created. HD has two Loadinglists for each shipment, one for D&W and one for HD OPS. New shipments are made for each trip to HD, normally three trips per week. The Loadinglist is a list over all the load carriers that are connected to each shipment; in HD OPS you can enter each load carrier to see the content in SAP. This is done by allocating a SAP number to each load carrier so the number can be used to identify the container and see the content.

### **9. Shipped offshore.**

Before the goods leave SBK it has to be sealed according to International Ship and Port Security (ISPS). ISPS responsible at SBK is MATCOR SBK, but the physical sealing is often done by Vestbase. On some special equipment, the load carriers are sealed from the supplier and Vestbase are not allowed to open the load carrier on the basis of insurance reasons.

The physical loading of the vessel and where the load carriers are placed on the vessel are today decided by the vessels captain. The vessel has some restrictions concerning placing of the carriers. The load carriers have to be placed in accordance with regulations. Some examples; dangerous goods must be placed in accordance with existing guidelines, and food carriers needs power supply during the trip. The vessel follows a sailing schedule made by SM for the supply vessel pool. On this trip several other installations are visited on the same trip, depending on the rig activity in the area. The vessel plan is rarely correct; there are often several adjustments in terms of when the vessel leaves SBK and the other installations. The vessel progress can be monitored by personnel on/offshore with position and updated estimates of arrival times using VTMISS. For more information about the supply vessels and the supply pool see (Aas and Senkina 2003).

### **10. Place allocation offshore (HD)**

When the supply vessel arrive HD, the vessel is unloaded by the crane and deck operators from the logistics crew. This is done by instructions from the Loading list made in SAP following each shipment offshore. The loading instructions are made by the MATCOR OPS HD. When the Loadinglist is ready (usually when the vessel leaves SBK), MATCOR OPS HD enters the Loadinglist to get an overview of the load carriers and their content on the current shipment, then he marks the load carriers with the location the crane operator

shall place it e.g. SKID WEST see Appendix L for a map. On a large installation like HD they have dedicated decks to place different types of equipment e.g. pipe deck for placing of drilling pipes and casing and the milk ramp for food containers. In the same process MATCOR OPS HD goes through the Loadinglist and marks the load carriers he is responsible for unloading and notifies other personnel if they are receiving equipments on this shipment. The person who orders the equipment normally has his name attached to the equipment in SAP so he is notified when it arrives; if not MATCOR OPS HD has to search for the recipient.

#### **11. Equipment registered offshore. Done by department responsible.**

MATCOR OPS HD and the responsible personnel in other disciplines register the equipment as arrived in SAP. When the needed equipment has arrived offshore, the responsible person for the AO creates a pick list in SAP. This list includes all equipment attached to the AO. Further, this list is given to MATCOR OPS HD. MATCOR OPS HD ensures that the right person get the equipment, and reports this in SAP.

#### **12. Backload registered.**

The backload requirement must be reported to SM and has a deadline at 10 am the day the vessel leaves SBK. Equipment/waste from HD OPS that needs to be sent onshore is reported to MATCOR OPS HD from different division responsible. MATCOR OPS HD makes a return message and deliveries for the backload. MATCOR OPS HD then prints yellow patches with cargo information that is attached to the backload. The information on the patch consists of cargo number, weight and content. Dangerous goods needs to have a data sheet when it is back loaded, this is MATCOR OPS HD responsibility to print and make sure it is sent with the load carriers to the vessel. For waste backload HD uses the Waste management module in SAP. When all backload is finished, an unloading list is printed and delivered to the logistics team to support them in the unloading process of HD.

#### **13. Shipped onshore.**

When the backload is on the vessel; the vessel continues the schedule according to the supply vessel route. The route fluctuates from time to time, according to different demand for the installations in the pool. The backload is unloaded from the vessel in SBK.

Now we have described how D&W and HD OPS plan and executed their operations at HD. In the next section we will focus on the connection between people and equipment needed to solve the demand HD have offshore. As mentioned in the introduction to this chapter our focus here will be on personnel vs. equipment concerning D&W.

### 6.3 PERSONNEL VS. EQUIPMENT

When HD has a job that needs to be done offshore, both personnel and equipment are needed. This means that there has to be coordination between the personnel and equipment needed offshore. This applies both for internal personnel from HD and external personnel from contract suppliers. In this section we will describe this process and find the link between personnel and equipment offshore.

As a consequence of expensive rental equipment and the cost of having personnel offshore, it is important that the coordination between personnel and equipment is optimized. The main focus is to avoid having expensive equipment offshore waiting for personnel arriving the next day or vice versa, or sending equipment and personnel offshore if the demand offshore has been postponed on short notice. In the following, we will describe the process when personnel are linked to jobs offshore. Figure 6-4 illustrates the process from the need of personnel occurs at HD, to the booking is done in DaWinchi.

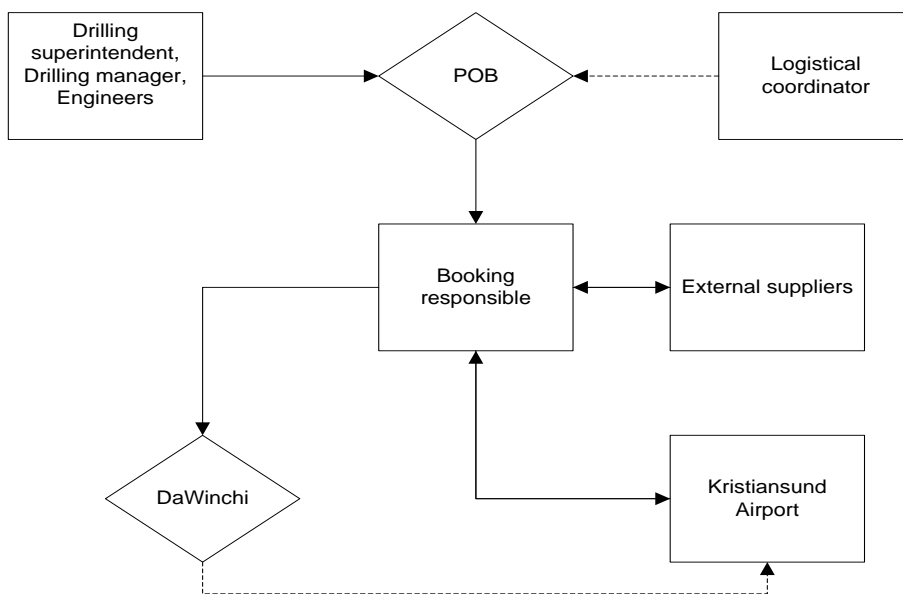


Figure 6-4 Planning process personnel D&W

The drilling supervisor offshore or the drilling superintendent onshore is the decision makers in the D&W operations. They have a full overview over the operations, and which service suppliers that are needed to execute a specific job on HD. They are responsible for giving the booking responsible information about which people that are needed offshore at all time. This is done through an excel sheet called POB (see section 5.5.1.2). Each morning the D&W crew offshore has a daily operation meeting with the personnel onshore (Stjørdal). One of the things that are discussed in this meeting, are the personnel situation. The POB is reviewed, and changes that are needed on daily basis are made at this meeting. The D&W supervisor offshore is responsible for maintaining the POB. Sometimes the BFA LOG also updates the POB, but this is only done when this is clarified with the drilling supervisor offshore.

The POB gives an overview over all personnel going in and out of the installation, and the horizon for the POB is from 7-10 days ahead of the operation. In addition to the personnel overview, the POB gives the booking responsible an overview over number of persons on the installation at all time. This is helpful when the capacity of sleeping accommodations is limited.

When the information is included in the POB, the bookings responsible book the personnel on flights to the installation. If the personnel are from external suppliers, the bookings responsible have contact with the respective supplier to get information about the personnel/person that needs booking. This information includes information about the person, and if he or she has certification of working offshore. Further, the booking information will be given to the particular person that is going offshore. The booking responsible has only one contact person at each of the external supplier regarding personnel booking. This is done so the information flow should be as simple as possible to get better overview.

The actual booking is done in a system called DaWinci (see section 5.5.1.2). This system provides all services regarding flights, sleeping accommodations offshore and information about personnel going in and out of the installation. One of the limitations at this point, is that the helicopter only has from 17-19 seats (see Figure 6-5). If there is need of more

seats, the booking responsible has to arrange extra flights. This is often coordinated with needs from other installations to utilize the capacity of the helicopter.

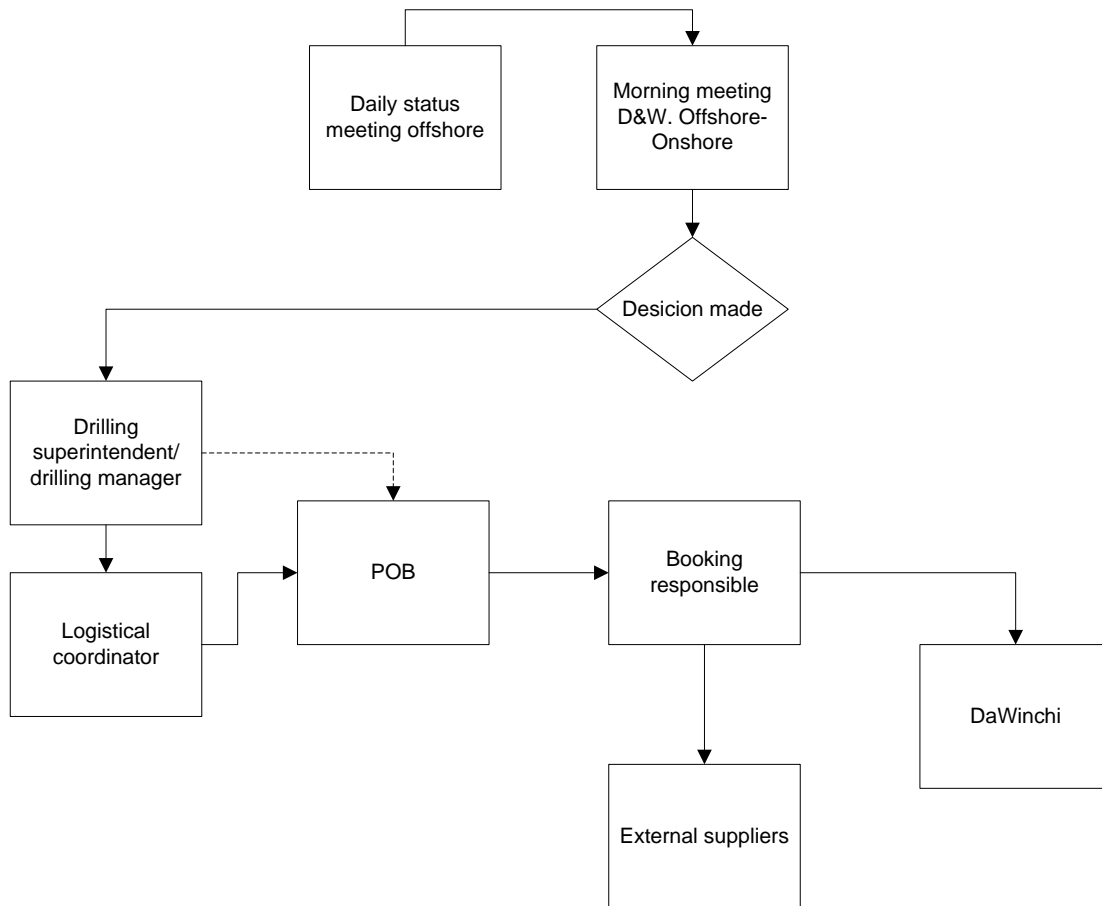


**Figure 6-5 Offshore Helicopter (CNNMoney.com 2010)**

One thing that is not mentioned yet, is the personnel going out from other departments than D&W. Most often these are personnel that are in Statoil's rotating work schedule. This means that they have a requirement of a fixed number of seats on each flight. However, the communication between booking responsible for the different departments is done when the capacity is limited and changes in the booking have to be done.

As mentioned over the personnel planning is done from day to day. Changes in operation happen quite sudden, which means changes for both equipment and personnel. Figure 6-6 illustrates how the communication is when sudden incidents occur, and a change in the personnel plan is needed.





**Figure 6-6 Process when a change in the personnel plan is needed**

Most often, the changes needed are identified on the daily status meeting between the contractors and HD's D&W team offshore. They have the best presumption to identify changes in an early stage. Further, this is communicated to the D&W organization onshore, and a decision of potential changes is made. Here the drilling superintendent and the drilling manager offshore are the decision takers. The changes are made in POB by either the drilling manager or BFA LOG. The booking responsible gets the information from the drilling manager and the POB, and handles the booking process as described earlier.

The communication line described ensures that the demand for personnel is ensured, and that the right persons are the decision takers. Although, this requires that all involved parts gets the information in the right time.

**Planning horizon**

The planning horizon for booking of personnel should be 2 days in the APOS guidelines. APOS states that the booking for every flight should be completed 2 days before the flight. According to the booking responsible, this is not possible in practice. In reality the booking responsible has one day of actual planning horizon. Earlier there is mentioned that the logistics for equipment in the D&W department is quite uncertain. As a result of this, the planning of personnel that is going to operate this equipment is also uncertain. Through the POB, the booking responsible has a rough overview over the personnel situation for a week ahead. If we compare the planning horizon for the equipment and personnel, we see that the first thing that is planned is the equipment. The planning of equipment that is needed is based on the planned operations. Personnel planning are again based on equipment needed. As described earlier, most of the personnel going out offshore through the D&W department are personnel operating equipment for a specific job. Often this is personnel from external suppliers.

Now that we have an insight in the process from planning to execution for activities at HD offshore installation, we can continue in the next chapter with the analysis. In the analysis part we will try to identify the actual planning horizon for logistics activities at HD, how it can be improved, how proactive monitoring of the SC can affect the planning horizon and show the operational benefits an improved planning horizon will give HD.

## **7 ANALYSIS**

The analysis performed in this chapter will be founded on the theory described in Chapter 5, and the description of the planning activities presented in Chapter 6. Further, our research questions will be addressed more thoroughly. Suggestions presented in this chapter are built on ideas from the theory presented, combined with findings from the empirical study of the HD organization.

The outline of this chapter is to first describe the planning horizon for logistics activities on HD today. Thereafter, suggestions for improving the planning horizon will be addressed. These suggestions will be based on one of Lambert's business processes; *Demand management* (Lambert 2008), and the thoughts of Bjørnar Aas from his PhD dissertation (Aas and Wallace 2008). The last section is addressed to critical links in the SC, and how these critical links could be used to improve the SC. The theory we make use of in this section is Lambert's ideas about the business process *Customer Service Management* (Lambert 2008).

### **7.1 PLANNING HORIZON**

One of our research questions is to find the planning horizon for logistics activities offshore. We stated that the planning horizon is a result of the information available of the planned execution of logistics activities offshore. In Chapter 6, we described the whole process from planning to execution of activities carried out on HD. Based on this description we have identified some sub- processes which we use to describe the planning horizon.

We have gathered these processes and put them in a chronological sequence in accordance with the timeline. The whole idea behind this is to show the most important processes that affect the planning horizon, and to show which persons that gets the relevant logistics information. We have also included the time aspect, to show when the different persons have the information available. This is done for both D&W and HD OPS.

**D&W**

Sub process	Planning of well	Needlist ready	PO created and sent to suppliers	Information included in LLL	Bring informed, date of shipment decided	Arrival SBK	Loadinglist ready	Shipped offshore	Arrives offshore
<b>Who gets information</b>	D&W engineers	BFA LOG, BFA PUR, Suppliers	BFA LOG, BFA PUR, Suppliers	BFA LOG, BFA PUR, MATCOR SBK, MATCOR HD D&W, Suppliers	BFA LOG, MATCOR SBK, Suppliers	BFA LOG, MATCOR SBK, MATCOR HD D&W	MATCOR SBK, MATCOR HD D&W	MATCOR SBK, MATCOR HD D&W, BFA LOG	MATCOR SBK, MATCOR HD D&W
<b>When information is available</b>	1-3 months ahead of shipment	3 weeks ahead of shipment	3 weeks ahead of shipment	7-10 days ahead of shipment	1-2 days ahead of shipment	6 hours ahead of shipment	4 hours ahead of shipment	12 hours before arrival HD	

**Table 7-1 Sub- processes D&W**

Table 7-1 shows the identified sub processes we have extracted from the description in Chapter 6. This shows when the different actors in the SC have access to information about the progress in the logistics. For instance, MATCOR SBK and MATCOR HD D&W have access to the loading list 4 hours ahead of the shipment. When explaining the time aspect, we use the time of shipment from SBK as the starting point, and refer to this when we calculate how far ahead of the shipment the different actors has access to the information.

