Master's degree thesis

LOG950 Logistics

Mapping Information Flow:
A Case study of an Upstream Supply Network

By Runa Torvik and Louise Bue

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Acknowledge

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At last we also want to say thank you to the people which made our study easier. A thank you is therefore given to the canteen for giving us food the past 6 years and also to the janitor for keeping us in company late at night. The printing service for laughing with us and not of us, and of course also our physiologically support the last semester: Mao.

Louise Bue and Runa Torvik

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I would further like to dedicate this thesis to my father Albert Torvik, who has always been there and supported me together with my mum when it comes to the important things in life. Even if you are no longer here, you're still a great support and inspiration to me in all the things I do. I would like to eventually draw up a verse that I got from the two of you some years ago, in order to keep focused on the right things; **Proverbs 4:23.**

Runa Torvik

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Louise Bue

Executive Summary

The subject of this thesis has been investigation of information flow. During the execution of the work, the objective has been revised several times. The thesis has been modified from dealing with internal information within a company, but ended up mapping information flow externally between four companies. These companies are Baker Hughes, Bring, Vestbase AS and Statoil ASA.

A model for mapping information flow within a supply chain network has been designed. The final product of this thesis provides an analysis and evaluation of the Information Flow Mapping Model (IFM), based on an Upstream Supply Network and empirical data.
The analysis has been conducted using empirical data gathered from interviews with Bring, Vestbase AS and Statoil ASA. Baker Hughes was not available for interviews, thus information concerning Baker Hughes has been gathered from other sources.

The method of analysis started as a descriptive case study. When the focus was changed, it partially went into an exploratory case study and finally ended up as a descriptive case study. A qualitative analysis has been conducted through an empirical data research.
A number of theories have been utilized to describe the information flow in the supply chain network, such as supply network, supply chain management, information supply chain, information systems and coordination theory. They are the basis for our definition for information network and information business processes. Further, these theories are contributing for developing our Information Flow Mapping Model (IFM).

The IFM model has been utilized to analyze an empirical case and this has shown the complexity of a mapping and analyzing an information process in an upstream supply chain network.

The strength and weaknesses of the IFM Model have been discussed. The result of the discussion indicates that the IFM model can be utilized for mapping information flow for an empirical case study.

During the work we have developed an IFM Model, which can be used to understand and map information flow at a process level. The model is used for a specific process in order to illustrate the information flow within an upstream supply network.

The analysis shows that the mapping can be done step-by-step in an external supply network. The general approach in the way which the model is formatted makes it appropriate for other processes, though this needs to be further investigated.
By analyzing an empirical case we have shown the complexity of an information process mapping and analysis of an empirical case study. Also the model adapts this complexity by using the dependencies within the coordination theory.

Recommendation (Further Research Work):

- The areas of weaknesses of the model can require further investigations or improvements.
- In this thesis we have not taken into consideration any improvements of mechanisms that can improve the information flow. This can be further researched, by using the coordination theory.
- If such work is performed , new research may need additional coordination mechanism, for improving the information flow which will expanding the use of coordination theory,

Limitations of the thesis:
The analysis conducted has also limitations. Some of the limitations are;

- The lack of interviewing Baker Hughes, lead to secondary information gathered from this company. Our mapping model could in reality be more complex if the interviews with Baker had been performed.
- The research question and interviews utilized for this thesis was performed for another thesis. However the focus was changed, but due to time limitations no new questions or interviews were conducted. Hence this might be a limitation to our thesis.

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List of abbreviations

DSM- Drilling Supply manager

PO- Purchasing order

SBOG- Statoil Base Operation Group

RMC- Resource Management Coordination System

CC- Customer Center

VBO-Vestbase AS Base Operation

TT- Technical Service

DDR- Daily Drilling Report

LRL- Loading Renting Log

LL- Loading List

SAP- System Application production in Data Processing

CRM- Customer Relationship Management Systems

ERP- Enterprise Resource Planning

IS- Information System

Department belonging to Statoil:

Statoil Stjørdal (included DSM- Drilling Supply manager and engineer)

SBOG- Statoil Base Operation Group

Rig

Statoil Marine (Ship)

Department belonging to Vestbase AS:

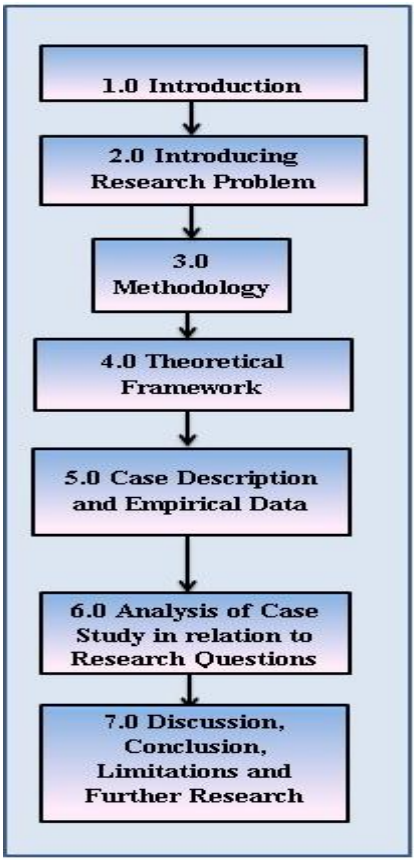
CC- Customer Center

VBO- Vestbase AS Base Operation

Enterprise

TT- Technical service

1.0 Introduction



The Thesis consists of 7 chapters of which the first outlines the introduction to the Thesis. The second chapter focuses on the Research problem and the third explains the Research Methodology.

Chapter four entails the Theoretical Framework giving an overview of the related applicable theories and the IFM Model is created based on relevant theory. Chapter five gives an overview of the case description with the Empirical data collected from the interviews.

In chapter six we utilize the collected information in an empirical case analysis using the model which we have made. This shows the complexity of the information network. Finally in chapter seven the discussion, conclusion, limitations and further research will be found.

Logistics has traditionally been focused on the flow of goods from point of origin to the end consumption. As research within logistics has evolved one has recognized the importance of including information flow as a supporting role to the physical flow. Consequently, the transition from logistics into supply chain management, which to a greater extent also emphasizes the role of information exchange, has developed into an important function in the professional business world as well as within academia.

Information is increasingly becoming more important when businesses grow in size and at a rapid pace. More actors are collaborating across organizational boundaries than before, thus information exchanges take place more frequently. The need for information systems

to cope with vast amount of information involved in business relationships are important in order to collaborate in an efficient way.

When a process expands to a network, the information flow becomes more complex and it is therefore important to gain an overview in order to achieve a better understanding of how the network is related. Information and information systems are also of importance in relation to the logistics aspect of a process. The logistics activities might often be seen as the main part of a process. But as Alshawi (2001) states: "*Goods cannot flow without information*", and the information flow therefore can be said to be an important support function to the physical flow. The information flow ensures that the materials can flow efficiently. Therefore, one can view information as having a value in itself.

With the recognition of the crucial function of information in logistics operations, the selected topic for this thesis deal with the mapping of information flow in relation to a supply network.

The research previously undertaken within this field of study concerned with information flow related to networks is relatively scarce. Due to lack of research and theories which could be used in order to map information flow in relation to a network, the authors found it interesting to look further into this topic.

Specifically, the thesis will look at an upstream supply network related to the oil industry in Norway. The network involves different actors from different companies. Baker Hughes, Bring, Vestbase AS and Statoil ASA are the actors that were chosen as interviewees; however Baker Hughes had to be excluded from the primary data collection due to the lack of availability from their part. The empirical data is therefore collected from these interviews with only second hand information from Baker Hughes.