In the D&W department, the operations have a relative short planning horizon. The planning of a new well starts approximately 1-3 months ahead of the shipment. As a result of this, the Needlist that contains information about equipment planned used in the operation is not available until 3 weeks ahead of the shipment. From this point, BFA LOG has a central role in planning and coordinating the logistics.

The deadline for equipment that arrive SBK for shipment to HD is 6 hours before the planned shipment, or 10am on the day of shipment (see APPENDIX N). Most of the equipment shipped to HD in the D&W department is expensive rental equipment. This type of equipment is often on contracts with the suppliers, where the rent starts when the equipment arrive SBK. This gives the D&W department incentives to not get the equipment to SBK before the shipment day, to minimize the rental costs. As a result of this, most of the D&W equipment arrive SBK on the shipment day. The D&W department also ship out equipment that is not on such contracts, but this only represent a small percentage of the total outbound of D&W equipment used in operations offshore.

When equipment has arrived SBK, and is ready for shipment, MATCOR SBK updates LLL with information that informs BFA LOG about the arrival and MATCOR HD D&W about shipment number, which carriers that is used, and the number of carriers. Information about which supplier the equipment comes from is already included in LLL by BFA LOG. The next process is when the Loadinglist is created. The deadline for finishing the loading list is set to be 4 hours before the shipment, or 12am on the day of shipment. This deadline is not always obtained, because of urgent shipment that arises after the deadline. Urgent shipments or not, the time when the loading list is ready, is the point where FA LOG OFF and MATCOR HD D&W get the final and locked information of what equipment that are placed on the supply vessel. *The time difference between the point in time when the Loadinglists at SBK are ready, and the point in time when the supply vessel arrive HD, is the actual planning horizon for logistics personnel offshore today.*

## HD OPS

Sub process	Planning of activity	AO plan ready	PO created	Shipped to SBK	Stock	Loading list ready	Shipped offshore	Arrives offshore
<b>Who gets information</b>	HD OPS	HD OPS, Planner, Purchaser	Purchaser	Purchaser, Vestbase	Purchaser, Vestbase	Purchaser, Vestbase	MATCOR SBK, MATCOR HD OPS	MATCOR SBK, MATCOR HD OPS
<b>When information is available</b>	1-3 months ahead of shipment	AO plan is locked for 14 days	14 days ahead of shipment	7-12 days ahead of shipment	7-12 days ahead of shipment	4 hours ahead of shipment	12 hours ahead of arrival HD	

Table 7-2 Sub- processes HD OPS

Different from the D&W department, HD OPS do not have the same uncertainty during operations. Similar with the table for D&W processes, Table 7-2 shows the sub- processes where the different actors in the SC get relevant information. In section 6.2, the whole process from there is a requirement for a job/equipment at HD is created, to this is included in the AO plan is described. The sub- process *planning of activity* represents these processes. When the AO plan is ready, this is locked for 14 days ahead. This means that all relevant information about logistics activities is available for personnel listed in Table 7-2 from the day the AO plan is locked. In difference from the D&W department, HD OPS do not track the equipment in the same way. The purchase order specifies when equipment is needed on SBK, and the material handling on SBK are outsourced to Vestbase. Similar with the D&W department, offshore personnel do not know which equipment that arrive HD before the Loadinglist is ready. The Loadinglist for HD OPS shipments are created

automatically in SAP, when the equipment is registered as outbound shipments by Vestbase. The deadline for this list is also 4 hours before the shipment, or 12am on the day of shipment. *The most critical sub- process that affects the planning horizon for HD OPS equipment is when the Loadinglist is ready.*

Based on these reflections, we can state that the logistics personnel offshore do not know what is shipped offshore before the Loadinglist is ready. If we assume that the Loadinglists for both departments are ready 12am the day of shipment, and that the sailing time SBK-HD is 12 hours, the theoretical planning horizon is 16 hours. These statements do not hold scientifically, because the loading lists are not ready at 12am every time. The sailing times are also quite uncertain. The sailing time we were given is 12 hours. This is the sailingtime under normal weather conditions, an average speed of 12 knots, and that HD is the first installation that is served on the shipment. We know that the sailingtime SBK-HD vary a lot, and that 12 hours does not hold scientifically. We tried to gather data to find the average sailing times to HD in 2009, and the first months in 2010. Unfortunate, we did not succeed with this because we did not have access to relevant data. However, we managed to identify the main reasons why the planning horizon is limited today. We have also identified sub- processes that affect the planning horizon.

## **7.2 LIMITED PLANNING HORIZON**

As described in Chapter 6, the processes from planning to execution in D&W and HD OPS are executed in different ways. The main reason for this is that the D&W department has different levels of uncertainty in their operations. During D&W operations often unexpected incidents occur. This requires urgent requisitions of equipment and/or personnel or changes of already ordered equipment and/or personnel. Combined with the fact that a significant part of the equipment is rental equipment, the rental costs influence how the logistics are managed. A result of this is that the planning horizon is limited to the time difference between the point in time when the loading lists at SBK are ready, and the point in time when the supply vessel arrive HD.

In HD OPS, they withhold with the AO plan which are locked for 14 days. This creates more predictability, and the logistics could be managed in another way. Despite this, the planning horizon is still limited to the difference between the point in time when the

loading list is ready, and the point in time when the supply vessel arrive HD. The loading lists for both departments are not created before MATCOR SBK or Vestbase has confirmed that the outbound cargo is present at SBK. When most of the D&W equipment do not arrive before the shipment day, it is difficult to have the loading lists ready at an earlier stage. We believe that if D&W and HD OPS share relevant logistics information on an earlier stage in the planning process, the HD organization would be able to have a total overview of the outbound shipments to HD. In HD OPS, this should not cause any problems considering that they know quite certain what is shipped offshore because of the AO plan. In the D&W department, it could be difficult to share information earlier than 1-2 days ahead of the shipment.

When the suppliers for the D&W department gets information about when their equipment is planned shipped offshore, they inform Bring so that the transport from the supplier to SBK could be arranged. If Bring gets this information before 2pm, they can arrange the transport the same day. When Bring has the information, the shipment date is usually set. This is because the transport is arranged such that the equipment arrive SBK the same day as the shipment is. The reason for this is the contract terms Statoil has with most of its suppliers within D&W activities where the rent of the equipment starts when the equipment arrive SBK. As shown in Appendix O the transport times from suppliers to SBK are between 1 - 2 days, depending on the locations of the suppliers. ***This means that this information could be shared when Bring is informed, which is 1-2 days ahead of the shipment. We believe that this is the earliest point in the process where D&W could share the most reliable information.*** In Figure 7-1 we have illustrated where in the process we think it would be convenient to share relevant logistics information between the departments.

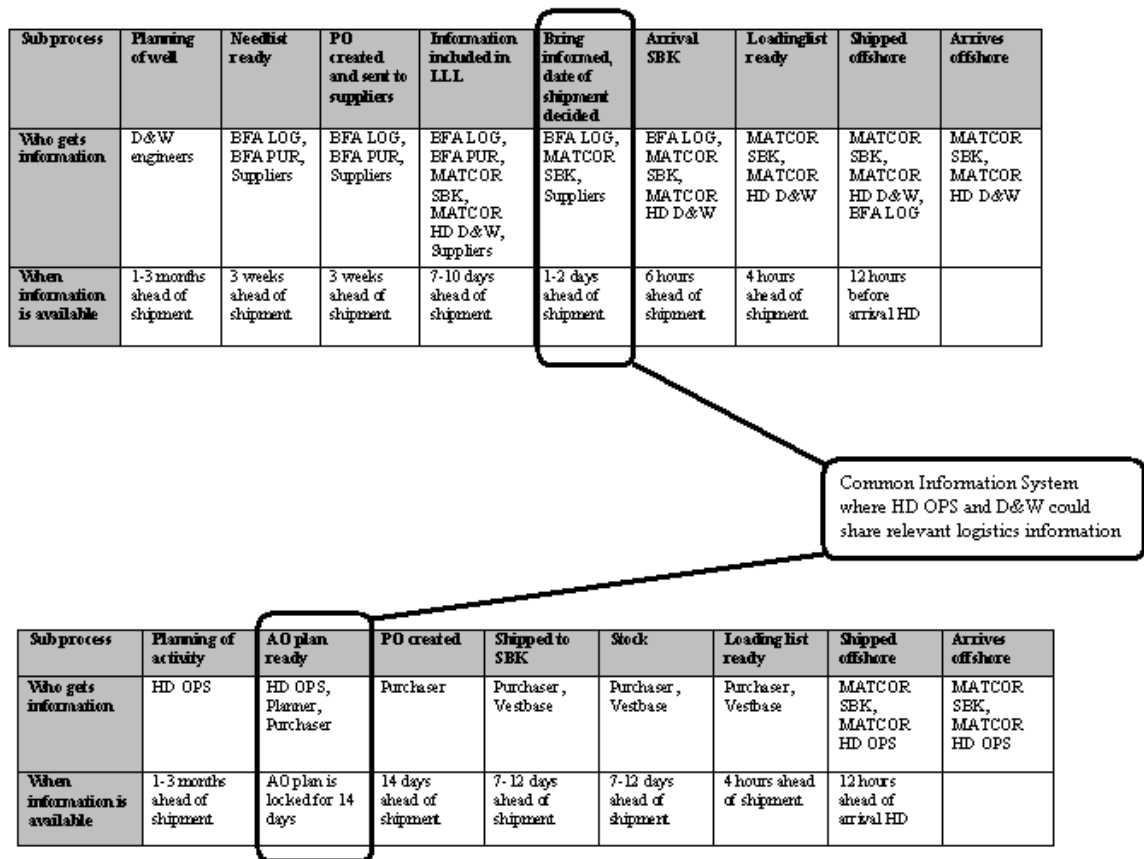


Figure 7-1 Sharing of logistics information between HD OPS and D&W

### 7.2.1 Supplier Relationship Management

One of the business processes we have focused on is the *Supplier Relationship Management* process. This process mainly relates to the proactive management of an ongoing business relationship to secure a competitive advantage for your own organization (Office of Government Commerce (OCG)).

The procurement process for the two departments D&W and HD OPS are described in Chapter 6. This represents the process where the suppliers are included in HD’s operations, and this is the point where the suppliers are included in HD’s SC. From this point, the information flow between suppliers and HD is critical for a well functioning SC. In section 7.2 we state that the D&W department could share relevant logistics information when Bring is informed by the suppliers to arrange transport to SBK. One of the presumptions for this is that BFA LOG has received information from the supplier about the shipment. By this we mean information about which type of carrier the equipment is sent in, together with weight and volume of the carrier. This type of information is sent from the supplier to



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BFA LOG when the equipment is ready for shipment. Usually this information is included in a DT. *With this information, BFA LOG is able to share relevant information when Bring is engaged to execute the transport from the supplier to SBK.*

### **7.3 COMMON INFORMATION SYSTEM (IS)**

In the previous sections we have analyzed the planning horizon and concluded that it is possible to get logistics information for both D&W and HD OPS *1-2 days* before shipment.

The goal by collecting the logistics information from D&W and HD OPS is to give the logistics team offshore a better overview of the logistics demand in advance. With this information HD can utilize their logistics in terms of more efficient logistics operations offshore and higher utilization of supply vessels. The quantified benefits of this common information system (herby denoted as IS) will be elaborated in Chapter 8.

To be able to make use of this logistics information from D&W and HD OPS, HD needs to collect the information into a common IS. This could be done by having a common IS for D&W and HD OPS. To help us suggest the structure of a system like this, we seek help from the SCM theory described in Chapter 5. The focus should lie on the business processes and how these are shared in the SC; our focus in this section is on the business process *Demand Management*. Lambert (2008) states that empirical research has led to the conclusion that;

*“The structure of activities within and between companies is a critical cornerstone of creating unique and superior supply chain management performance” (Lambert 2008. p 9)*

*Demand Management* is the business process that balances the customer’s requirements with the capabilities of the SC (Lambert 2008).

Related to our problem; HD as the customer does not have their requirements for logistics information availability satisfied. HD wants to have relevant logistics information on an earlier point of time. As we described in section 5.4.3, *Demand Management* contributes with increasing the flexibility of the SC by development of better planning and

coordination of activities through the SC to achieve an improved planning horizon. As stated in Chapter 6, D&W and HD OPS have different processes in their planning; as a consequence the *Demand Management* is different. The main difference between the two is the uncertainty in their operations.

A good *Demand Management* process can enable a company to be more proactive to anticipated demand, and more reactive to unanticipated demand (Lambert 2008). HD needs better systems to handle and react to sudden changes in demand, which is very relevant for D&W operations. To do this, HD needs to reduce the variability and improve the flexibility in their SC. This can be done using the *Demand Management* process developing contingency plans and achieving better planning of their information flow. By sharing the *Demand Management* process between D&W and HD OPS, HD is able to improve their planning horizon by making logistics information accessible on an earlier stage (see section 7.1).

Today the problem is that there is no coordination between the logistics demands in the two departments before the Loadinglist is ready. If we manage to develop a common IS there would be coordination between the *Demand Management* processes in the two departments. With a successfully implemented *Demand Management* process, leading to better information sharing, HD's SC have the flexibility to handle sudden changes in demand and the variability is reduced. Then the information that forms the finished loading list would be accessible on an earlier point of time.

Management components mentioned in section 5.5 are according to Lambert (2008) essential to integrate and manage the business processes in the SC. It is important that both the structural and the behavioral components are included in the process. To be able to manage and integrate the business processes in the SC, HD must make use of focus on the management components.

Further, our thoughts around this IS are about how it should work, and how it should be managed. One requirement for an IS like this is that it must be flexible enough to handle sudden changes. Changes will occur on daily basis.

### **7.3.1 Building a common information system**

The most ideal scenario for using a common IS, is that it could be integrated or developed in SAP. Statoil have a strategy of integrating all new software they use, into SAP. This will contribute to less confusion for the users, because they only have to withhold and relate to one software program.

When it comes to the presumption for how this new IS should function, we think it is appropriate to use the model introduced by Aas and Wallace (2008) in the planning component section (see section 5.5.1.2). If HD wants to achieve better planning by a common IS they need both solving capability and information availability, which are two complementary elements. When these two complementary elements are made and leveled correct, HD can achieve better logistics planning leading to more efficient use of HD's logistics resources. Following, we will list the presumptions for this IS to function, divided into solving capability and information availability.

#### **Improved solving capability:**

- Personnel with the right competence/education
- Optimizing software to handle the information
- User friendly interface
- Accessible for relevant personnel/actors
- Procedures to be able to handle sudden changes in demand (re-planning)

#### **Improved information availability:**

- Access to information about cargo shipped offshore 1-2 days before.
  - o Shipment date
  - o Type of equipment
  - o Number of carriers
  - o Bulk
  - o Which contractor that supplies the equipment/bulk
  - o Purchase order number
  - o Weight and size
  - o Belonging documents

- Information about dangerous goods or particular sensitive equipment
- Priority

In addition to the suggestions above we see that there are some other requirements that could be implemented in the IS. This is done to make it easier for the users to have a total overview and improve HD's solving capability.

- A tool that shows the available capacity on the HD offshore installation.
- A tool that shows the available capacity on the supply vessels. (This requires that other installations implement the same solution, because one supply vessel supplies several installations on each shipment.)

In section 7.3.4 we will show how these suggestions can help HD, and what they are able to achieve if the suggestion above are implemented. But first we start off with some thoughts about the current system supported by interviews with the daily users.