Some contribution in this thesis concerned defining new definitions related to Information Network and Information Business Processes (IBP) due to lack of existing definitions.

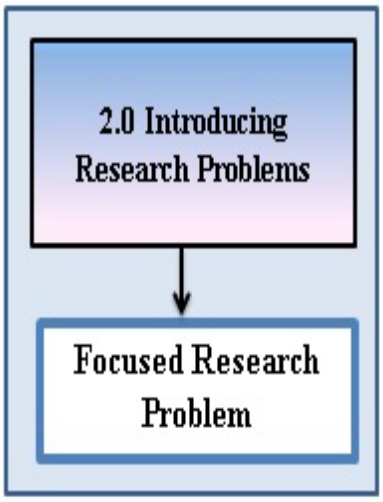
Based on less theoretical models that could be used for the purpose of mapping information flow within a network, the main contribution of this thesis has been to develop

a new model for this purpose, which is called The Information Flow Mapping (IFM) model. This model is developed on the basis from several theories. The main emphasis was on the theories from the authors below.

Bø and Sadler are focusing on information in a supply chain, while Lambert, Cooper and Pagh mainly focus on supply chain business processes. Alter has the main focus on information in various decision phases. Buckland looks into different views of information, while Word and Magal focuses on different types of data. Malone and Crowston focuses on different types of dependencies.

The research undertaken in this thesis will consequently investigate information flow in supply networks from both an empirical and theoretical perspective. One contribution is therefor to apply the developed model for analyzing the case study of the upstream supply network.

2.0 Research Problem



In this section the background of the Research problem will be exposed. This will further lead to the focused research problem which will be the basis for the further analysis.

Introducing Research problem

The motivation for choosing the subject information flow in an upstream supply network process, concerning rental equipment, related to an oil industry, is because the information is very important in such process. This is due to the fact that lack of equipment might stop the operation offshore which is very costly.

The information has a function of linking the processes together. Each separate activity will be less efficient without having information flow to link and support various steps. Therefore information flow has an important function in relation to processes.

The information flow is more difficult to overview, since information is less tangible than the material flow. The case study chosen for this research, an upstream supply network, is focusing externally where the need for information exchange becomes more important.

It becomes more important because the actors may not be familiar with each other's organizational structure. This may lead to less efficient information flow. With several actors, the processes become larger and there are larger distances between the organizations. Exchanging information between the actors might therefore be more demanding.

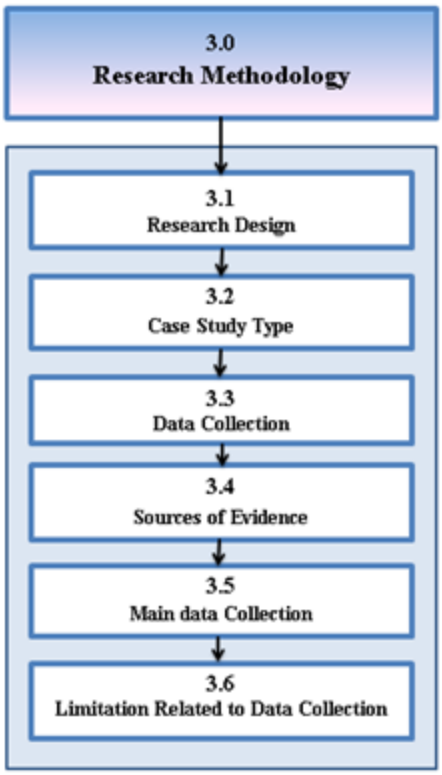
More overview of the information flow might lead to a better understanding and contribute to improved collaboration and higher efficiency for the whole network. It is therefore important to get this overview in order to achieve a smoother flow.

Our proposed research problem will therefore be as follows:

Develop a descriptive model that is useful for mapping the information flow in a supply chain network

Do an empirical case study of an information flow connected to an upstream supply network process by using the developed model.

3.0 Research Methodology



In this chapter the research methodology utilized in this thesis will be presented. The data collection method for the research design and the types of data collected will be described.

3.1 Research Design

Yin (2003) defines research design as: *"…the logic that links the data to be collected (and the conclusion to be drawn) to the initial question of a study." (Yin 2003, p.19)* In other words there are some questions to be answered and some set of conclusions to be drawn.
Yin (2003) mentions important components of research design, which are used in this thesis, and these are:

1. *a study`s questions;*
2. *its propositions, if any;*
3. *its unit(s) of analysis;*
4. *the logic linking the data to the propositions; and*
5. *the criteria for interpreting the findings.* (Yin 2003, p.21)

Study questions, is the first component, where the formulation of the research questions will indicate the type of research that will be conducted. The task is to clarify the study

questions and their purpose. Relevant research strategy questions starts with *Who, What and Where.*
How and why, are typical case study strategy questions.

We would like to find the information flow and the connections between the actors in the information network. To find *how,* the information is transferred and *why*. Therefore the problem is a study question and relevant for the thesis.

Study propositions, is the second component, which will be additional to the study questions and help direct the attention to what should be examined in the study. However, because of researchers lack of experience, knowledge or information, proposition will not be present in an exploratory case study (Baxter and Jack 2008).

The proposition is to map the information flow after the model has been created. Therefore the research design is also a study proposition.

Unit of analysis is the third component and the case which should be studied. The case can be some event, companies or a single individual.

This thesis has been focusing on the information flow between the various actors, hence the unit of analysis is utilized as a design in the research problem.

Linking data to proposition is the fourth component. This can be done by analyzing the findings from the research design using various tools and techniques.

The data is linked to the proposition which is mapping of information and therefore relevant for the thesis.

Criteria for interpreting a study`s finding, is the fifth component. Statistical data might be used to set these criteria or, if possible compare with findings from similar studies, which however might not support the explanation of the result.

By looking at other models like Ola Bø`s, and other relevant theories, utilizing the information given from the actors, helped to create the model. The model was then utilized in an analysis in an empirical case study of an upstream supply network.

3.1.1 Classification of Research Design

Data type and type of analysis

According to Ellram (1996) is *"research methodologies can be classified according to the type of data used and the type of analysis performed on the data"* (Ellram 1996, p.96).

The figure below shows how Ellram (1996) classifies the methodologies according to types of data and analysis.

Types of Analysis*

Type of Data	Primarily Quantitative	Primarily Qualitative
Empirical	Survey data, secondary data, in conjunction with statistical analysis such as: factor analysis cluster analysis discriminant analysis	Case studies, participant observation, enthnography. Characterized by: limited statistical analysis, often non-parametric
Modeling	• simulation • linear programming • mathematical programming • decision analysis	• simulation • role playing

Figure 1 Basic Research Design (Ellram 1996, p.96).

As seen from the figure 1, the data can be categorized into two, *empirical* or *modeled*. Further quantitative or qualitative analysis or a mixtures of both can be used. Empirical data can be gathered for analysis through surveys or case studies from reality. The modeled data may be either hypothetical or manipulated real data, and this is then often done by simulation.

This thesis is utilizing a qualitative case study, were empirical data is used in a model.

3.2 Case Study Type

The research goal is of relevance when performing a study. According to Marshall and Rossman (1999) there are different purposes of a study, which can be categorized in several ways. We will describe three taken from Yin (2003). They are *exploratory* and *descriptive.*

The exploratory case study type is researching a case where there is no single and clear result. It investigates phenomena that is hardly or poorly understood and tries to identify the meaning of the case study and it might lead to new research which can be investigated further (Marshall and Rossman 1999). Exploratory research is used for getting in-depth knowledge and understanding of a topic or phenomena which is not well researched. The researcher usually has to get close to the setting and attempts to get direct and firsthand information of the subject in small samples (Ruane 2005).

The descriptive case study type, research a real life phenomena in the situation where it occurs. The descriptive case study describes and documents what is going on in a social structure or process and the behavior which arise in this setting and of interest for the case study (Marshall and Rossman 1999). Issues like measurement and sampling, which means describing the facts like what is going on, and who is participating in an event, will be paid close attention to in a descriptive case study (Ruane 2005).

Regarding general research questions in relation to the descriptive research, they will describe what kind of factors that occur in the situation that one would like to describe. This can for example be processes and social structures that take place. For instance the most important activities that takes place and the peoples beliefs and attitudes (Marshall and Rossman 1999). The two types utilized in this case study are the exploratory and the descriptive case studies which will be explained further below.

At the beginning of this thesis we wanted to find out how the Vestbase AS internal information flow was handled. Therefore, this thesis started as a descriptive case study. The focus was changed and for a period of time the exploratory case study has been utilized in the sense that at a certain time and point, there was no clear end result given.

When looking into relevant literature, we learned that the information in general is described as a support for the material flow by several researchers. Because of this it became necessary to see information as a whole. We needed therefore to look into information in a network with several actors. The topic information network was not well researched by other researchers.

We became more flexible when using an exploratory case study. The study became more open and we gained new ideas. In total we got more insight regarding methods and knowledge in the case study.

First we made definitions for information network and business processes.
During this process, we found very few researchers that had described how to map information flow.

This encouraged us to design a new model which maps the flow of information in a network. When using this model we had to get close to the interview objects by performing various interviews on locations.

Therefore, our case study turned into a descriptive case study again. This is because our focus was put into a specific direction. We mapped companies in real life, with material and information flow. The focus was to describe the facts, the order and the participants regarding information flow. It made us get a clear picture of the phenomenon.

Further on, a descriptive case study was utilized when collecting data. We had a mixture of different interviews with Vestbase AS, Statoil and Bring. We collected accurate and authentic descriptions. A real life situation regarding information flow between Vestbase AS, Statoil, Baker and Bring was mapped.

We believe that the process in this thesis has been hard work, however, the way it ended up turning it into a descriptive case study has been a success for us. The case study was started with an opened mind and later mapped in detail.

3.2.1 Case Study Method

Selected Method for Case Study

A case study method has been utilized in this thesis, studying real businesses, using qualitative analysis through an empirical data research.

According to Ellram (1996) states that a: *"Qualitative results are frequently expressed verbally, often to create an understanding of relationships or complex interactions."* (Ellram 1996, p.97). The data collections, primary data, in this thesis have been collected through interviews, in addition the theoretical part, secondary data, have been performed by research in the literature.

In this thesis the final case study method was a descriptive case study. A qualitative analysis was done with empirical data. Through interviews, the information, structure and the processes were mapped in an upstream supply network.

Advantages and disadvantages with case study method

Yin (2003) has defined a case study as:

> *…an empirical inquiry that investigates a contemporary phenomenon within its real- life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin 2003, p.13).*

According to Aitken and Marshall (2007) mentions that *"A case study should not only describe, but also facilitate understanding and convey an educational message through explanation of the chosen aspect…"*(Aitken and Marshall 2007).

A case study is not limited to utilize only quantitative or qualitative evidences; as mentioned earlier it can be a mix of both and may lead to qualitative and quantitative results (Yin 2003).

According to Meredith (1998) there are disadvantages and advantages for using a case study method. One advantage is that comprehension will be gained and relevant theory might be generated from studying the phenomenon in a natural setting.

Another advantage using this method is that it can analyze simple and complex situations which makes it easier to answer the *How* and *Why* type of questions (Baxter and Jack 2008).
A case study is researching within a natural setting and this makes the question *Why*, be more understandable, because this setting allows a deeper and easier understanding how complex the nature of the phenomenon might be (Meredith 1998).

The third advantage with a case study is that even though the variables are still unknown, it is possible to do early exploratory investigations (Meredith 1998).

According to Meredith (1998) a disadvantage of a qualitative case study research might be that it is perceived to give possibility for error, to have poor confirmation of data and the generalizations can be debatable. Further on he mentions some other disadvantage of using a case study method, like it is time consuming. This is because direct observation takes time as well as one needs access to what is being studied. There is also a need for various tools and multiple methods, which may be time consuming and costly. Another disadvantage is that the observer is going into unfamiliar territories which might lead to lack of control as well as the context may have complications (Meredith 1998).

3.3 Data collection

A research study is totally dependent on collected data. The data will be analyzed and the information will be drawn from this. Data may be divided into two categories, primary and secondary.

3.3.1 Primary data

Primary data is defined as:
" *Original data collected for a specific research goal*" and " *Data that are collected for the specific research problem at hand, using procedures that fit the research problem best*" (Hox and Boeije 2005, p.593).

New research will create primary data and this will be original information. This data will increase the knowledge and will be made available for other researchers. In general specific data is collected for specific cases.

Under primary data we find two different types of data, which are *quantitative* and *qualitative*. Quantitative data can be defined as follows:
"*Data that can be described numerically in terms of objects, variables, and their values*" (Hox and Boeije 2005, p.593). This means that the data will have to be measured or quantified by numbers.

Qualitative data can be defined as:
"*Data involving understandings of the complexity, detail, and context of the research subject, often consisting of texts, such as interview transcripts and field notes, or audiovisual material*" (Hox and Boeije 2005, p.593).

	Solicited	*Spontaneous*
Quantitative	Experiment	(Passive) observation
	Interview survey	Monitoring
	Mail survey	Administrative records (e.g., statistical records, databases, Internet archives)
	Structured diary	
	Web survey	
Qualitative	Open interview	(Participant) observation
	Focus group	Existing records (e.g., ego-documents, images, sounds, news archives)
	Unstructured diary	

Figure 2 Examples of Primary Data in Social research (Hox and Boeije 2005, p.596)).

There are different ways of collecting these types of data. This depends on whether the work of collecting data is planned or is received during the process. These are shown in the table to the left (Hox and Boeije 2005).

Advantages and disadvantages of collecting primary data

There are several **advantages** of collecting primary data. We will mention some of them. An advantage is the control the researcher has during an *experiment*. The researcher has planned and is conducting the experiment with selected participants. Therefore, the design and procedures are handled and controlled by him.

Interview surveys, can give a large amount of information regarding objective and subjective characteristics of a population. The advantage of having solicited data is also that data collection can be designed to give data that is optimal for the specific research question (Hox and Boeije 2005).

A *disadvantage* with survey interviews could be a problem of finding representative interview objects. In could also be an issue with the validity of the answers obtained from the respondents. Also the characteristics of the questions and the respondent can influence the answers. It is therefore important to utilize a good design when forming the questions. Likewise it is important to evaluate the validity of the questions and test them on beforehand.

Another *disadvantage* is that if a research situation is planned, like they are when having experiments, the situation is also to some degree artificial, and the results might be difficult generalized into real life studies.

Another *disadvantage* is by planning the experiment to partly create an artificial situation, which is not simulating an atmosphere in a real life situation.

There might also be some issues when having solicited data. Here the respondent might adjust to the topic of the study, the institution behind or the interviewer. This may lead to difficultness of getting a "natural" response (Hox and Boeije 2005).