### **7.3.2 Limitations in the current system**

Through our interviews with key personnel about the current software they use, our impression is that they think SAP is difficult to navigate in and that there is room for improvements. In their daily use they have to navigate through several screens to gather the information they need to do a single operation. Often they need to physically have 5 screens up at the same time to get the necessary overview!

Another problem using SAP is that there is no information about volume and weight of the equipment when it is entered into SAP. And in their planning process there exists no updated charts over the existing space on the offshore installation. Today this is solved by experience. If there are 200 load carriers at HD; FA LOG ON knows by experience that the deck on HD is full (the deck is considered full when the capacity reaches 80%). This is because of safety terms and because the deck operators need some free space to operate.

Footprints of the container/baskets are given in SAP to see their size, but this is not put into system, so they use the number of load carriers to estimate when the deck is reaching full capacity. In SAP there should be added a module where FA LOG OFF could allocate each load carrier to a specific cargo deck at HD before the supply vessel departures SBK. From our interviews we know that this is in the implementation stage, and with this solution HD can achieve better overview over their load offshore. This is elaborated on further in 7.3.4.3.

The same situation occurs when they are loading the ship. It is not possible to see how much of the vessel capacity the cargo occupies, and the only information available is about what type of equipment it is. When sending bulk it is a bit different, since they have the information about volume and the type. All they need to assure is to have enough free tanks to take the different types of bulk. This is hardly any problem today with the type of vessels in use, and the present activity level at HD

In section 7.3.1 we suggested which requirements that should be included in the common platform for sharing relevant logistics information between D&W and HD OPS. These suggestions are based on the limitations in the current system which we identified through our interviews.

### **7.3.3 Who in the supply chain should enter relevant logistics information into the common information system?**

Earlier we have elaborated about when in the planning process it would be convenient for D&W and HD OPS to share information. HD OPS has predictability in their operations, and could share information 14 days ahead. D&W has more uncertainty, and can share information 1-2 days ahead.

In HD OPS, Vestbase has the best presumption to include relevant information into this common IS. They have access to information about the outbound equipment. Similar, in the D&W department, BFA LOG is the person that has all information accessible. Based on this, we suggest that Vestbase and BFA LOG are the actors that include information about outbound equipment into the IS. Where in the planning process this information should be included is shown in Figure 7-1. When both D&W and HD OPS have included the information, FA LOG OFF could allocate the equipment into specific storage areas on HD. This will be described more detailed in section 7.3.4.1.

The goal with this common IS, is that logistics personnel offshore should have better overview over the logistics demand in advance. The main users of this IS are therefore logistics personnel offshore. Therefore it is crucial that they can access this at all time, and that changes done by Vestbase or BFA LOG is updated. Examples of how logistics personnel offshore could plan their logistics activities in a better way are described in section 7.3.4.

### **7.3.4 How can HD benefit from improved information sharing in the SC?**

If the purposed suggestions are implemented in HD's SC, this would generate changes in how things are done today. Both BFA LOG and Vestbase has one more element to consider in the planning process, and the logistics personnel offshore will be able to execute the logistics in a more efficient way. In the following section, we will give examples of how logistics personnel offshore could take advantage of the common IS for sharing relevant logistics information between D&W and HD OPS.

#### **7.3.4.1 Plan logistics operations offshore more efficient**

With this new solution the logistics team offshore is able to influence how the supply vessel is loaded. This is possible because they now know with some certainty what is sent offshore 1-2 days ahead. They benefit from this by influencing how the cargo is loaded on the vessel, normally leading to safer lifting operations and a reduction in number of crane operations. E.G heavy equipment should be loaded in the middle of the vessel; if the weather conditions are rough the vessel has less vertical movement in the mid section. With an improved planning horizon it would be able to coordinate backload with the incoming load, so they can load cargo and unload backload in the same operation. It is a goal to reduce crane operations offshore, as a consequence of every lift offshore is considered a safety risk. Internal lifts are considered to represent a higher safety risk compared to lifts between vessels and installation (because of safety for personnel and the installation itself). As a consequence, the vessel often has to change crane position instead of using internal lifting operations. With better planning of the cargo on the vessel, HD avoids that the vessels have to go back and forth to the same crane, this takes from 0.5-1.5 hours depending on weather conditions and the vessel (see Figure 7-3) a cost estimate for laytime at HD in 2009 are given in section 8.4.

#### **7.3.4.2 Coordinate bulk and cargo**

Coordination of bulk and cargo has large savings potential in terms of time and safety. Loading / unloading of bulk is a time consuming operation. And at HD, the bulk station is located at the east side of the installation. This means that the vessel have to stay at the east deck until the bulk is loaded. With better planning, HD can utilize the time spent at the bulk station by lifting load and backload at the east crane simultaneously as they load bulk. This requires preparation ahead, but with an improved planning horizon this is achievable.

Concerning bulk there is a company developing a new way of handling bulk between supply vessels and offshore installations, this company is named Themis Create AS. The main difference is that there are no humans physically involved in connecting the hose to the supply vessel. Since this have a big impact on safety, especially in rough weather conditions we recommend HD to have a close look at the further development of this solution. We think it could have large effects related to HSE for personnel involved with bulk handling.

#### **7.3.4.3 Overview over storing capacity offshore**

With information about weight and size of load carriers, HD would have the possibility to measure the used storing capacity offshore. With this information, the storage capacity offshore could have been planned more detailed, and they can see how much space their load needs on the supply vessel. HD has several areas that are used as storage areas. With detailed information about how much of the capacity that is used, logistics personnel could prioritize which load that are sent offshore when the capacity reaches critical levels. Similar, load that is not used offshore could be sent onshore. This is also done today, but this requires a lot of resources to achieve because necessary information is difficult to find.

Allocation of cargo offshore could also be done more efficient in the IS we suggest. If logistics personnel offshore get information of which cargo that arrive HD 1-2 days ahead of the shipment, they could plan where to allocate cargo offshore. To illustrate this more detailed we will describe how we think this could be done. If FA LOG OFF has information about the load arriving HD 1-2 days ahead of the shipment, then FA LOG OFF would be able to allocate each carrier to a specific storage area on HD. One of the presumptions for this is that there is a module in the IS for this purpose as suggested in section 7.3.2. This could be adjusted such that the laytime for the supply vessel is minimized (see section 8.1). Figure 7-2 illustrates how information can be included in the

purposed IS. In this figure we try to show how we think such a platform could look like. In addition this puts the information into one picture, making the navigation easier for the user. The most important additions in this IS, compared to the existing systems are weight, size, location and crane. The weight and size could be used to monitor the total capacity on the storage areas on HD. Location is where FA LOG OFF allocates each carrier on HD before the supply vessel departures SBK. The last column is the suggested crane used for the loading of the specific carrier, also included before the supply vessel departure SBK.

Shipment date	Department	Bulk	PO number	Contractor	Type of container/carrier	Weight	Size	Location	Crane
01.06.2010	D&W		4501807215	Schlumberger	AMD 64	3500	3m2	4	W
01.06.2010	D&W		4501807215	Schlumberger	AMD 32	2400	3,5m2	4	W
01.06.2010	D&W		4501815568	Aker Well Service	AMD 11	900	1m2	4	W
01.06.2010	FOOD		4501600025	Nor Engros	FDB 43	1100	2,5m2	1	E
01.06.2010	FOOD		4501600025	Nor Engros	FDB 32	1000	2,5m2	1	E
01.06.2010	D&W	Mud	4501552200	Halliburton			5m3		E
01.06.2010	F&A	Water	Internal				5m3		E
03.06.2010	PROD		Internal	Statoil	AMD 22	705	1m2	2	W
03.06.2010	PROD		Internal	Statoil	AMD 22	750	1m2	2	W
03.06.2010	PROD		4501225584	Linjebygg Offshore	AMD 351	900	1.5m2	4	W
03.06.2010	PROD		4501225584	Linjebygg Offshore	AMD 452	1500	3m2	4	S
03.06.2010	D&W		4501589566	Baker Oil Tools	FSM 459	4500	4m2	4	S
03.06.2010	D&W		4501589566	Baker Oil Tools	KA 173	3000	3m2	3	S
03.06.2010	D&W		4501589566	Baker Oil Tools	FR 044	3000	3m2	3	S

**Figure 7-2 Example of interface of the suggested IS**

Figure 7-3 shows an example of how the storage areas on HD could be divided. This is just to illustrate the purpose with the extra additions suggested over. The yellow circles illustrate the crane positions, and the red squares illustrates where the loading areas are placed (cranes could be changed on the basis of the weather conditions).



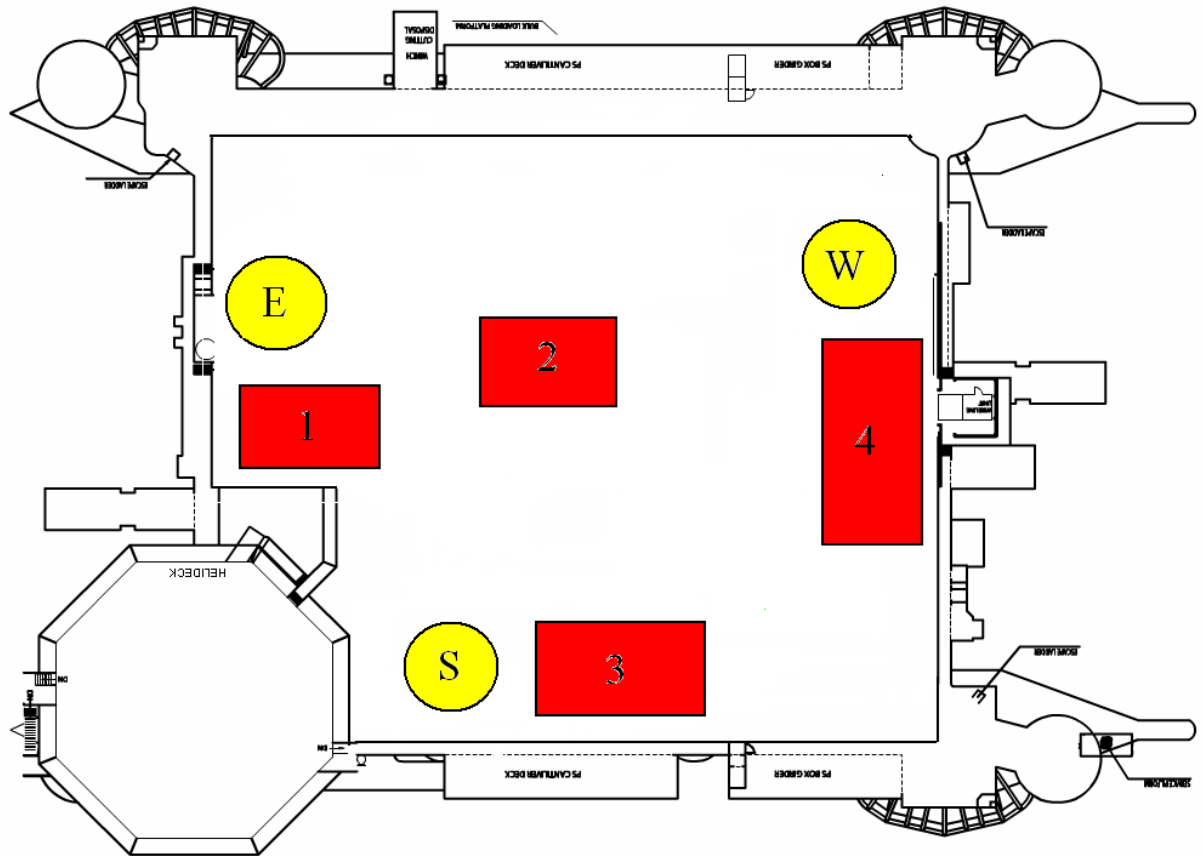
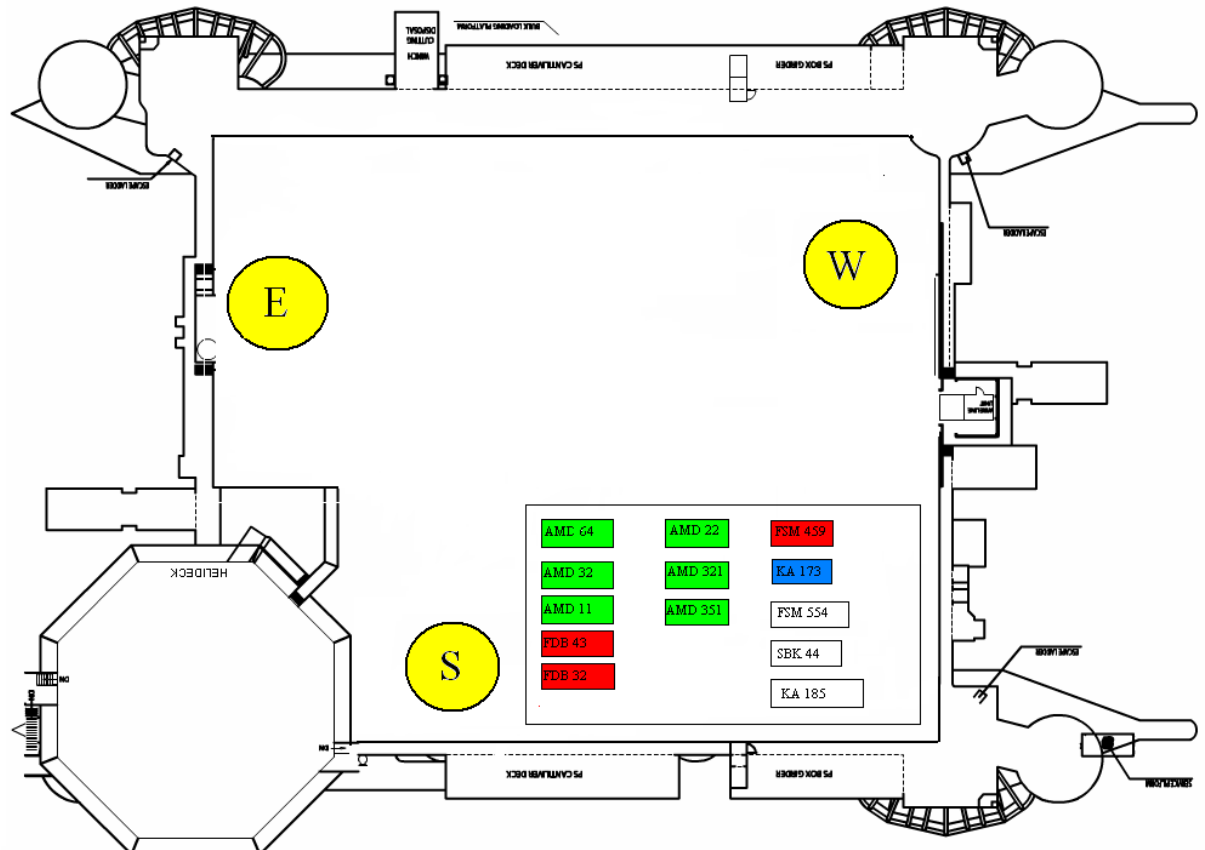


Figure 7-3 Storage area and crane positions

#### 7.3.4.4 Able to allocate cargo offshore

With an IS that contains information about carrier type, weight and size, this could be set into system graphically. HD's storage area could be shown visually on the users interface; load carriers could be dragged and dropped where they physically shall be placed by the logistics personnel offshore. In Figure 7-4 we have illustrated how this could be visualized. Loading area 3 is used as an example, where carriers with color are physically on HD's storage area. The carriers without color are allocated to this loading area by FA LOG OFF before the supply vessel arrive HD.



**Figure 7-4 Allocation of cargo**

All the load carriers offshore are marked with a date. This date indicates when the load carriers have to be sent onshore for inspection, this is to assure that the carriers are fulfilling the requirements to be used offshore. Including these inspection dates in the IS for each carrier, would have improved the usage of logistics recourses offshore. Today, logistics personnel offshore have to physically check when the load carriers have to be sent onshore. This is both time consuming, and unnecessary movements in-between load carriers on deck are considered as a safety issue. Our suggestion could utilize the usage of logistics recourses, and create a better overview over when carriers have to be sent onshore for inspection.

### 7.3.4.5 Advantages/ Disadvantages

When suggesting this IS for sharing relevant logistics information, it is important to be aware of the possible challenges doing this. Under we have listed some advantages and disadvantages related to our suggestion.

#### **Advantages:**

- Offshore logistics personnel could have access to relevant information at an earlier stage.
  - o Information concerning total logistic demand is shared before the deadline of the loading list (See section 7.1). This could lead to better planning of logistics activities offshore, which again could lead to less usage of logistics recourses offshore.
- Could result in an improved planning horizon.
  - o Improved planning horizon makes it possible for the logistics team offshore to affect the logistics operations.
- Improved user interface for the users.
  - o Requirements we suggest that should be included in the new IS will improve the user interface for the users. E.G the users do not have to use five different windows in SAP to have an overview.
- Integration between D&W and HD OPS.
  - o We believe that a common platform for sharing logistics information would lead to an improved cooperation between D&W and HD OPS. Each department would get better overview over each other's outbound shipments.

#### **Disadvantages:**

- Difficult to get 100% credibility in the plan.
  - o Especially in D&W there are high uncertainty in the operations, this makes it difficult to share information with 100% certainty. But, it is better to know e.g. 70% then 0%.
- Technical challenges with respect to flexibility.
  - o Needs to be able to handle sudden changes, especially concerning D&W operations.

- Different challenges in operations.
  - Different operations leads to different challenges, this could be a challenging task to coordinate to make it function appropriate.
- Comprehensive implementation.
  - This can be challenging to implement, and also the users could resist on the changes made. This should be handled with support from the top management.

The last section in this chapter is addressed to critical links in the SC, and how these critical links could be used to improve the SC. This addresses the research question about critical links in the SC that can affect the planning horizon.

#### **7.4 CUSTOMER SERVICE MANAGEMENT**

In the previous sections we have identified the planning horizon for logistics activities offshore, and identified processes that are important in relation with the planning horizon. Further we state that the planning horizon depends on when the Loadinglist created at SBK is ready. We suggested that by sharing relevant logistics information between HD OPS and D&W in an earlier stage of the planning process, the information included in the loading lists could be available earlier for the logistics personnel offshore. Theoretical, this could lead to an improved planning horizon.

In section 7.3 we suggest that HD OPS and D&W share logistics information in an earlier stage through a new IS. We have also suggested when in the planning process it would be most convenient for D&W and HD OPS to share this information. The IS we suggest, depends on correct information to function as intended. Therefore we will suggest how the D&W department could quality assure information included in the IS in this section.

In this section, we will use the business process *Customer Service Management* to support our suggestions. The main purpose with this process is to satisfy the customer needs (HD). We have used the business process *Demand Management* earlier in this thesis, where the goal is to meet the customers demand in a most efficient way. Reading this, it seems like these processes has the same goal, focusing on satisfying the customer. The main difference between these two processes is how the customer is satisfied. *Demand Management* has a goal to reduce the variability and improve the flexibility in the SC, by

improving the flow of information. The business process *Customer Service Management* focuses on satisfying the customer needs by avoiding problems in the SC.

*Customer Service Management* is a business process that represents a proactive monitoring of the SC. Proactive monitoring of the SC could contribute to creating triggers that could detect possible problems in the SC. Lambert (2008) states that;

*“In order to be proactive, triggers and signals must identify tasks that were not performed as planned”.* (Lambert 2008, p. 75)

In other words there must be a system that is able to detect and inform about changes in the SC. When we talk about changes we mean changes according to relevant logistics information. When changes do occur, they should be spotted by monitoring. A response procedure should be developed, that are set into action when changes are triggered. The best solution is to trigger the situation with enough time to resolve the situation so that the customer (HD) is not affected (Lambert 2008). To be able to trigger situations with enough time to resolve the situation, it must be some triggers or critical links that has to be proactive monitored. In one of the research questions we want to identify critical links in the supply chain that affect the planning horizon. Based on the description of the planning process in Chapter 6, we think that LLL and the POB are critical in the planning process, and could be used as such triggers. Next, we will discuss if POB and LLL could be used as triggers that could be monitored proactive such that potential problems in the SC could be avoided.

#### **7.4.1 Developing triggers that could be proactive monitored**

In Chapter 6 we described how the link between personnel and equipment is. In the D&W department, most of the operations are carried out by external suppliers. This means that most of the equipment and personnel used are rented from external suppliers. E.G the rented equipment from one supplier needs to be operated by personnel from the same supplier. A consequence of this is that the planning of equipment and personnel follows each other. The planning tools used to carry out the planning of personnel and equipment is the POB, and LLL. These tools are critical, meaning the planning process rely on them. In the following, we describe whether the POB and LLL could function as triggers that could be proactive monitored.

#### **7.4.1.1 POB (Personnel onboard)**

The POB are a tool used during the planning of personnel going in and out of HD. This is one of the elements defined to be a part of the structural management component planning.

The critical link in the personnel booking process is the POB. This is not a highly advanced software, only an excel sheet is used. The booking responsible is dependent on the POB to plan and carry through the booking of personnel. With other words, the POB needs to be updated at all time to work for its purpose. As mentioned in section 6.3, the drilling manager offshore is responsible for updating the POB. According to (Bjørshol and Tan 2006), the drilling manager uses too much time on solving logistics issues. This situation is also present today, but it seems to us that the booking responsible has taken over several of these issues so that the drilling manager can use the time on more important issues regarding the D&W operations. If the POB is not working proper, the booking responsible will have an almost impossible job to coordinate and plan the booking of personnel. We believe that the POB does not have the requirements to be a trigger that could be proactive monitored to avoid problems in the SC. First, if some changes are done in the POB, the users do not have anything that alerts them. The only person with overview over the changes done is the booking responsible. Second, we believe that using an excel sheet is too simple seen in relation of the importance of this tool.

#### **7.4.1.2 LLL (Laste Leie Loggen)**

Similar with the POB, LLL are critical in the planning and execution of logistics in the D&W department. LLL provides necessary information sharing, and the D&W logistics depends on this tool. LLL has several similarities with the POB. It is very simple, and it is easy to manage by the users. The LLL also depends on the users to work properly. If the BFA LOG does not update LLL when changes occur, LLL will not work to its purpose.

As mentioned earlier, the D&W department suffers from high uncertainty in operations. The main tool used to overcome this obstacle is LLL. LLL handles changes, and all necessary information is included. Related to the business process *Customer Service Management*, we believe that LLL could be used as a trigger to proactively monitor the SC with. By using LLL, different actors in the SC are able to monitor changes that could affect the customer. If the POB could have the same characteristics as the LLL, this also could have been flexible enough to be used as a trigger. We think that the ideal solution

would be to include the function of POB into LLL. Then the changes in equipment would affect the personnel situation and vice versa.

#### **7.4.2 Integrating POB and LLL**

Statoil has decided that LLL is a preliminary tool that should be used until a new module in SAP is ready. LLL has been used for a long time now and the technology is in a way out of date, even if it works perfectly well for its purpose. The new solution is planned to be a SAP solution. Requirements that are stated by the users are that it should be as good as LLL or better. A new SAP module that provides the same requirements as LLL is challenging to implement. We think that such a module could be integrated with the POB. If Statoil has decided to replace LLL, this could be a possibility to develop and implement a tool that covers more than just equipment from the D&W department.

Our thought, is that the POB could be integrated in this new system. As mentioned, equipment and personnel is in a way “following each other” in the D&W perspective. It would be beneficial for all parts in the SC if the POB could be integrated in the logistics system. If a change in departure of equipment is done, the changes in the personnel situation could be done simultaneously. Potential benefits of this are that there will be fewer systems to use each day. Every part of the SC can follow the changes made, and the information and communication flow with respect to personnel booking can be more standardized. BFA LOG could be responsible for updating information for both personnel and equipment. We think this would lead to better overview over the personnel/equipment link. Another potential gain is that the planning horizon for personnel can improve in time with the equipment.

The suggestion of integrating the POB in the new logistics system could also create confusion for the users. Many of the users of LLL and POB today are satisfied with the solution and thinks that it is a simple and effective solution. LLL and POB represent simplicity, good informality and it works for its purpose. With the possible solutions technology can provide today, we think that this is too simplified, and that the possibilities with a more integrated solution could provide improvements for the users and the customers.

An integrated solution like this would cover all aspects concerning logistics in the D&W department. We also believe that it would be easier to monitor the critical links in the planning process in the D&W department by implementing a solution like this. The idea of

this solution is that it would function as a trigger that could be proactively monitored by several actors in HD's D&W logistics. We believe this will enable HD's SC to provide better customer service to HD. This also ensures the quality assurance of the information included in the new IS that we suggest in 7.3.

Proactive monitoring of the trigger we suggest requires that the personnel using it has sufficient knowledge and competence. In the next section, we will suggest triggers that will provide this. These triggers are also based on the business process *Customer Service Management*, with a more strategic approach.

### 7.4.3 Key Personnel and Knowledge Management

In section 5.3.2.1, key personnel working with logistics in the HD organization is described. These persons have daily responsibility for taking decisions in HD's SC. The competence of these key personnel and how this is developed could be seen as another trigger that could be proactively monitored. Another trigger is how knowledge is shared between key personnel and other actors in the SC. Monitoring these triggers should be a responsibility for the management in HD's organization.

As described in the sections about POB and LLL, the users of tools like POB and LLL are of high importance. The functionality of POB and LLL depends on the users. The users of these tools are the persons that control the information flow, and determine who and where the information goes. BFA LOG, BFA PUR, booking responsible and MATCOR SBK possess key positions that are critical for the logistics in the D&W department. In HD OPS, FA LOG ON/OFF, MATCOR HD OPS, MATCOR SBK and the purchaser are key personnel. In a SCM view, it is of high importance that these persons have necessary knowledge about the whole SC.

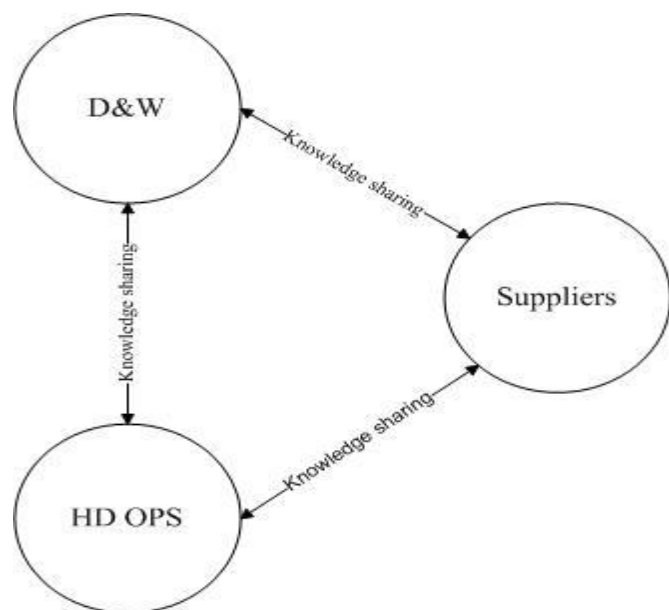


Figure 7-5 Knowledge management



They have to know how their decisions affect the rest of the SC. Our impression is that the personnel working with logistics in HD's SC today are highly competent. Despite this, we think that it is important to develop the competence of these persons, so they could have the best presumptions to execute their work in a best possible way.

The HD organization should focus on knowledge sharing in the SC (see Figure 7-5 ). It is important that everybody has an understanding of how the SC works. In addition, personnel often possess in dept knowledge within their profession. In the structural management component *Knowledge management*, Lambert (2008) states that knowledge is maintained inside the firm by writing it into books, manuals and procedures. In the HD organization, this is done today in some extent with APOS and having an intranet like Entry where internal information is shared in portals belonging to the different installations and professions. When a company becomes independent of the individual, anyone can be taught to do a job if the person who developed the procedure is not available (Ikujiro 1991,p. 96-104). This is something HD is aware of by Statoil having a goal to become a plan controlled organization. If HD loses key personnel this could be critical in that way that they lose important insight knowledge about their operations.

Personnel offshore would be in a position to affect and influence how things are done in an earlier stage with ingoing SCM knowledge. We think that offshore personnel could contribute with objections about how things could be done better. One example of this is how the crane operators offshore suggest that the supply vessel is loaded. They state that how the vessel is loaded could affect the laytime. Crane operators have ingoing knowledge and experience with this, and suggestions from them should be seriously considered. In section 5.5.1.1 education of logistics personnel are discussed. With a better SCM knowledge, each person in the HD organization has better presumptions to understand the process from planning to execution.

## 7.5 SUMMARY

After reading this chapter, we think it would be convenient to summarize. The first research question where we wanted to find the planning horizon today is addressed in the first section in this chapter. The conclusion is that the theoretical planning horizon for logistics activities offshore is 16 hours. This depends on when the loading lists are ready at SBK, HD's position in the routing of the shipment, and the weather conditions.

Next, we elaborated about the limited planning horizon. The main reason why the planning horizon is limited is because logistics personnel offshore do not get information about the outbound shipments before they get the Loadinglist. The Loadinglist is not ready before 12am at the same day as the shipment is. We think that if information included in the Loadinglist could be available at an earlier stage, the planning horizon could be improved.

Therefore we suggested sharing relevant logistics information between D&W and HD OPS on an earlier stage. We identified when in the planning process it would be best to share information, and suggested how this could be done.

The last section is addressed to developing triggers that can be proactive monitored so that problems in the SC could be avoided. The foundation of this is the business process *Customer Service Management*. Here we suggest possible triggers that could be proactive monitored to avoid problems in the SC. We also believe that this could ensure quality assurance of information included in the IS suggested in 7.3.

In the next chapter, we will list some tangible improvements we believe HD would have if the suggestions stated in Chapter 7 are implemented.

## **8 QUANTIFIED BENEFITS HD WOULD HAVE WITH AN IMPROVED PLANNING HORIZON**

One of the purposes with this thesis is to find the benefits the HD offshore installation could achieve by an improved planning horizon. We have identified that sharing of information as early as possible in the SC is a key element that affect the planning horizon. How this should be carried out is also suggested in the thesis. It is also important to clarify that some of these suggestions are possible solutions, and we do not state that they are the only solutions available. As mentioned in the introduction, one of the goals with this thesis is to stimulate to further research within this research area.

During the analysis of this thesis we have identified several areas where HD benefits from an improved planning horizon, and in section 7.3 we showed how HD where able to;

- Plan logistics operations more efficient
- Obtain a better coordination of bulk and cargo
- Obtain a better overview of the storing capacity offshore
- Be able to allocate cargo on specified decks offshore

Fully utilizations of the benefits above could lead to more quantified benefits for HD in terms of:

- Reduction of laytime for supply vessels
- Reduction in ports of calls to HD
- Greener operations
- Cost reductions

In the following section we will elaborate more on the quantified benefits above. How they are achieved and how they will benefit HD.

## **8.1 REDUCTION OF LAYTIME FOR SUPPLY VESSELS**

Better planning of activities leading to more efficient logistics activities offshore could lead to a reduction in laytime for the supply vessel. If HD manage to take load/backload in the same operation HD saves 5-7 minutes on one lifting operation, and at the same time the safety risk is reduced. This can be done when they have the possibility to influence how the cargo is loaded on the supply vessel, and get the total overview of the outbound load. Other elements that could contribute to reduced laytime is coordination of bulk and cargo (see 7.3.4.2), and the possibility to avoid that the supply vessel goes back and forth to the same crane (see 7.3.4.1). The laytime costs for HD 2009 are shown in section 8.4.

## **8.2 REDUCTIONS IN PORTS OF CALLS TO HD**

Longer planning horizon could lead to a reduction in port of call to HD. From time to time there are situations where the load that are going out to HD are relatively small or have low priority. With a longer planning horizon this load could be rearranged to take the next vessel going two days later. The positive consequence would be that the vessel does not have to visit HD that day. It could be argued that this will affect possible renting equipment that a demand suddenly occurs for. But this is unaffected; if a sudden demand occurs before the vessel leaves SBK the trip to HD goes as scheduled.