Having control over a study can be demanding for a researcher. It might cause lack of control over activities performed. It is therefore necessary to create notes of the study or choices they make, in order for reproducing or for copying the work later on (Hox and Boeije 2005).

3.3.2 Secondary data

According to Hox and Boeije (2005), secondary data can be defined as "*Data originally collected for a different purpose and reused for another research question*" (Hox and Boeije 2005, p.593).

Secondary data has already been used in a previous research and will be made available for other researchers. Said differently, according to Hox and Boeije (2005), any type of primary data that is archived and made available for others, can be used further as secondary data.

According to Kumar (2008) can secondary data be obtained internally within a company and externally from the outside of the company.
Secondary data can further be collected either from secondary or original sources. The latter of these, original sources are preferred. This is because the original data can show the procedure of how data is collected; it presents all of the data, but also to avoid possible sources of errors (Kumar 2008).

Advantages and disadvantages of secondary data collection

There are different *advantages* of secondary data collection. First of all, it is both cheaper and less time consuming due to that other already have collected the data.
Secondary data also shows what information that is available and where there are gaps. Therefore the researcher can focus on filling these out with more targeted collection of primary data.
Some of the problems in the research can also be better understood, and sometimes partly solved by looking at secondary data that is already available.
Another advantage is that the researcher can compare the secondary data against the collected primary data (Kumar 2008).

There are also some *disadvantages* of using secondary data.
According to Hox and Boeije (2005), there are three main factors that need to be considered.
First of all, the researcher must search for sources of data that will be useful based on what their research problem is**,** which might be difficult to find.

Second, the researcher also must be able to obtain the data that is needed for the research work.

At last, it is also important to evaluate the standard of the data in relation to current quality standards regarding research and methodological criteria (Hox and Boeije 2005).
Secondary data can also be out of date (Kumar 2008).

The primary data used in this thesis has been collected from interviews with Vestbase AS, Statoil and Bring. The secondary data has been collected from research in the literature.

3.4 Sources of evidence in case studies

According to Yin (2003), there are many sources of evidence when it comes to case studies. Further there are six that could be seen as the main sources, which are: *documentation*, *archival records*, *interviews*, *direct observation*, *participant-observation* and *physical artifacts*.

All of these have strength and weaknesses and none of them are solely better than others (Yin 2003).

However, only some of them were used during the work of this thesis. Therefore it will be focused on these below before going more deeply into interviews, which became the main source of evidence used.

3.4.1 Primary data collection

Collection of primary data for this thesis has mainly been collected through interviews with employees from the different companies related to the case study.

In the beginning some *informal conversations* were performed with employees at Vestbase AS. This was related to the logistics department in order to achieve an overview and a better understanding of the overall picture at the supply base Vestbase.

Further several interviews were executed with the terminal unit at Vestbase AS. Interviews were also held with representatives from Statoil Stjørdal rep. located in Kristiansund and Statoil operation group also located in Kristiansund.

All interviews were performed in order to obtain more details and better understanding of flow of information within this supply network.

Finally the interviews were conducted with the company Bring, which handles transportation for Statoil. Some of the interviews and data gathered were also collected by using e-mail. This was due to large distances between the interview objects and interviewers. Questions that appeared during the process were obtained by communicating with the different interview objects and contact persons as required.

3.4.2 Secondary data collection

There were no quantitative data used for secondary data collection. Regarding the qualitative data, several sources were used to obtain information. These sources were different company websites from NorSea Group, Vestbase, Statoil, Baker and Bring. Here the background of the companies was found. These showed organizational structure, customers, business goals and information systems. In addition maps were found showing an overview of the supply base. This was done in order to gain a better understanding and overview of the different companies involved.

In order to understand and find information on certificates, specification and abbreviations used by the interview object, other search sites were also used.

Additional secondary material was received from the different interview objects. This was information on internal presentations of the company, communication maps, job descriptions and visual images from selected pages in different information System.

Baker, another actor related to the case study, was not available for interviews. The missing information was obtained from the other interview objects throughout the process of writing this thesis and could therefore be seen as data obtained from secondary sources.

A large part of the secondary data was collected and obtained by searching in relevant literature. This literature could be utilized to develop a suitable framework for finding possible new ways of modeling information.

3.5 Main data collection method for primary data

Due to that most of the collected data in this thesis were obtained through interviews, it will therefore be elaborated below.

3.5.1 Interview

Yin (2003) mentions three types of interview. These are *open-ended*, *focus*- and *survey interviews*. These will be explained briefly below.

Open-ended interview

Under *Open-ended interview*s, the interview objects can be asked about facts and opinions. In some cases, it might be an opportunity to ask the respondent of its own insight. This might be used for further investigations. If the respondent assists he can be looked upon as an informant, which can provide additional sources (Yin 2003).

Focus interview

In *Focus interviews,* might still be open-ended, but is following a certain set of questions. The interviews are shorter in time and the question might concern facts that you know, but need to confirm and underpin (Yin 2003).

Survey interview

The questions under a *Survey interview* will be more structured and similar to what is found in surveys. The design of a survey could partially be a case study, and as a part of the case study evidence it could produces quantitative data. The data collection will be analyzed in the same manner as for a general survey (Yin 2003).

In this thesis, both open-ended interviews and focus interviews were used. However, the interviews which were executed were mainly based on the focus interview method. In the beginning of this thesis, open-ended interviews were made to achieve a broad perspective and understanding from the interview objects. Further, focus interviews were prepared with a set of questions that were asked to the different informants for gaining a step by step overview over the information flow. Questions, regarding some already known facts, were still asked according to the interview protocol in order to confirm information from different sides.

When executing the focus interviews, it was given room for the interview object to come forward with his own insight information during the conversations and therefore the interviews might be seen as a combination of both interview methods

3.5.2 Interview Techniques

There are different interview techniques that can be used when it comes to interviews. According to Ellram (1996) there are three main forms of interviews which are *Structured*, *Semi structured* and *Unstructured*.

Structured interviews might use techniques like questionnaires and scales with ranking and ratings. Unstructured interviews are more conversational interviews that go wider. Semi structured lies between these two, and the techniques used can be focus group interviews (Ellram 1996). The basic form of a focus groups is as follow: "*...meetings with a small group of individuals (ie, "informants" or "participants") that allow for the exchange of information, opinions, and feedback related to a single topic."* (Huston and Hobson 2008).

Strength and weakness of interviews as data collection method

There are several weaknesses and strength by using interviews for collecting data.
Strength is that questions can be adjusted to target area and to what the researcher are investigating. However, there are also other strengths of using the interview method.
During interviews, the respondent can make thing more explanatory. This may contribute to increase transparency for the researcher. As mentioned before, the informant can also suggest additionally sources and give access to these (Yin 2003).

Additional to strengths there is also weaknesses for using interviews as method for collecting data.

The informant can give erroneous information because he cannot recall the answer.
Questions that are not designed well enough can result in poor information**.** The informant can respond according to what he thinks the researcher want to find out.

For example when it comes to *focus interviews*, the researcher needs to be careful when making the questions. Leading questions should be avoided. This so the respondent can give new information that has not been given them. This must be done without affecting the respondent in any direction.

Regarding *open-ended interviews*, the researcher needs to be careful of getting too dependent on a single source, due to that the informant might influence the researcher. Several sources are therefore an advantage (Yin 2003).

3.6 Limitation related to data collecting

When collecting data, different actors related to the topic were interviewed. However, one of the actors, the supplier Baker, was not available for interviews, and the information about this actor is therefore not directly from the original source. Since the actor was not available, the information that was obtained was based on secondary sources that had information about this actor. The validity of the data about this actor could therefore be discussed.

Another limitation that could be mentioned when it comes to the data collection is that some of the data collection was done by e-mail. A disadvantage related to the process of collecting data, could then be said to be that the information obtained sometimes was not satisfying. This because by not executing the interview face-to-face, it several time lead to misunderstanding or gave less detail in relation to the answers. This further made it necessary to ask more or additional questions which were time consuming.

During the research period, the case that was studied went from internal focus to an external. This means that instead of focusing internally within Vestbase, it resulting in including several more companies externally. Due to that the main data collection method was based on interviews, we were dependent on information from the informants. However, the persons that were interviewed, works in a hectic market where every day is different. This made it difficult to plan ahead, and we had to adapt to when they were available for interviews. Due to this, the data collecting was done late and might cause a less detailed level due to the size of the case.

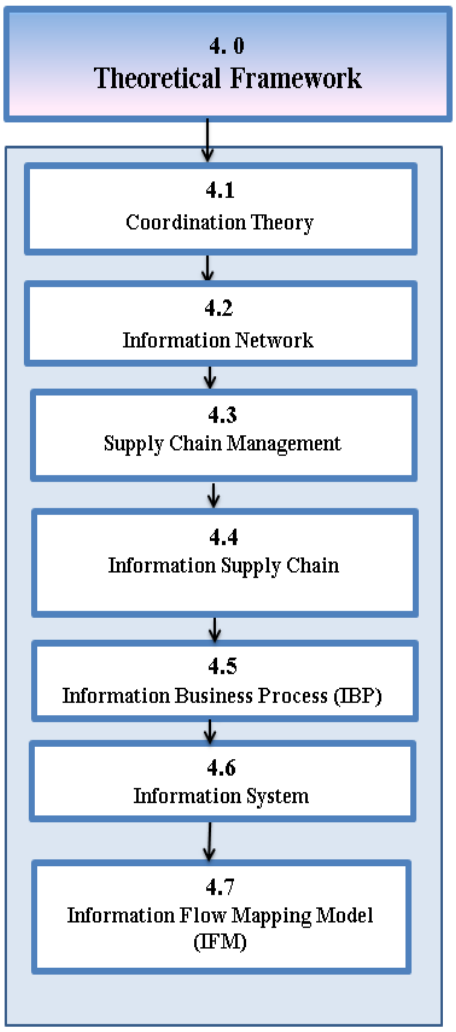
Another limitation that could be mentioned is that none of the researchers had made or executed interview guide before, which caused a lot of time and effort. It was also used a mix of methods when it comes to techniques and types of interviews in order to let the informants talk freely. However, this lead to a large amount of unnecessary information, which also were time consuming.

With more experience and focus on how to develop and execute interviews, it might have given a better outcome, with more useful information received at a shorter time frame.

The informants also had different vies and knowledge when it came to the information flow. Due to this, we received different levels of details, which were demanding when trying to map the information flow.

A last limitation that should be mentioned is that we might have obtained a better overview by having several interviews with more people within each department or company. However, this was difficult when it came to the time frame for this thesis in relation to the size of it and also the distance between the actors. Based on this it might be difficult to say that the result of the empirical work reflects the real situation.

4.0 Theoretical Framework



In this chapter, theories for the research problem will be introduced. First, the Information and Supply Network will be elaborated which further leads to a definition for information network. Second and third theories Supply Chain Management and Supply Chain are a basis for understanding the supply network. The fourth theory Information Business Process (IBP) will be elaborated to get an overview over business process with a focus on information. Further this theory leads to an own definition for information business process (IBP). The fifth theory Information System gives an overview of different information systems and data. The sixth, coordination theory will be explained, with the focus on dependencies between activities and actors. The latter a new information flow mapping model will be explained with a focus on mapping information flow in a supply network. These theories will be used as a basis for developing an information flow mapping model (IFM). Further, the theories will be used for analyzing the case study which is the main focus of our research.

4.1 Information Network

As mentioned in the introduction the main topic of this thesis is information network. The term network is of relevance because organizations are collaboration more across organizational boundaries than before. Looking into a network perspective will be of

interest, when looking into how actors may be inter-connected. A network perspective is therefore of relevance in relation to the case analysis in this thesis.

Processes are increasingly crossing external boundaries. Business processes are usually internally within companies. However, it is not sufficient to only focus on internal business processes without seeing it in the external environment context.

However, when looking into existing theories it was found that there is no clear definition on the topic "information network". The term consists of a combination of two words, information and network. These two concepts will therefore be looked into.

Based on this it will be relevant to look into theory that concerns network in relation to information and how they are linked together.

4.1.1 Information

Information can be seen as different things. One example is the figure made by Buckland (1991). Here the concept of information is seen in the light of two dimensions. The dimensions will be between tangibles and intangibles, and between processes and entities which is shown below.

	INTANGIBLE	TANGIBLE
ENTITY 2.	Information-as-knowledge Knowledge	3. Information-as-thing Data, document
PROCESS 1.	Information-as-process Becoming informed	4. Information processing Data processing

Figure 3 Four aspects of Information (Buckland (1991, 352.)

In this figure, *Information as a process* is when facts or knowledge is being communicated. Here people is either being informed or they are informing others (Buckland 1991).

Information as knowledge is describing what is understood in information as a process. In other words it is the knowledge that is being communicated(Buckland 1991).

Information-as-thing, may be objects which can be seen as information. These objects can be informative. They can for example be documents and data (Buckland 1991). They may also be related to information systems, where "*what is stored and retrieved, is physical information*"(Buckland 1991, p. 352). This type of information, information-as-thing, will further be referred to as Physical information.

The last way of seeing information, is as *information processing*, and can be defined as: "*the handling, manipulating, and deriving of new forms or versions of information-as-thing*" (Buckland 1991, p. 352).

Information can cross different activities and processes. Thus, information is necessary in order to maintain a continuous flow between the different actors.
Therefore, a supply network and the information related to a supply network will be looked into.

4.1.2 Supply Network

Ian Sadler defines supply network as*: "…the sum of supply chains across all production and services provided to end customers through a focal company"*(Sadler 2007, p.8)
A network comprises of several partners linked together forming an enterprise in an industry (Brown et al.2013). With the main focus on serving the end- customer and adding value through the processes. It consists of physical and informational elements (Lau and Lee 2000).
A supply network consist of several supply chains, likewise the information in a network will include information from all the supply chains.

According to Emmet (2008) the information in a network is utilized for all the activities. This consists of planning, control and decision making, directing and coordination, planning and implementation of other activities.

The information flow link external suppliers, customers and internal company activities together. This covers information in the supply cycle on stock, forecasting and buying, purchase orders and transactions. In addition to this information is also covering the customer demand cycle and more (Emmett 2008). In general information may be seen as the driver for flow of materials (Sadler 2007) and a manager depends on it to run the business (Boddy et al.2008).

Information is referred to as data that is useful for an organization (Word and Magal 2009). In a supply chain the information is totally integrated in the various processes and activities. It goes from the manufacturer, supplier and to the end- customer, flowing in both directions and it can best be described as an information network.

The network in context, figure 4, by Harrison and Hoek (2005)which clearly illustrates the information flow along with the other flows. It shows physical movement of material and products in the supply chain. It is the information part that is important for our purpose.