## **8.3 GREENER OPERATIONS**

As mentioned in section 8.2, we argue that the port of calls to HD could be reduced. This is a consequence of the possibility of having a longer planning horizon. If the port of calls to HD is reduced, this means reduced usage of supply vessels. Reduced usage of supply vessels means reduced emission of greenhouse gases as CO<sub>2</sub> and NO<sub>x</sub>. Statoil has estimated that an average supply vessel contributes with about 9400 tons of CO<sub>2</sub> and 32 tons of NO<sub>x</sub> per year (Nordlund 2010). Average usage of supply vessels in the supply pool in Kristiansund in 2009 was 3.3 vessels. If we use the average numbers mentioned, the total emission will be 31 020 tons CO<sub>2</sub>, and 105.6 tons of NO<sub>x</sub>. If the usage of supply vessels is reduced to only 3 vessels, this would generate savings for the environment of 2729 tons CO<sub>2</sub> and 9.3 tons of NO<sub>x</sub> per year. If we compare, this is the same emission that 145 cars contaminates each year.

## 8.4 POTENTIAL COST REDUCTIONS

We will give an example showing a potential cost reduction for HD, by showing how much the laytime for supply vessels cost HD in 2009.

### Costs related to laytime for supply vessels at HD

HD is member of the Kristiansund supply vessel pool (se section 4.3.1.1). In this part we will show how the cost are distributed within the supply pool, and what one hour of laytime at HD costs. This will be visualized using an example with actual data for HD in 2009.

All the costs in the pool (not extra trips) congregate and are distributed by the following formula:

- Laytime at the installation \* Adjustment factor.
  - Adjustment factor = (A \* B \* C \* D)
    - A = Distance from supply base to planned destination
    - B = Planned arrivals to installation per week
    - C = Share of sailing time of total time share each day: 0.40
    - D = Factor for having open at night: 0.95

### Example for HD:

In February 2010 HD had 68 hours laytime , the distance from SBK to HD is 139 nautical miles and HD is open at night.

$$68 * (139 * 3 * 0.4 * 0.95) = 10.775$$

Total for all members of the Kristiansund supply pool was 82.644, which means that HD had a share of 13.04% of the costs of the Kristiansund pool in February.

There is no direct cost related to laytime exact for registered laytime that influences the adjustment factor in the distribution of the pool costs. In the adjustment factor there are added two economical incentives to indirect influence the installations supply planning. The first one is the planned arrivals each week and the second one is the laytime at the installation.

**Costs:**

All the costs related to supply vessels used in the supply pool in that period is charged the pool. The vessels in service for the supply pool are monitored 24-7, and the hours used is logged.

Normally the pool has fixed vessels allocated to the pool, but a vessel can switch pools. In addition it can be used vessels from the spot-market or other available vessels in the pool if there is demand for extra capacity.

The average vessel rate in Kristiansund pool in 2009 was NOK 144 000 per each vessel day. Total cost including common costs is NOK 213 000 per each vessel day.

**Pool costs include:**

- Vessel rate
- Port fees
- Tank cleaning (bulk)
- NOx tax (Nitrogen oxide)
- Other miscellaneous costs elements

In addition to the pool costs each pool member have to pay a share of common costs consisting of administration costs and cost that cannot be related to a certain pool.

For 2009 the total cost of the supply pool in Kristiansund was NOK 219 170 460. HD's average share of the pool cost was 23.1% and HD had a laytime of 1136 hours. This gives an average price per hour laytime for HD of NOK 44 560.

In 2009 HD had a total pool cost of NOK 50 620 494 and common costs of NOK 2 675 603. Chart 8-1 shows the potential saving from reducing the laytime from 2009's 1136 hours to 908 hours (20%), which correspond to a saving of NOK 10 004 551. Chart 8-1 shows that the cost improves linearly with the laytime.

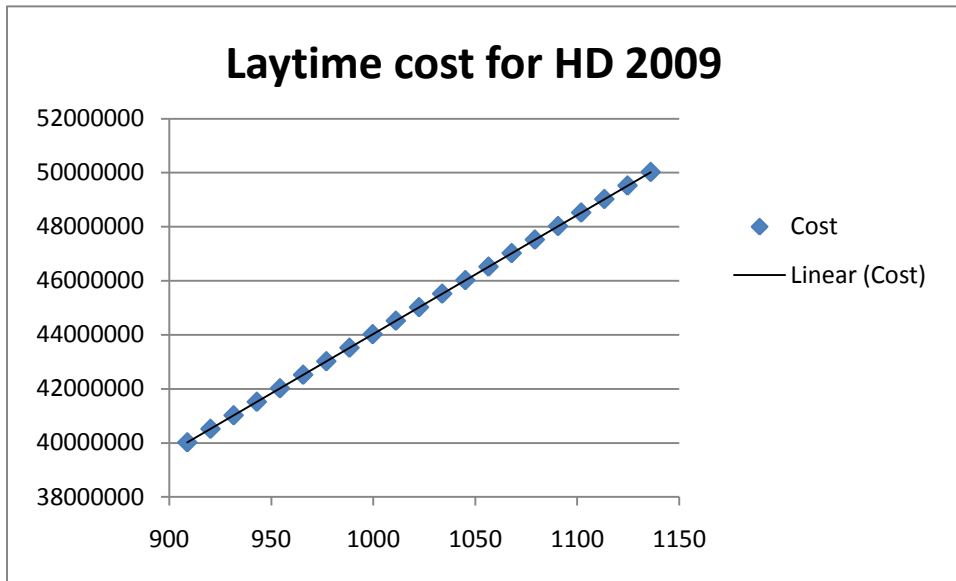


Chart 8-1 Laytime cost for HD 2009

In general there is little to save for Statoil which is the operator of HD if HD reduces their costs by reducing the laytime. The saved costs are then transferred to other members of the pool (one of the members is operated by Shell). It is only reduced vessel usage that gives reduced costs to the supply pool as a whole. But we still believe it is important to have focus on the logistics such that the laytime could be reduced. If every installation has the same focus, maybe Statoil can manage to reduce the vessels used in the pool, or postpone an extension from e.g. 3 to 4n vessels. In our thesis we are using this to state an example of gains that can be made by focusing on this issue. In the short-term HD is gaining on it, hopefully in the long run also Statoil will gain from it by implementing changes on all installations in the pool.

To conclude we will summarize the benefits HD achieves with an improved planning horizon. They will be able to:

- Plan logistics operations more efficient
- Coordinate bulk and cargo
- Have better overview over storing capacity offshore
- Allocate cargo offshore
- Reduction of laytime for supply vessels
- Reduction in ports of calls to HD
- Realize greener operations
- Obtain cost reductions

In the next chapter we will give the conclusion. We will discuss if we have managed to meet the research objectives given in the research plan, and give our recommendations with concluding remarks on the theory used. Next, we will discuss the quality and weakness of our research, finishing off by giving our thoughts about future research within this area.

## **9 CONCLUSION**

In our research plan we stated that our research was empirical. By that we meant that we were going to study a real life case, with a goal of suggesting possible improvements. We knew that this was going to be challenging, based on our limited prescience knowledge about offshore logistics. During our research, we searched for relevant theory that emphasizes our research area. We could not find anything directly related to the issue of the planning horizon for offshore activities. Theory used is SCM and logistics planning theory that we have interpreted with respect to our research objectives.

The outline for this chapter is first to discuss if the outcome of this thesis is in accordance with what we wanted to accomplish. We start off by discussing whether or not we have met the research objectives that we established. Further, we discuss how theory has helped us to achieve our conclusions. In the end of this section, we will discuss the research quality of the thesis, its weaknesses and some suggestions for further research within this research area.

### **9.1 RESEARCH OBJECTIVES**

We stated three research objectives in this thesis. They are linked to each other, meaning that the solving of the first objective, gives us the presumption to solve the next and so forth, in accordance with the exploratory research design.

Our first research objective was to *describe the process from planning to execution for activities on HD offshore installation*. The approach we chose was to describe the process in a chronological sequence for D&W and HD OPS. In Chapter 6, we described all steps in the planning process for both D&W and HD OPS departments. One of the main findings was that these two departments have different approaches in the planning process. We also



realized that the communication between the two departments was almost non-existent. Another finding is that each department has control of their outbound shipments to HD, but no overview over the total outbound shipment.

Because of the restricted time available for this thesis, and the complexity of the operations, we cannot claim to have fully described all activities in the planning processes in the HD organization. Anyway, we believe that this description is detailed enough to get sufficient understanding of the planning process.

Our second research objective was *to investigate the reasons for the limited planning horizon for logistics activities offshore*. We suspected that the main driver affecting the planning horizon was lack of information sharing. In other words, the different actors in HD's SC do not get sufficient information early enough. Uncertainty also contributes as a significant factor with respect to the limited planning horizon. Several aspects of the uncertainty have not been emphasized in the thesis. Especially the uncertainty created by weather conditions and other factors humans are unable to control. The uncertainty created by challenging operations offshore is also difficult to avoid. We have limited the focus on uncertainty to contain uncertainty created by lack of information sharing.

From the description of the planning process in Chapter 6, we identified some sub-processes that affected the planning horizon in Chapter 7. In addition to these sub-processes we included which personnel in the SC that gets logistics information, and when the logistics information is available. One of the main findings by doing this, is that the logistics personnel offshore do not know with certainty which equipment that are shipped offshore before the Loadinglist created at SBK is ready. This confirms our suspicions about lack of information sharing.

The third and last research objective was *to explore how the planning horizon for the logistics activities offshore can be improved and the potential positive consequences of this*. Based on findings in the other two research objectives, we were able to suggest actions that could lead to an improved planning horizon. Based on our statement that logistics personnel offshore do not know with certainty what is shipped offshore before the loading list is ready, we suggested how information included in the Loadinglist could be available in an earlier stage. Our suggestion is to implement a common IS for sharing relevant logistics information between D&W and HD OPS. We also identified when the two departments would be able to share such information. The goal with this is to give

relevant logistics information to logistics personnel offshore in an earlier point in time. This will make the logistics personnel offshore able to plan their logistics operations more efficient. We state that they could have this information available 1-2 days ahead of the departure from SBK. This means that the theoretical planning horizon could be improved with 1-2 days.

We also believe that monitoring the SC such that potential problems could be avoided before they occur is important in relation with the planning horizon. We identified potential triggers that could be monitored. The triggers identified are the planning tools used in the D&W department, LLL and POB. Our conclusion is that the POB does not have the requirements that are needed in such a trigger. On the other side, LLL would function perfect. Our solution is to include the POB in the LLL. This will give the users the complete overview over the D&W logistics, giving better presumptions to function as a trigger that could be proactive monitored. We also believe that this will contribute to an improved planning horizon for the planning of personnel.

We state that successful implementation of our suggestions makes HD able to; *plan logistics operations more efficient, coordinate bulk and cargo, have the total overview over storing capacity offshore, allocate cargo offshore, reduce supply vessel laytime at HD, reduce ports of calls to HD, achieve greener operations and reduce costs.*

## **9.2 OUR RECOMMENDATIONS**

The recommendations we have concluded with is mainly related to how HD could improve their planning horizon. We have described the planning process, how the different actors interact and communicate, and which business processes that could be improved and integrated. We have also identified how HD could benefit from an improved planning horizon. The theoretical framework that we have used is Lamberts view on SCM and Aas and Wallace's view on Logistics planning. We have focused on business processes, and how these could be managed in a best possible way to satisfy HD's demand.

We early decided to use Lamberts thoughts within the SCM area. In Chapter 5, we decided which business processes that are most related to our research objectives. The business processes used is mentioned under, with some concluding remarks based on how these business processes are used.

The *Supplier Relationship Management* process is used to describe the importance of the relationship between the HD organization and the suppliers. We outlined this by explaining the importance of sharing logistics information. E.G. that the suppliers sending the DT in time to BFA LOG such that the information could be included in the suggested IS.

The *Demand Management* process is used to illustrate how HD can be more proactive to anticipated demand, and more reactive to unanticipated demand (Lambert 2008). We used this process to illustrate how a common IS could help D&W and HD OPS to coordinate the demand management process. By sharing the *Demand Management* process between D&W and HD OPS, HD is able to improve their planning horizon by making logistics information accessible on an earlier stage (see 7.1). To outline requirements in such an IS, we used the model introduced by Aas and Wallace (2008). This model shows which requirements that are needed if HD should improve their planning by a common IS. Aas and Wallace (2008) states that both solving capability and information availability, which are complements of each other, are needed to achieve better logistics planning leading to an improved planning horizon.

The *Customer Service Management* process is used to illustrate how proactive monitoring of triggers in the SC that could detect potential problems before they arise. Based on the description of *Customer Service Management* in Chapter 5, we suggest integrating the POB into LLL. We believe this will improve the triggers that could be proactive monitored, giving the users total overview over the logistics in the D&W department. This enables the users to:

- Proactive monitor all information with respect of personnel and equipment in the D&W department such that potential problems in the SC could be fixed before they occur.
- Ensures the quality of information included in the recommended IS.

Personnel monitoring these triggers must have sufficient knowledge and experience. This could be ensured by defining the structural management component *knowledge management* as a strategic trigger in the *Customer Service Management* process. How knowledge is shared, and how the competence and experience of the users are monitored is important to ensure the best presumptions for monitoring triggers in the SC.

### **9.3 RESEARCH QUALITY**

In the next sections we will discuss the quality of the research, the apparent weaknesses and some suggestions for further research.

#### **9.3.1 Internal validity**

We strongly believe that our recommendations are internal valid. During the work with this thesis, we have observed the process from planning to execution of logistics activities offshore. We have interviewed key personnel working with logistics in HD, and we have been directly involved in the logistics operations offshore. Together with our own considerations, we have received inputs and considerations from personnel involved in HD's logistics. Our supervisor has also helped us to improve our recommendations. We also got valuable input from participating on a conference for the offshore industry, where the topic was logistics planning. From this conference, we got confirmation from several ranges that we were thinking in the right direction. Additionally, we observe that earlier studies are pointing out similar solutions.

#### **9.3.2 External validity**

According to Ellram (1996) external validity is an issue that must be addressed during the design of the research. It also represents how accurately the results represent the phenomenon studied, establishing generalizability of results. In our thesis, we believe that the generalizability, or transferability to other installation is present. If the suggestion concluded in our analysis is implemented, this also should have been done by the other Statoil installations present in the Norwegian Sea. As described in section 8.4 HD will benefit from this with possibilities for reduced usage of logistics resources and costs, but the cost savings for HD will be transferred to the other installations in the supply vessel pool.

## **9.4 RESEARCH WEAKNESSES**

### **9.4.1 Methodology**

One of the methods used in this thesis is exploratory research design. This was chosen because this field has no or little prior research. As a consequence of this, our research are based on interviews of key personnel in the HD organization and own observations. We interviewed key personnel onshore and offshore. We only had the possibility to interview one logistics crew offshore. If we had interviewed the other 3 logistics crew, this probably would have provided a confirmation of the information we got. This would have provided higher validity of the already gathered data.

### **9.4.2 Theory**

The theory foundation used is based on Lambert's view of SCM. We have adopted three of total eight business processes that need to be implemented to have a successful management of a SC. The fact that we only have used three of the suggested business processes is a weakness in the theory foundation used. Similar, we have not adopted all of the structural and behavioral management components Lambert suggest. The reason why we did not adopt all of them is because we could not find areas in our research area that covered these components. Lack of data and knowledge about these components is also one of the reasons why we did not include these.

### **9.4.3 Recommendations**

This research is mainly an empirical qualitative study. This means that our findings are not based on quantitative methods. In this thesis, a qualitative approach has been chosen. Our first thought was to find how much the planning horizon could be improved, measured in hours or days. Further, the thought was to include a graph that showed how different planning horizons affected HD. We realized that the time available, and the complexity with this would be too comprehensive for this thesis. It is also clear that if our recommendations should reach the level of usefulness that we intend, further research/tests has to be completed to see how our solutions actually would work. Next, we will mention some weaknesses with respect to statements and assumptions we have given.

- **Uncertainty with respect to weather and challenging operations not considered**

As mentioned earlier, an offshore installation like HD suffers from high uncertainty. This is also one of the main elements that contribute to a short planning horizon. The most obvious reasons of uncertainty as weather and operational challenges are not considered. These are elements that are unaffected of human involvement. Including these types of uncertainty into the planning is difficult, if even possible. We have not included these aspects, because we do not occupy necessary expertise within this area.

- **Not sufficient information about actual sailing times**

In the thesis, we claim that the theoretical planning horizon for HD is 16 hours. This number is based on statements given by personnel in SM. They meant that this number was representative with respect to our research problem. We know that the sailing time SBK-HD differs a lot. Several aspects affect the sailing time. Weather, routing, priorities and speed of the supply vessel are some examples. We were not able to find an average number which could be scientific representable, because we were not able to find sufficient information about historical sailing times SBK-HD.

- **Presumptions the D&W and HD OPS department has to share relevant logistics information**

In Chapter 7, we discuss the presumptions D&W and HD OPS have when considering sharing relevant information. We assume that HD OPS could share information 14 days ahead with almost 100% certainty, based on the AO plan. In the D&W department, we know that the actual shipment dates for specific equipment could vary a lot with the planned shipment date. We claim that it is possible for the D&W department to share information 1-2 days ahead of the shipment with a given certainty. The fact that we have not quantified this certainty, and assumed that it would be good enough is a weakness. Quantification of this requires a comprehensive study of the actual performance of the execution of the logistics compared to the planned execution. We realized that this would be too time demanding with respect to the time limit given to carry out this research.

## **9.5 FURTHER RESEARCH**

### **9.5.1 Analysis of the performance of logistics planning in the D&W department**

One of the weaknesses with this thesis is that we have not quantified how early D&W and HD OPS could share relevant logistics information with a given certainty. We think this is possible to map. This could be done by comparing when equipment is shipped with the planned shipment date. If this is done over time, we think it will be possible to state the predictability of the plans. This would give valuable input in the development of a platform for sharing logistics information between D&W and HD OPS. We also think that this analysis could be performed of several mobile rigs/installations to compare the performance.

### **9.5.2 Common platform for information sharing**

In the thesis we suggest that the two departments D&W and HD OPS share information earlier in the planning process. This would provide a better overview over all outbound cargo to HD. We have outlined which requirements we think are necessary, and how this platform should be used. To implement a functional platform like this is challenging, and a more comprehensive study is required before a decision of implementing is done.

### **9.5.3 Power structure in the supply chain**

As the operator on several of the oil and gas fields on the Norwegian Continental Shelf, Statoil is a major participant of the upstream SC. This also means that Statoil has a great effort of power in the supply chain. An interesting research problem in this relation is how Statoil could make the most out of this power. Interesting research questions could be:

- What is the optimal power structure in an upstream SC?
- How could Statoil in a best possible way exploit the leading position they have in the SC?

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## 11 APPENDICES

### 11.1 APPENDIX A: Abbreviations

Abbreviation	Norwegian	English
AO	Arbeidsordre	Work order
BFA LOG	Forsyningsansvarlig boring, logistikk	Drilling supply responsible D&W
BFA PUR	Forsyningsansvarlig boring, innkjøp	Drilling purchasing responsible D&W
DT	Leveringssedel	Delivery ticket
D&W	Boring & Brønn (B&B)	Drilling & Well
EHS	Helse, miljø og sikkerhet	Environment, Health and Safety
FA LOG OFF	Fagansvarlig logistikk offshore	Field manager logistics offshore
FA LOG ON	Fagansvarlig logistikk onshore	Field manager logistics onshore
FBK	Forsyningsbase Kristiansund	Supply base Kristiansund
FV	Fast vedlikehold	Fixed maintenance
PV	Periodisk vedlikehold	Periodic maintenance
HD OFF	Heidrun offshore installasjon	Heidrun offshore installation
HD	Heidrun	Heidrun
ISPS	Internasjonal fartøy og havn sikkerhet	International Ship and Port Security
IO	Integrerte operasjoner	Integrated operations
IS	Informasjons system	Information system
LOG LEAD HD	Logistikk leder Heidrun	Logistics leader Heidrun
MATCOR SBK	Materialkoordinator SBK	Material coordinator SBK
MATCOR OPS HD	Materialkoordinator OPS HD	Material coordinator OPS HD
MATCOR D&W HD	Materialkoordinator B&B HD	Material coordinator D&W HD
O&M	Operasjon og vedlikehold	Operations & Maintenance
PM	Plan vedlikehold	Plan maintenance
PO	Innkjøps ordre	Purchase order
POB	Personell ombord	Personnel onboard
PUR OPS	Innkjøper HD OPS	Purchaser HD OPS
RFQ	Forespørsel til anbud	Request for quotation
SAR	Søk og redning	Search and Rescue
SBK	Forsyningsbase Kristiansund	Supply Base Kristiansund
SC	Verdikjede	Supply chain
SM	Statoil Marine	Statoil Marine
SCM	Verdikjede ledelse	Supply Chain Management

## **11.2 APPENDIX B: Key personnel interviewed**

### **Onshore**

Key personnel interviewed onshore:

- Logistical Leader Heidrun (LOG LEAD HD)
- Field manager logistics (FA LOG ON)
- Planner at Heidrun
- Heidrun's purchaser D&W (BFA PUR)
- Logistics coordinator drilling and well (BFA LOG)
- Material coordinator at the supply base in Kristiansund (MATCOR SBK)

### **Offshore**

Key personnel interviewed offshore:

- Field manager logistics (FA LOG OFF)
- Material coordinator offshore Hedrun operations centre (MATCOR OPS HD)
- Material coordinator offshore drilling and well (Odfjell) (MATCOR D&W HD)
- Crane and deck operators

### 11.3 APPENDIX C: Interview guide

#### 1) Hva er dine arbeidsoppgaver?

#### 2) Arbeidsverktøy/software:

##### SAP

- Oversikt over alt utstyr som er på riggen til en hver tid.
- Oversikt over vekt/volum på utstyr.
- Oversikt over hvor utstyr skal plasseres på rigg før båten går fra basen, for så å planlegge kranoperasjoner bedre.

##### APOS

- Brukes dette av deg, evt. hvordan?

##### Laste Leie Loggen

- Er dette et optimalt verktøy for deg med tanke på oversikt over hva som kommer inn/ut? (får ikke melding ved endringer).

##### VTMIS

#### 3) Planlegging:

- Hva kan gjøres fra plattformens ståsted for at logistikken og planlegging skal bli så optimalt som mulig?
  - Planlegging av boring og brønnaktiviteter.
  - Planlegging av operasjoner fra Heidrun OPS.
  - Planlegging av lasting lossing av supplybåter.
  - Plassering av innkommende varer, arealplanlegging ute på dekk. (15% besparelse hvis godset allerede er allokert til en bestemt plass på riggen, redusere liggetid/risiko)
  - Bruk av lagerbåt (koordinering av lagerbåter som ligger ved flyterigger i nærheten).

Hvilke møter deltar du på, med hvem?

#### 4) Hvordan synes du kommunikasjonen med organisasjonen på land fungerer? med tanke på

- Utstyr som skal inn/ut.
- Uforutsette hendelser som fører til hasteleveranser av utstyr/personell.
- Ekstra båtanløp. (- Ekstra helikopter.)
- Kontroll på dyrt leieutstyr (B&B).

#### 5) Kontakt med leverandører.

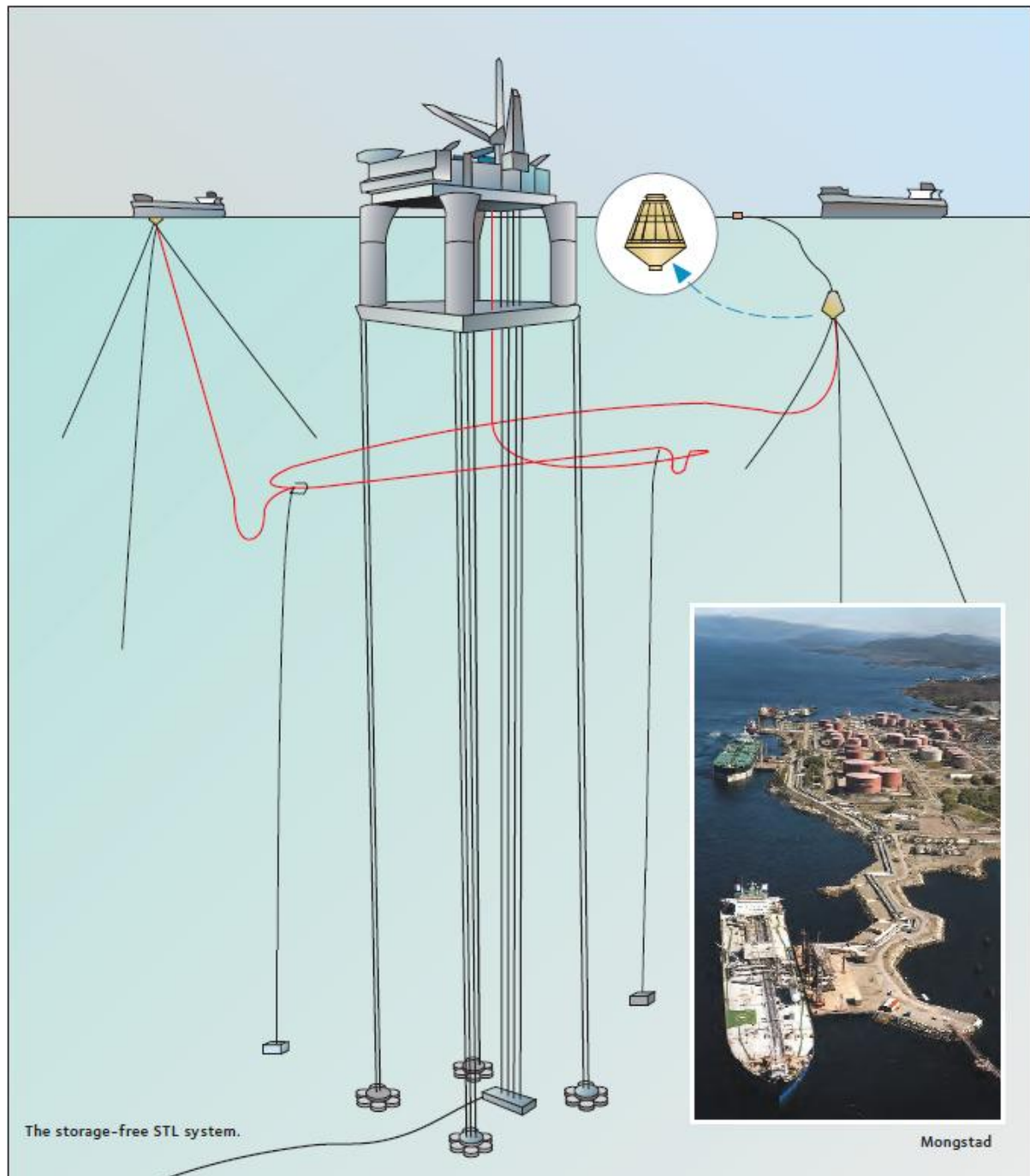
#### 6) Kontinuitet mellom skift

- Dag/natt
- Turnus

## 11.4 APPENDIX D: Haltenpipe



## 11.5 APPENDIX E: Submerged current loading



## 11.6 APPENDIX F: Needlist

Equipment Needlist		P&A						21-mai-10
Heidrun TLP		6507/7 - A-46		On board	Verified by service comp	Back loaded		
Pos	Description	Supplier	Need	Onboard	Order	Date from base	PO	Comment
<b>Odfjell</b>								
<b>GTV/Set PaA cement plug</b>								
1	Emergency x-over, 7" 29 #, Varn Ace pin x 5 7/8" XT-57 box	Odfjell	2					OWS 2185/2181
2	XO 7" Hydril 563 pin x XT57 box	Odfjell	1					
3	5 7/8" XT-57 kelly cock	Odfjell	2					
4	5 7/8" XT-57 gray valve	Odfjell	2					
5	7" Handling utstyr (Slips, OWS tang, elevators for 7" tubing+++) NB: 7" H2C elevator for 20 deg bevl. Couplings	Odfjell						
6	3 1/2" DP for cutting + stinger for sementplugg	Odfjell	1800 m					Trenger kun ca 550 m for det første kutte. Resten er bare contingency hvis vi må kutte rett over gauge (~ 2250 mMD)
7	3 1/2" IF kelly cock	Odfjell	2					
8	3 1/2" IF gray valve	Odfjell	2					
9	Slings for 7" tubing innsendelse + wirelåser	Odfjell	100					05.04.10kasp: Statoil Materialvakt tar seg av dette
10	3 1/2" cement diverting tool	Odfjell	1					
11	6 1/2" Drilling Jar	Odfjell	2					
12	6 1/2" Intensifier	Odfjell	2					
13	6 1/2" DC	Odfjell	12					
14	Personal Protective Equipment (PPE) for scale	Odfjell						Sjekkes av material mann.
15	LPR, WOR	Odfjell						
16	5 7/8" HWDP	Odfjell	12 stand					GTV plugg
17	Kaldkuttutstyr for 7" tubing	Odfjell						
18	5 7/8" DP	Odfjell	2300 m					Maks dyp for P&A er 2272 mMD med sementstinger.
<b>riser/Run drilling riser</b>								
1	Production riser tensioning frame	Odfjell	1					
2	Production riser protectors	Odfjell	1 sett					
3	Spear for Prod. Riser	Odfjell	1					
4	Basketer for prod riser og tie-back connector basket	Odfjell	1 sett					
5	Prod.riser tenger + spider	Odfjell	2 sett					
<b>10 3/4" &amp; 13 3/8" casing</b>								
1	x-over, 4 1/2" IF pin x 5 7/8" XT-57 box	Odfjell	1					OWS 2185/2181
2	5 7/8" XT-57 kelly cock	Odfjell	2					
3	5 7/8" XT-57 inside BOP (gray valve)	Odfjell	2					
4	Utstyr for trekking av 9 5/8" og 10 3/4" casing	Odfjell	lot					
5	Utstyr for trekking av 13 3/8" casing	Odfjell	lot					
6	14" FARR (Kraftigere tang for å brette casing)	Odfjell	1					
7	Diverse X-overs for BHA	Odfjell						Sjekk med assemblyer fra Smith!
8	XO (5 1/2" FH pin x XT57 Box)	Odfjell	1					
9	XO (4 1/2" IF Pin x XT57 Box)	Odfjell	2					
10	XO (XT57 Pin x 4 1/2" Box)	Odfjell	2					
11	XO (6 5/8" REG Pin x XT57 Box)	Odfjell	2					
12	5 7/8" HWDP	Odfjell	28 stand					
13	Slings for innsendelse av 9 5/8" og 13 3/8" csg.	Odfjell	25					
14	Nødvendig utstyr for milling	Odfjell						
15	8" Griffith Drilling Jar	Odfjell	2					
16	8" Griffiths Intensifier	Odfjell	2					
17	8 1/2" DC	Odfjell	13					
18	Personal Protective Equipment (PPE) for H2S	Odfjell	6					1 tilfelle H2S (2 på boredekk, 2 i shaker rom, ved pitene)
19	Bullnose med XT57 box	Odfjell	1					
20	Sneglehus	Odfjell	1					
21	5 7/8" Cement diverting tool	Odfjell	1					For setting av KOP, erfaring fra A-36 T2 med at 3 1/2" cement diverter ikke klarte å entre 13 3/8" casing.
<b>Halliburton - Baroid</b>								
1	Mud	Baroid	DPO					1.48 sg for kutting av 9 5/8", 1.20sg for kutting av 13 3/8" og 1.20sg bentonitt slam i back-up for eventuell milling.
2	Bentonite	Baroid	DPO					
3	Barytt	Baroid	DPO					
4	Diverse kjemikalier	Baroid	DPO					Soda ash & H2S scavanger.
<b>Halliburton - Cement</b>								
1	Diverse sementkjemikalier	Halliburton	DPO					
2	Diverse skillevæskeskjemikalier	Halliburton	DPO					
3	Wiperballs	Halliburton	6					
4	13 3/8" Fas Drill w with drillable brush	Halliburton	2					
5	9 5/8" EZSV	Halliburton	2					
6	WL adapter for setting av 9 5/8" EZSV*	Halliburton	1					For setting på WL
7	Mekanisk settetool for 9 5/8" EZSV*	Halliburton	1					For setting på DP
8	WL adapter for setting av 13 3/8" EZSV	Halliburton	1					For setting på WL
9	Mekanisk settetool for 13 3/8" EZSV	Halliburton	1					For setting på DP
<b>Halliburton - Fluids</b>								
1	NaCl brine	Halliburton	DPO					1.20 sg NaCl brine
2	Slam	Halliburton	DPO					
3	Diverse kjemikalier	Halliburton	DPO					