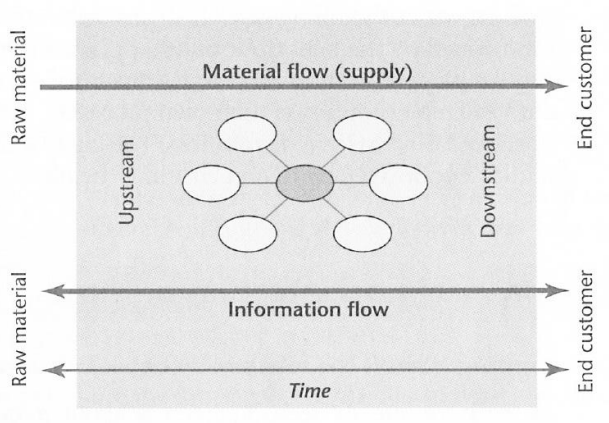


Figure 4 The network in context (Harrison and Hoek 2005, p.11)

According to Harrison and Hoek (2008) a network needs to have *time, material and information flow* in order to serve the end customer.

Information in this respect can be divided into three major steps:

1. Customer demand
2. Information sharing in the network
3. Information arriving along with the material

It starts with the demand from the end-customer as a flow of information to the preceding organization in the network.
The information will then be shared across the network and the material flow will correspond to the demand from the customer (Harrison and Hoek 2008).
The information will arrive along with the material, and at last information will be transferred from the end- user after receiving the goods.

A network is based on several processes which can be defined as: *"A series of time-based activities that are linked to complete a specific output"(CSCMP 2010).* Hence, the time is essential since it measures how long it takes the network to respond to the demand raised by the customer. Any disruption in the network will affect the next business process. Therefore, flow of information is needed to prevent disruption to ensure the material moves in a coordinated way (Harrison and Hoek 2008).

In the information network, information systems (IS) play a very important role in organizations. The figure 5 below by Boddy et al. (2008) shows that business activities are supported by information systems.

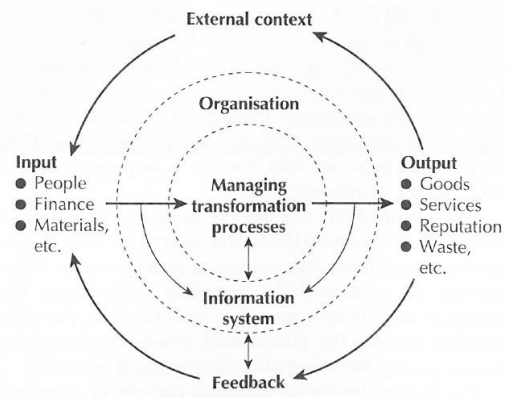


Figure 5 The role of information systems in organizations (Boddy et al.2008, p.6)

The input is resources taken from the external environment and is transformed. Further the purpose of the output is to create new resources and add value. If this does not happen the enterprise has failed. The lack of adding value will not lead to attracting resources from the external environment.

The transformation of input adds value through several processes until it reaches the end customer. The information system has a feedback function which means the output information will be fed back to the input in order to attract new resources.

Availability and the cost of staff might be an example of information input. Delivery schedules or quality could be transformation information. The customer satisfaction information could be example of output. Figure 5 shows the inputs is transformed into outputs.

Resources are normally required to execute the transformation. Therefore, this figure will be suitable for our thesis because in general there are always input in form of resources, and in our case the resources will be information. This information will have to be transformed in the process, which will result in an output. Therefore, in our thesis this figure will be useful when mapping the information flow in a supply network to show different inputs, transformation and outputs in form of information.

However, the figure does not fulfill all purposes and is very general. It does not take into account the amount of resources and time needed.

The information follows the material and the various related processes and the authors have not found a clear definition of an information network. Therefore the definitions of a network above in this section have been utilized to create a general definition of information network.

An information network can vary in size, dependent on what the information network is supposed to cover. Therefore a definition of a general information network is defined:

"*Information network links internal and external companies, ensuring information flow and driving the material flow." (*Composed by the authors, 2013*)*

There are many information network models that can be discussed, we will mention one taken from Ola Bø (2012). This model will further be used in relation to define and map information flow.

4.1.3 Information Network Model

Information is seen as a support to the physical flow and therefore is related to the process. Thus, an information network model will be presented below with a focus on actors and related information in processes.

Ola Bø (2012)shows a flow diagram map from a fresh fish auction mapping notation. He goes through the network model explaining the relations in a simplified way.

actor	info element	catch	land/ regrade	quality control	pre auction	auction
logistics unit	LUI quantity quality address					
fishing vessel	LUI quantity quality price					
fish auction	LUI quantity quality price address					

Figure 6 SCIMN Structure (Bø 2012, p.118)

He explains the overall Supply Chain Information Mapping Notation (*SCIMN) Structure* with the actors. In the vertical axis; logistical unit, fishing vessels and fish auction is shown. The horizontal axis show the following operations: Main information element, catch, land/ regrade, quality control, pre- auction and auction. This axis can also be seen as a time axes.

The information element is subdivided into Logistic Unit identification (LUI), quantity, quality and address or price for every actor. This information will indicate the situation of the goods before, during and after the transaction. The same information is recorded (mapped) several times and therefore the different actors will have different data quality for the same goods (Bø 2012).

This figure will be necessary to use in this thesis for mapping information related to the process. It will be helpful to define and map information received in relation to the goods

before, during and after transaction for each actor in the supply network. The structure or method Ola Bø utilizes can be partially used in mapping information flow in an upstream supply network.

However, the figure do not take into account that the actors and information elements can be inter dependent, which might have some effect on the process**.** The operations are going in a sequential line and for each step the operations creates new information. This information is the actor dependent on for making decisions on for example price or quantity.

4.2 Supply Chain Management

Martin Christopher defines Supply chain management (SCM) as:
"The management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole" (Christopher 2011, p.3).
This theory explains that relationships and good management can improve the results for the customers and the entire supply chain. The market is the governing factor; hence the demand chain may be a better term than supply chain (Jespersen and Tage 2005).

In general we may say that a simplified purpose of SCM is to improve efficiency, reduce cost for every actor and process in a supply chain. This will be applicable both upstream and downstream to produce a product which is required by the end customer.

Another definition of Supply Chain management has been made by Handfield and Nichols (1999):

> *The supply chain encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the supply chain.*

> *Supply Chain management (SCM) is the integration of these activities through improved supply chain relationships, to achieve a sustainable competitive advantage* (Handfield and Nichols 1999, p.2).

As can be seen they utilize the definition of supply chain to define SCM. It clearly shows that the relationship between supply chains and that its management is closely linked and integrated. The SCM definition includes the eight business processes shown in figure 7 below. They will be found in the downstream distribution channels as well as in the upstream supplier network.

In other words, SCM involves management of sourcing and procurement, production, ordering, warehousing, inventory, packaging and transport linked with the flow. It will concern both material and information systems both upstream and downstream of the focal firm (Handfield and Nichols 1999).

It is quite comprehensive to explain all the actors and activities in a SCM structure. Before, the SCM was seen as just a chain of one- to- one business, or business- to business relationships. However, the distinction now is that SCM is a multiple network of businesses and relationships (Lambert et al.1998).

Leinbach and Bowen (2004)state that the purpose of supply chain management is to:

> *…aim for improvement in logistics performance including greater reliability, smoother flow through the chain, and more efficient connections between the various links in the chain and second, to realize the lowest possible cost for the chain as a whole* (Leinbach and Bowen 2004, p.301).

Each organization in the supply chain will directly or indirectly affect the performance of the overall supply chain (Mentzer et al. 2001). Therefore the less bottlenecks and smoother flow in the system will improve the management performance.

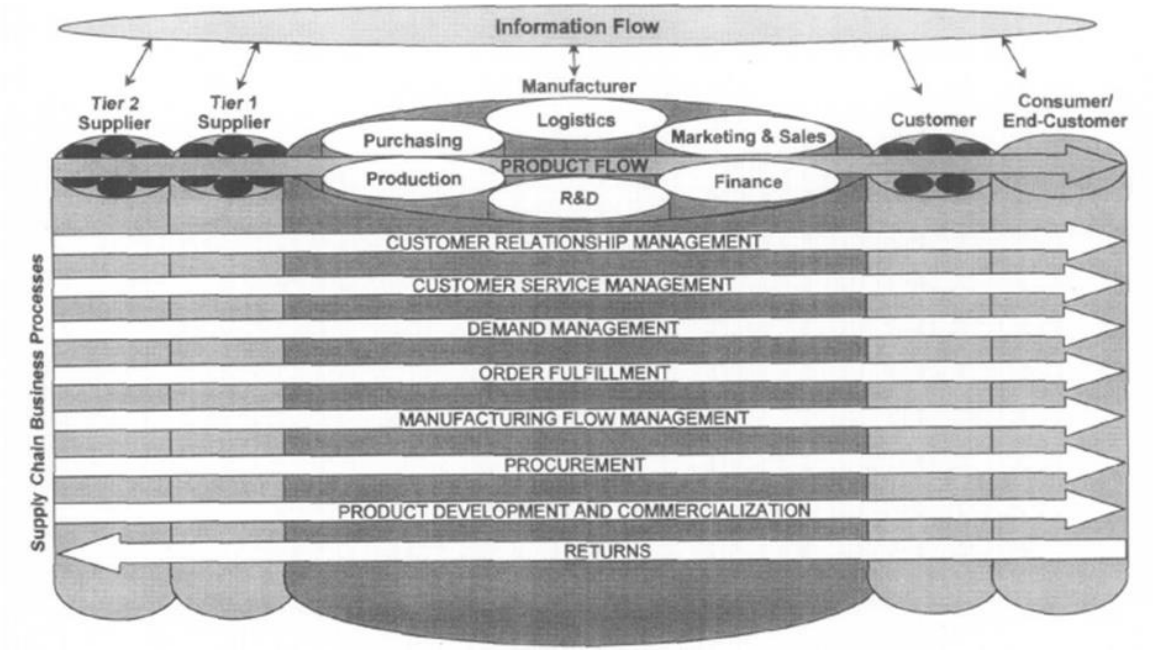


Figure 7 Supply Chain Management: Integrating and Managing Business Processes Across the Supply Chain (Lambert et al. 1998 , p.2)

The figure above is taken from the authors Lambert et al. (1998). This gives a good overview of the SCM structure. This may possibly be described as a framework or an umbrella with its various actors and processes. SCM has the focus on integrating the various processes and actors. The SCM framework can be split in three main systems. These are *Structure, Components and Business processes*. The figure shows how the main structure is linked together with the business processes and actors.

The figure explains that there is a horizontal and vertical structure. The horizontal shows the various tiers, and the vertical structure represents the number of suppliers within each tier. The figure shows eight business processes, which follow the horizontal axis. It does not describe the steps or any details how the business processes are carried out. However it stresses the requirement of having a broad overview over the different business processes, actors, components and functions in the framework within the entire supply chain network.

Further, the figure vaguely indicates the functions crossing the business processes. The last system is the various management components shown in figure 8, which should be integrated in figure 7. However, this is not visualized in the figure.

As mentioned the SCM components seen in figure below by Cooper et al. (1997) are integrated in the business process. Of the ten management components listed below we see that the seven has to do with the structure of the business processes. The latter will manage the planning and control, another will handle the management methods and the last one will handle culture and attitude.

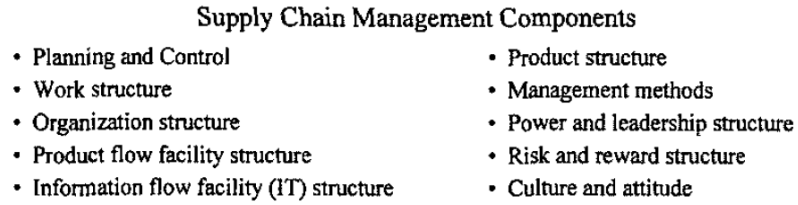


Figure 8 A Framework of Supply Chain Management (Cooper et al.1997, p.10)

The figure 7 does not clearly show how the functions interact with the business process flows other than that the functional silos are crossing the business processes. In addition the integration of the management components cannot be seen in the figure.

SCM has the focus on integrating the various processes and actors, which will be of interest in this case study. This can be related to the information flow which is integrating business processes and actors together.

4.3 Information Supply Chain

A supply chain can be referred to as many companies that are linked. The supply chain starts with acquisition of raw material, to the output of finished goods delivered to the end user (CSCMP 2010). This definition can be complemented by Donald Waters (2009)definition of a supply chain: *"…consists of the series of activities and organisations that materials move through on their journey from initial suppliers to final customers."*(Waters 2009, p.9).

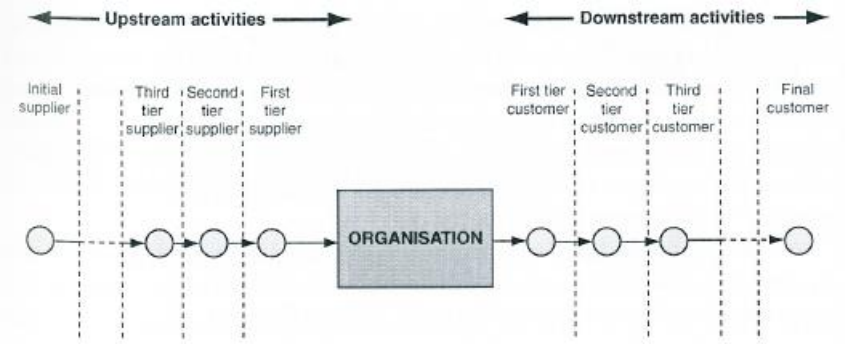


Figure 9 Activities in a small supply chain (Waters 2009, p.9)

Figure 9corresponds with the definitions and shows the basic structure of a small supply chain. The material flow starts from the initial supplier upstream heading towards the focal firm. It continues downstream to the final customer as an end-product. Although the figure does not show how the information flows, but it is logical to assume that the demand starts from the final customers as information and then spreads through the supply chain. It shows how the various actors are linked in the chain. The figure will be useful in this thesis to illustrate how the different actors in this thesis are interconnected.

A supply network includes several supply chains with different actors connected to each other through several processes.

The difference between supply chain and supply network is that a chain is a sequential line of links. A network gives a broader perspective of more complex inter-firm relations such as there are many companies linked together. The similarities between supply chain and supply network is that buyer and supplier are linked together to serve the end-customer (Harrison and Hoek 2008). However, according to (Waters 2009) the difference between the two can just be a matter of definition. This is because they describe the same structure. Therefore a supply network can be regarded as a larger form of supply chain.

According to Harrison and Hoek (2008)*"The focal firm is embedded within the chain, and its operational processes must coordinate with others that are part of the same chain."* (Harrison and Hoek 2008, p.9). A company will be a customer buying materials from

suppliers, and in the next instance, it will act as a supplier when the goods are delivered (Waters 2009). This shows how integrated the companies are.