## 11.7 APPENDIX G: Laste/leie logg

Workspace Laste/Leie-Logg (Sjerdal) - 1... X

Laste/Leie-Logg (Sjerdal)

1 ANS BBO

1 Dag ut

1 Fremover

2 Alle

3.0m bord

2 Børm

3 Leverander

2 Base

3 Plattform

4 Kipp - motvart

8 Ekssport

9 Vedlikehold

Endre dokument Kopier dokument(er) Dato/Endre dato Gå til L3 Arkiv

Dato/Børm Innt. Tlf. # Enhet Beskrivelse Leverander MR/ PD NR

Aker Spitsbergen

Deep Sea Bergen

HD

[Not Categorized]

09.10.2009

05.10.2009

28.09.2009

25.09.2009

18.09.2009

16.09.2009

14.09.2009

11.09.2009

09.09.2009

[Not Categorized]

PNLS 1 eske(f) 10% -1% Calibration Gas. DT 09-449 Geoservices

41454078

07.09.2009

A-344

BSEM 1 8 cont DPO28177, 8 x 25 ltr kanner med Mussole Halliburton 232020 AMD2509 Island 07.09

95433958

BSEM 3 tank 12 m3 MEG MI Swaco 4501671702 232020 THSA912 Island 07.09

95433958

BSEM 8 m<sup>3</sup> SD 250 Champion 4501623878 Challenger Island 07.09

95433958

BBL 100 ltr STS 50, svefthengssåpe Technologies AS 4501820513 AMEE23 Island Challenger

95442331

[Not Categorized]

BBL 1 hiv Sylinder Haug Distisore 232020 AMD3502 Island 07.09

95442331

BBL 1 LOT DPO 28178, 10 saks V/G 24, 10 cans MD 67, 2 saks FE 2 Halliburton 232020 AMD2509 Island 07.09

95442331

BBL 1 hiv Tom 13ml basket for backload Swire EPD 232020 CBW089 Island Challenger 07.09

95442331

BBL 1 pallet(1) Brakkeleir Aker MH AS 232020 KB066 Island Challenger 04.09

95442331

04.09.2009

Borestans

Feik 2 cont Div. equipment Odifell 231686 MD708 Viking Queen 04.09

48060844

07.09.2009

AMEE48



11.8 APPENDIX H: Project planner

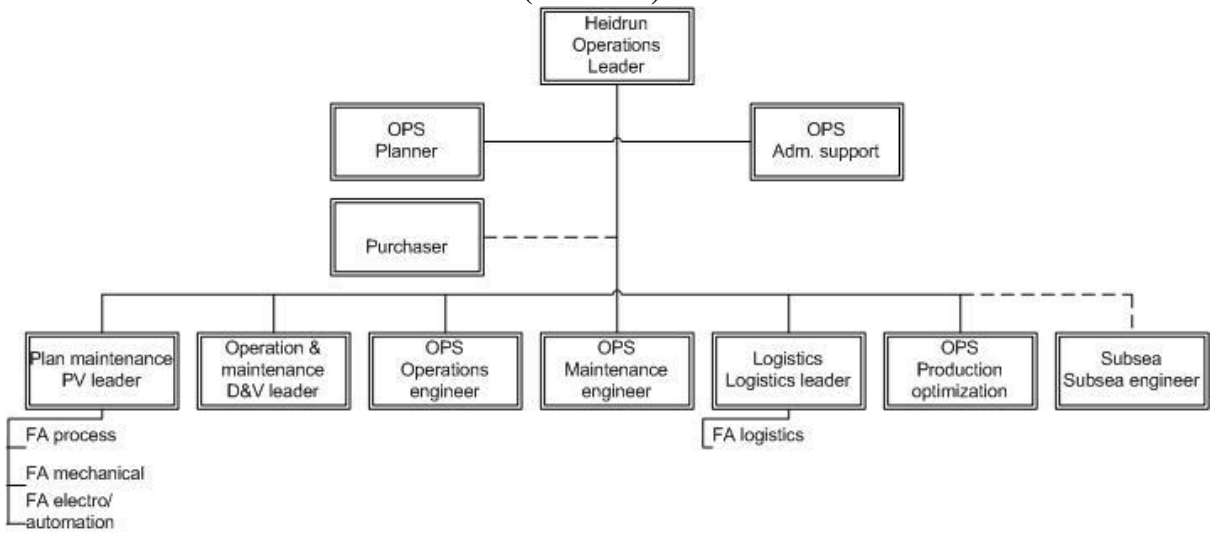
Project planner											
	Start time	End time	Budget/ Acc time days	Teach limit hrs	Acc batch days	Planned time hrs	Actual time hrs	Acc actual days	Hours remain	Description	Companies
57	27.12.05 06:30	28.12.05 17:30	44.0	1.6	32.3	1.2	37.6	41.5	1.1	MOVE [ NO 556/12-M-2 AH ]	
58	28.12.05 17:30	28.12.05 21:00	14.0	6.6	12.3	8.5	12.6	3.5	0.1	MOBILIZ [ NO 556/12-M-2 AH ]	
59	28.12.05 21:30	03.02.06 15:30	670.0	27.5	371.3	15.5	541.6	656.5	36.3	PERM P&A [ NO 556/12-M-2 AH ]	
60	03.02.06 15:30	18.02.06 23:00	440.0	18.3	275.3	11.6	285.6	351.5	14.5	12 1/4" [ NO 556/12-M-2 AH ]	
61	03.02.06 19:30	08.02.06 05:00	101.0	34.5	68.0	19.5	60.0	106.5	45.1	12 1/4" Dril 12 1/4" section acc to planned wellpath until 64' subs (M 25, East 14 min)	Trans, Geo, M (Schlun, Schlun)
62	08.02.06 16:00	08.02.06 21:00	4.0	34.7	3.0	15.5	3.0	3.2	43.4	KT Circulate and rotate hole clean	Trans, Geo, M (Schlun, Schlun)
63	08.02.06 21:00	09.02.06 11:00	16.0	35.4	16.0	20.3	14.0	14.5	41.3	46 Drop Gyro and POOH.	Trans, Geo, M (Schlun, Schlun)
64	09.02.06 11:00	09.02.06 23:00	0.0	35.4	6.0	20.3	12.0	12.1	44.1	46a RH with SLT and pressure test BOP. Prepare function test of B/E elevator. POOH with SLT	M, Trans, Geo, Schlun, Schlun
65	09.02.06 23:00	10.02.06 05:00	12.0	35.5	6.0	20.3	10.0	10.2	44.1	45 NU test 12 1/4" BHA and RH	Trans, Geo, M (Schlun, Schlun)
66	10.02.06 05:00	13.02.06 15:00	117.0	48.6	78.0	23.6	75.0	75.1	48.1	50 Drill 12 1/4" as tangent to 42 deg to 45.90 mVD. (T&C 21, East 12 min)	Trans, Geo, M (Schlun, Schlun)
67	13.02.06 15:00	13.02.06 19:00	5.0	41.0	4.0	23.6	4.0	4.2	46.3	51 Circulate and rotate hole clean	Trans, Geo, M (Schlun, Schlun)
68	13.02.06 19:00	13.02.06 19:00	0.0	41.0	6.0	23.6	0.0	0.0	46.3	52 [Done] Run drop Gyro	Geo, Trans, M (Schlun, Schlun, Schlun, Schlun)
69	13.02.06 19:00	14.02.06 05:00	14.0	41.5	16.0	24.2	10.0	10.2	46.1	53 POOH and RB BHA	Trans, Geo, M (Schlun, Schlun)
70	14.02.06 05:00	14.02.06 17:00	17.0	42.3	12.0	24.7	12.0	12.1	46.1	54 RH and wash MR, BOP and WH. POOH. RH and pull WB.	Trans, Geo, M
71	14.02.06 17:00	16.02.06 14:00	60.0	44.6	45.0	25.5	45.0	45.0	51.1	55 RB out stand, PUJ and run 10 3/4" x 9 5/8" csg. Install RA manhole in 9 5/8" csg.	Trans, Geo, Hall, M, Weath
72	16.02.06 14:00	16.02.06 23:00	15.0	45.4	9.0	25.9	9.0	9.0	51.3	56 NU espanger. Cont RH, MU, out stand. Land csg hanger. Circ and condition mast.	Trans, F&S, Geo, Weath
73	16.02.06 23:00	17.02.06 05:00	11.0	45.6	7.0	27.2	7.0	7.1	51.3	57 Cement csg. Set seal assy. PT seal assy and casing.	Trans, Hall, Geo
74	17.02.06 05:00	17.02.06 13:00	11.0	45.3	7.0	27.5	7.0	7.1	52.1	58 RB out stand, POOH. LID out stand. LID 12 1/4" BHA.	Trans, Geo, Hall
75	17.02.06 13:00	17.02.06 21:00	13.0	45.6	6.0	27.5	6.0	6.1	52.4	59 RH and install WB. Test BOP	Trans, F&S, Geo, Hall
76	17.02.06 21:00	18.02.06 17:00	30.0	48.1	26.0	28.7	20.0	20.1	53.1	60 NU 8 1/2" BHA and RH while PUJ 5 1/2" DP.	Trans, Geo, Schlun, Schlun
77	18.02.06 17:00	18.02.06 23:00	14.0	48.7	6.0	29.9	6.0	6.0	53.1	61 Drill sidetrack and rat-hole while offsetting to 1.12 deg Parathem CBM	Trans, Geo, M (Schlun, Schlun)
78	18.02.06 23:00	25.02.06 01:30	250.0	18.4	145.3	6.1	145.6	145.6	61.1	8 1/2" [ NO 556/12-M-2 AH ]	
79	25.02.06 01:30	28.02.06 23:30	146.0	6.2	54.5	3.5	54.5	54.5	3.5	COMPL_LINER [ NO 556/12-M-2 AH ]	
80	28.02.06 23:30	04.03.06 02:30	197.0	4.5	75.3	3.1	75.0	75.0	3.1	COMPL_XTRNS [ NO 556/12-M-2 AH ]	
81	04.03.06 02:30	04.03.06 15:30	25.0	1.0	16.5	0.7	16.5	16.5	0.7	COMPL_WPREP [ NO 556/12-M-2 AH ]	
82	04.03.06 15:30	07.03.06 03:30	71.0	3.0	56.5	2.4	56.5	56.5	2.4	COMPL_TBCRM [ NO 556/12-M-2 AH ]	
83	07.03.06 03:30	08.03.06 06:30	37.5	1.6	26.5	1.2	26.5	26.5	1.2	COMPL_THIMS [ NO 556/12-M-2 AH ]	
84	08.03.06 06:30	12.03.06 02:30	130.0	5.0	50.3	3.6	50.0	50.0	3.6	COMPL_OTHER [ NO 556/12-M-2 AH ]	
85	12.03.06 02:30	13.03.06 05:35	138.5	5.4	57.5	4.1	51.6	51.6	1.3	COMPL_PERF [ NO 556/12-M-2 AH ]	
86	13.03.06 05:35	14.03.06 14:35	53.0	3.2	23.3	1.2	23.6	23.6	1.2	COMPL_OTHER [ NO 556/12-M-2 AH ]	
			87.4 days		55.3 days		61.6	77.1 days			

## 11.9 APPENDIX I: Personnel onboard (POB)

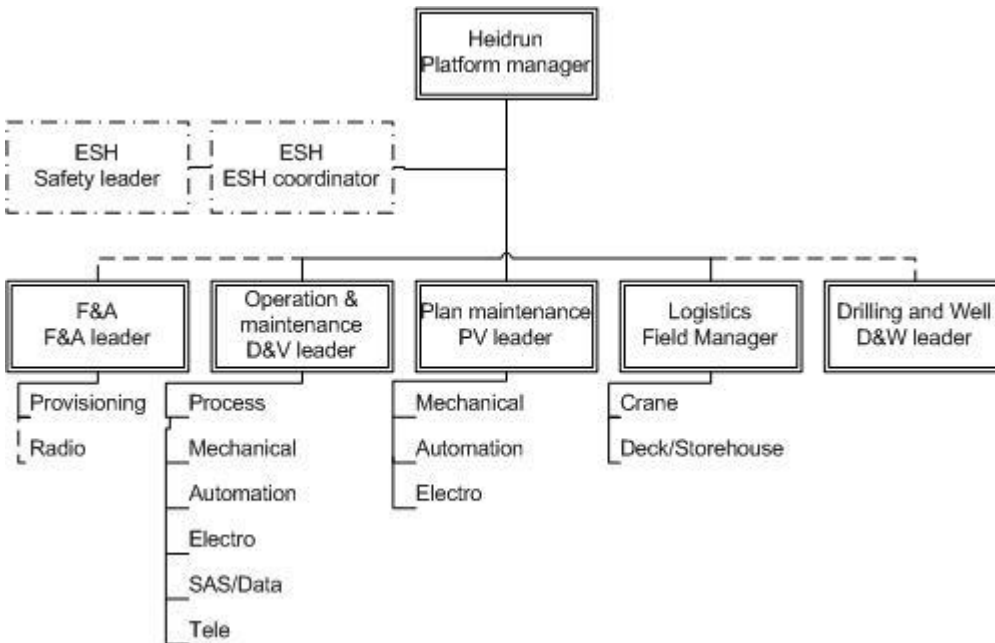
8 dagers personellplan for HD TLP Bore- og kompletteringsoperasjon														Personellplan HD TLP 11.mar.10		
Planen er oppdatert	16. feb		17. feb		18. feb		19. feb		20. feb		21. feb		22. feb		Tot	
11-mar-2010	Tot	Uts	Inn	Tot	Uts	Inn	Tot	Uts	Inn	Tot	Uts	Inn	Tot	Uts		Inn
STATOIL:																
BORELEDER DAGNATT	2			2	1		2			2			2			2
BORE- & KOMPL-ING	1			1			1			1			1			1
GEOLOG	0			0			0			0			0			0
LEDELSEBESØK	0			0			0			0			0			0
Prosjektleder (Oppgradering)	1			1			1			1			1			1
STATOIL ANDRE - 2	0			0			0			0			0			0
DRILLING SERVICE:																
AKER m/h (man)	3			3			2			1			1			1
HDP (Hitec)	0			0			0			0			0			0
Kongsberg	0			0			0			0			0			0
HALLBURTON CMT (1man)	1			1			1			1			1			1
HALLBURTON MUD (tirs)	0			0			0			0			0			0
HALLBURTON FLUID	0			0			0			0			0			0
Geoservices	0			0			0			0			0			0
National Oilwell Varco NOV	0			0			0			0			0			0
OCEANEERING (Tors)	3			3			3			3			3			3
ODFJELL DRILLING	36			36	17		16			37			37			37
ODFJELL ANDRE	0			0			0			0			0			0
ODT	0			0			0			0			0			0
Keppel	0			0			0			0			0			0
CAN	0			0			0			0			0			0
Semco	0			0			0	1		1			1			1
DNV/Axess	0			0			0			0			0			0
COMPLETION SERVICE:																
BOT Compl.	0			0			0			0			0			0
BOT Fishing	0			0			0	2		2			2			2
BOT Plug	0			0			0			0			0			0
BOT GP	0			0			0			0			0			0
Gyrodatta	0			0			0			0			0			0
Halliburton Straddle	0			0			0			0			0			0
Schlumberger Reslink	0			0			0			0			0			0
AVS	0			0			0	2		2			2			2
Schlumberger WL	0			0			0			0			0			0
Smith Red Baron	0			0			0			0			0			0
Furmanite	0			0			0			0			0			0
Cameron	0			0			0	1		1			1			1
Pl	0			0			0	1		1			1			1
DAGPERSONELL																
TOTALT PERSONELL:	47	0	0	47	19	19	47	12	0	59	0	0	59	3	3	59
																59

**11.10 APPENDIX J: Organizational charts Heidrun**

**HEIDRUN OPERATIONS CENTRE (HD OPS)**




**HEIDRUN OFFSHORE INSTALLATION**



11.11

APPENDIX K: Delivery ticket

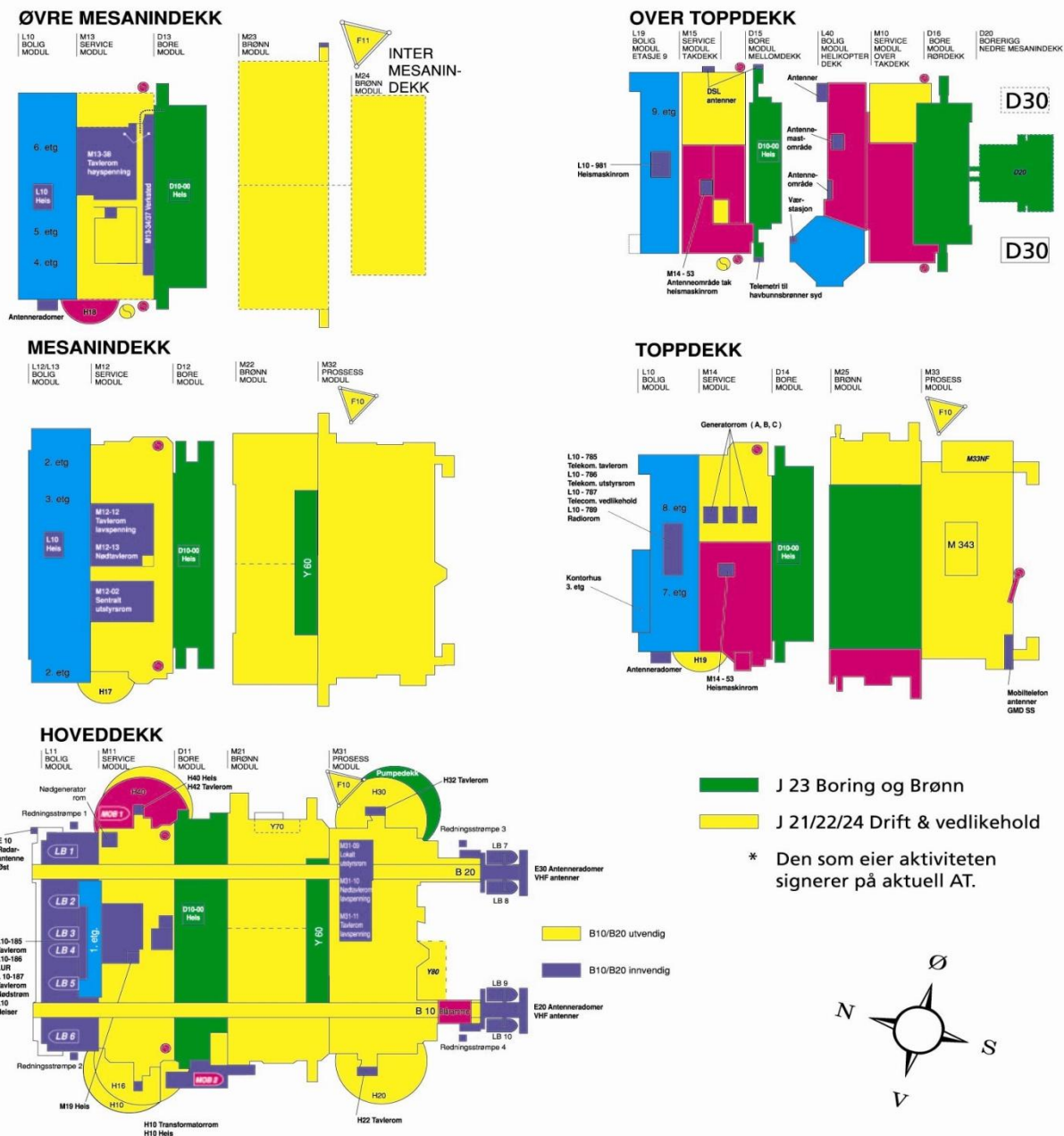
 <b>Baker Oil Tools</b> Div. of Baker Hughes Norge AS		<b>Delivery Ticket</b> :801633368		
Baker Oil Tools Div. of Baker Hughes Norge AS Tanangerveien 501 4056 Tananger Tel: +47 51 717000 Plant No.: 0234		Page: 1 of 5		
Sold-to Address STATOILHYDRO ASA CENTRAL ACCOUNTS PAYABLE 4036 STAVANGER		Ship-to Address STATOILHYDRO ASA STATOIL FORSYNINGSBASE KRISTIANS OMAGATEN 122 BYGG 9 6517 KRISTIANSUND N		
<b>WELL NAME: 6506/12-P-4 H</b> Field: ÅSGARD (SMØRBUKK) Rig: STENA DON Region/Country: Møre og Romsdal F. Norway		General Information Customer Number: 40036839 Delivery Date: 15-Jul-2009 Mode of Transport: Road Terms of Delivery: EXW Gross Weight: 314,295 KG PGI #: 4902520906 Transit #: 2009/0853 Notes: EN BASKET CB2044 12 M, 5400KG. SENDES KR. SUND BASE. LEVERES 17.07.2009 INNEN KL. 10.00. AVD: 5210 Mode of Shipment: Road Created by: FOSSVER		
SWP: 09-175802 WBC		Well Master No.: 60853539		
Del.Item	Ord.Item	Material/Description	Quantity	Weight
000010	001034	Order: 2471349 Customer PO: TBA Service Order: 901477942 H0234YCUS ZN00014510 DIM SPEC TBLR, LFT SUB 3.5" IF Customer Material No. 000901477942 0045 D Serial no. ZN00014510	1 EA	1,000 KG
000020	001046	H150003550 ROTARY SUB 3.500 IN NC (IF) BOX UP 2.875 IN NC (IF) PIN DOWN Customer Material No. 000901477942 0050 D Serial no. ZT6N36359	1 EA	61,690 KG
000030	001058	10235828 2.875 IN OD JUNK COVER F/2RH SETTING TOOL Customer Material No. 000901477942 0080 D	1 EA	0,050 KG

# 11.12 APPENDIX L: Area responsibility at Heidrun

26.06.09

## OMRÅDEANSVAR HEIDRUN

	<b>Boring og Brønn</b> Områdeansvarlig leder: * Boreleder/Brønnleder D30		<b>Drift &amp; vedlikehold</b> Områdeansvarlig leder: D&V leder		<b>F&amp;A</b> Områdeansvarlig leder: F&A leder
	<b>Planvedlikehold</b> Områdeansvarlig leder: PV leder				<b>Logistikk</b> Områdeansvarlig leder: Fagansvarlig logistikk



Schaal, 107-2003, Reklamemuseet, Veng, B

## 11.13 APPENDIX M: Purchase Order (PO)

### Purchase Order 4501807217

StatoilHydro Petroleum AS

Schlumberger Norge AS  
PO Box 8013  
4068 STAVANGER

If not specified, please  
deliver to:  
StatoilHydro Petroleum AS  
Heidrun platform  
Forsyningsbase Kr.sund  
Omagaten 122, bygg 9  
6517 Kristiansund

Please invoice to:  
StatoilHydro Petroleum AS  
4035 STAVANGER  
Central accounts payable

Purchase Order/Date <b>4501807217 / 07.08.2009</b>	Print date: 07.08.2009
<b>The above reference number must be given on all documents and in all correspondence</b>	
Your reference / Salesperson: BN / Yngve Johansen	
Our reference: I.Auflem	
Terms of delivery according to INCOTERMS 2000: FCA Vendor address	
Delivery date: 14.08.2009	
Terms of payment: Within 30 days of receipt of the invoice	

Unless otherwise stated StatoilHydro Petroleums "General conditions of purchase" & "General conditions for purchase of services" applies.

**For offshore use only.**  
**v.a.t. not to be charged. ref. law on**  
**v.a.t. 19.06.69 para. 16.1B.**

Invoice MUST be marked with PO number.  
Proforma invoice to be sent Inge Harlad Auflem, e-mail: inha@statoilhydro.com for approval,  
BEFORE invoice is sent to Central Accounts Payable.  
This Purchase Order contains estimated values.

Item	Quantity	Description		Price per unit	Net value NOK
00010		<b>A-30 C BO2 SLB services, NOK</b>			
		Rel. ord./contr. 4600008934 Item 00010			
		<b>The item contains the following services:</b>			
	00010/10	6048562 Engineer/Specialist			
		20	DAY	14.278,00 per DAY	
	00010/20	6048563 Operator			
		20	DAY	9.139,00 per DAY	
<b>Total net value excl. VAT NOK</b>					<b>468.340,00</b>

Forwarding instructions: (Art.1-4 only for del.of goods) Correspondence address on the right.  
1. Each Purchase Order item to be packed separately and labeled with consignment address, Purchase Order number, PO item number and material number if stated.  
2. The delivery note and any other consignment documents must specify the consignment address as well as the Purchase Order number and item number.  
3. If Purchaser is responsible for freight, Purchaser's forwarding agent must be used:  
**Bring Logistics AS**  
Nestegaten 28, Postboks 2683, Møhlenpris, N5836 Bergen  
Tlf: + 47 55557200, Fax: + 47 55557221, E-mail prosjekt.ncb@bringlogistics.no  
4. Consignments which fail to conform with the above, may be returned at Supplier's risk and cost.  
5. A signed copy of the Purchase Order, with possible amendments, to be used as order confirmation if requested.  
6. Invoice to be issued in exact compliance with the conditions of the Purchase Agreement. Both Purchase Order number and PO item number must be specified.

Yours sincerely  
For StatoilHydro Petroleum AS

Øyvind Sagbakken

StatoilHydro Petroleum AS  
N-4035 Stavanger

NO990888213 MVA

Phone +47 55142000  
Fax +47 51990050  
Dir.Phone  
Dir.Fax

## 11.14 APPENDIX N: Deadline logistics

Deadlines logistics	
Supply base	
<b>MAIN RULE</b>	
Material delivered at base	Within 16:00 one business day before day of departure from base
Registration of backload	Within 10:00 day of departure from base
<b>EXCEPTIONS</b>	
containers	departure
Temporary rented equipment (Z-015)	Reported 3 days before departure from base and delivered within 16:00 one business day before day of departure from base
Requisition of bulk	2 days / 48 hours before departure
Registration of OCTG (Needlist / check list)	30 days previous to startup at installation
<b>Helicopter</b>	
Requisition of seat on helicopter	No later than two working days prior to departure
Cargo delivered on heliport	2 hours before departure Lead time to Heliport is in addition
Shutting - HFIS/Log sends route setup to pilots	Normally 20 min before startup
Shutting - HFIS/Log låser ruten og setter opp mest effektive rute	1 hour before departure
Shutting - registration of passengers and cargo	1 hour before startup

## 11.15 APPENDIX O: Transport times, Bring

### Transport times

	Stavanger	Mongstad	CCB	Florø	Kristiansund
Stavanger		1 day	1 day	1 day	<b>2 days</b>
Mongstad	1 day		Local driving	1 day	<b>1 day</b>
CCB	1 day	Local driving		1 day	<b>1 day</b>
Florø	1 day	1 day	1 day		<b>1 day</b>
Kristiansund	<b>2 days</b>	<b>1 day</b>	<b>1 day</b>	<b>1 day</b>	

### Transport times, express transport (two drivers)

	Stavanger	CCB	Mongstad	Florø	Kristiansund
Stavanger		6 hours	8 hours	12 hours	<b>18 hours</b>
CCB	6 hours		2 hours	6 hours	<b>13 hours</b>
Mongstad	8 hours	2 hours		5 hours	<b>13 hours</b>
Florø	12 hours	6 hours	5 hours		<b>9 hours</b>
Kristiansund	<b>18 hours</b>	<b>13 hours</b>	<b>13 hours</b>	<b>9 hours</b>	



## **11.16      *APPENDIX P: The logistics team offshore***

### **FA LOG OFFSHORE (FA LOG OFF)**

FA log offshore reports to logistic leader onshore and has the following work tasks:

- Advance approval of AT (work permission)
- Safeguard the role as operational system responsible at the installation
- Safeguard the role as operational responsible for crane operations pursuant to NORSOK R-003.
- Safeguard the coordination between all crane/deck activities at the installation.
- Be the installations contact person for Statoil Marine, supply base and vessels.
- Attend meetings in relations with logistics.
- Safeguard task responsibility for the logistic team and the interplay with the installation manager.
- Coordinate tasks delegated by competent enterprise and follow-up the lifting equipment data-base.
- Contribute in activities on deck.
- Safeguard responsibility for source separation on the installation.

### **DECK OPERATOR 1 DAY/NIGHT**

- Individual in charge of overview and follow-up load and backload in collaboration with FA LOG OFF and MATCOR OPS HD.
- Together with FA LOG OFF have the total overview over in- and outgoing load, and make sure the next shift are updated.
- Responsible for all barriers.
- Responsible for handover day/night concerning load handling.
- Running contact with customers for internal lifting operations
- Responsible for maintenance on hose station east

### **DECK OPERATOR 2 DAY/NIGHT**

- In charge of follow-up logistics areas at the installation, this consists of tidy up, cleaning and responsible forerunner and crane equipment are on the right location. See APPENDIX L for which areas logistics are responsible for.
- Responsible for supplementing gear like strops and guiding ropes in equipment cabinets in east and west and also source separation stations M24 west, D11 and the milk pontoon. Together with responsibility for marking and accessibility of these areas.
- Responsible for maintenance on hose station west. And orderliness on landing place 30, blue frame, H 18, and H 20.

### **CRANE OPERATOR 1 DAY**

- Area responsible for the east crane.
- Examine together with FA the need for FV or PV east crane, including follow-progress up on these work tasks.

- Carry out prospective maintenance FV.
- Perform lifting controls on free lifting equipment
- Responsible for equipment ordered for the crane are executed, executed by FA.

**CRANE OPERATOR 2 DAY**

- Area responsible for the west crane.
- Examine together with FA the need for FV or PV west crane, including follow-progress up on these work tasks.
- Carry out prospective maintenance FV.
- Perform lifting controls on free lifting equipment

**CANE OPERATOR NIGHT**

- Area responsible for the south crane.
- Examine together with FA the need for FV or PV crane south, including follow-progress up on these work tasks.
- Carry out prospective maintenance FV.
- Working close with D&W
- Perform lifting controls on free lifting equipment. Make sure everything is transferred to SAP and followed-up by FA
- Individual in charge for orderliness in the strop storehouse.

**Material Coordinator OPS Offshore (MATCOR OPS HD)**

- In charge of ordering containers, stationary compressor from onshore.
- Ordering of helicopter fuel
- Through close collaboration with FA LOG solve tasks in the logistic team.
- Responsible for the goods and orderliness in the storehouse
- Goes through each shipment manifest and decide which deck each load carrier should be unloaded. This is written on a loading list used by the logistic team.
- Responsible for International Ship and Port Security on HD.
- Responsible for reporting backload to each shipment.
- Prints data sheets for the backload if this is required, depending on the load.
- Prints notes to be attached to the backload, containing number of the load carrier, weight, content. Sealing and attaching container notes are done by either the storekeeper or by a deck operator.