	Supplier	Manu-facturing	Distribution	Retailing	Customer orders &forecasts
Planning	• Available products • Stock availability • Lead time • price	• Products available for manufacturer • Batch size • Lead times • Cost • location	• what is to transported • transport to where • What mode • What price	• what is to transported • transport to where • What mode • What price	• Who is the buyer • What product has been bought • What price • Where is it bought • What price • Quantity • Future orders and long-term trends
Execution	• Available products • Stock availability • Lead time • price	• Products available for manufacturer • Batch size • Lead times • Cost • location	• what is to transported • transport to where • What mode • What price	• what is to transported • transport to where • What mode • What price	• Who is the buyer • What product has been bought • What price • Where is it bought • What price • Quantity • Future orders and long-term trends
Intercompany	• Available products • Stock availability • Lead time • price	• Products available for manufacturer • Batch size • Lead times • Cost • location	• what is to transported • transport to where • What mode • What price	• what is to transported • transport to where • What mode • What price	• Who is the buyer • What product has been bought • What price • Where is it bought • What price • Quantity • Future orders and long-term trends
Strategic analysis	• Available products • Stock availability • Lead time • price	• Products available for manufacturer • Batch size • Lead times • Cost • location	• what is to transported • transport to where • What mode • What price	• what is to transported • transport to where • What mode • What price	• Who is the buyer • What product has been bought • What price • Where is it bought • What price • Quantity • Future orders and long-term trends

Table 1 Supply Chain Information Framework (Sadler 2007, p.127)

The table above is an analyzing tool which shows the information framework to determine if a supply chain has sufficient information. There are five supply chain stages in horizontal axes. In the vertical axes there are four decision phases. Each supply chain stage will request information like: Available products, Stock availability, Lead time, Price and much more. This is to determine if any information in the supply chain is lacking, as all information is important for each phase and stage (Sadler 2007).

The structure of this figure will be of interest to use in this thesis.

On the other hand this figure neither shows not inform about the exchange of information, it only describes the type of data.

4.4 Information Business Process (IBP)

Information is needed in order to run a business process. Therefore business processes are further elaborated below.

A business process can be defined as: *"A collection of activities that takes one or more kinds of input and creates an output that is of value to the customer."* (McCormack et al.2003, p.201)
This describes business processes as a series of activities which each may have one or more inputs. The output is a product or service that will add value to the next activity and finally to the customer.

Another definition of business process is done by Steven Alter(1996):

> *A related group of steps or activities that use people, information, and other resources to create value for internal or external customers. The steps are related in time and place, have a beginning and end, have inputs and outputs.* (Alter 1996, p.705)

For instance an example of a business process, in a company, is to produce products, hiring employees and to maintain the equipment. These business process examples consists of activities that have a beginning and an end, with inputs and outputs (Alter 1996).

Figure 7 , by Lambert et al. (1998) visualize eight different business processes in a SCM system. These are the processes with the functions and activities where the values to the customers are produced.

According to Word and Magal (2009) there are three core business processes. The first is the *procurement process*, where materials are bought for production or service. The second is the *production process* (manufacturing flow management) where the product is manufactured or service is generated. The third is the *fulfillment process* (order fulfillment), where the goods or services is delivered to the customer.

Business processes will be quite different between various industries and companies, and usually very complex. For instance some companies might have no production process,

because the final product is purchased. Other companies have to buy raw material and will need a production process. We will describe the procurement process below.

Figure 10 Procurement Process (Word and Magal 2009, p.7)

Figure 10 by Word and Magal (2009) above shows the procurement process. The procurement process starts by deciding what to produce, what material to use, and how many units they want to produce. They need to find out who sells this material or component, and when they need, components or raw materials delivered, in order to meet the production due date. When this is done, the necessary components or raw materials are to be purchased. First, a purchase requisition is created, and then a purchase order (PO) is created and sent to the selected supplier. Goods will finally be received, an invoice will be sent, and the payment will be executed.

The figure is visualizing a business process which is focusing on internal activities within a company. It focuses on activities and do not show any flow of information in this process. The figure might appear rigid. It should not be implemented without the possibility to ensure that the process is flexible and able to accommodate changes both internally and externally.

The figure will be of interest in this thesis. The reason for this is that business processes is shown step-by- step, which in our case is necessary when mapping a supply network. However, the figure only visualizes an internal process and in this thesis this will not be of interest. The reason for this is that our focus will be of an external process.

According to Word and Magal (2009) the efficiency of the business processes depends on the organizational structure and design. This depends on how the workers are grouped in the various units or departments. Where departments are responsible for functions related activities, they will have a functional structure. For example, the warehouse takes care of receiving and shipping of materials. See figure11for a typical functional organization.

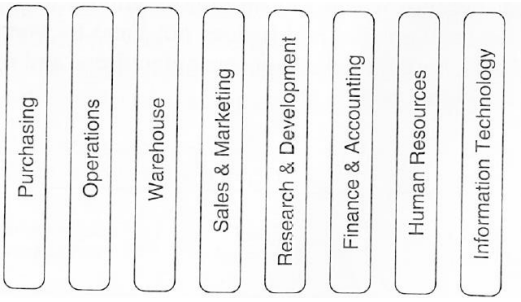


Figure 11 Functional Organization (Word and Magal 2009, p.8)

Each function will have several activities. The information network should be linked between all these activities and between the other functions in the organization.

The business processes must be aligned and be functional within a company. This in order to succeed when crossing company borders and international borders (McCormack, Johnson, and Walker 2003). Thus, it is important that the business processes is integrated within a company. It must be able to cross multiple company boundaries and be cross-functional. It involves all type of companies from banking to producers and retailers.

According to Word and Magal (2009) functional structures were effective in handling challenges related to rapid growth. However, it led to people understanding only their own step in the process, without fully understanding the entire picture. This is called the silo effect which is caused by the lack of sharing of information between the functions.

Lack of sharing information was caused by functional isolation. This led departments to develop their own information systems. The problem is further discussed by Boddy et al.(2008). They state that when the product or service moves between departments, boundary difficulties arises causing misunderstandings and problems. The reason is that nobody has ownership of the complete process.

The business process is cross- functional. The challenge will be the coordination of activities in different locations, functions or departments. To accomplish this, the key will be to exchange information effectively, utilizing an information network.

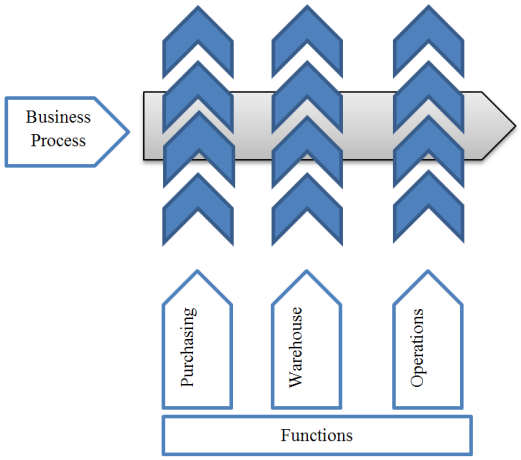


Figure 12 Cross functional Business process with integrated functions

The figure above shows that the business processes are cross- functional. This means that several functions will take place in each business process. This may include several activities within each function. It will also include various actors in the business process on various locations. It is important to utilize the business process view to avoid the silo effect. This will be valid for internal and external processes. Thus, it will be of interest in this thesis.

The best way to integrate an information system is to focus on the business process rather than the function (Word and Magal 2009).The information network will follow this cross-functional structure in this business process.

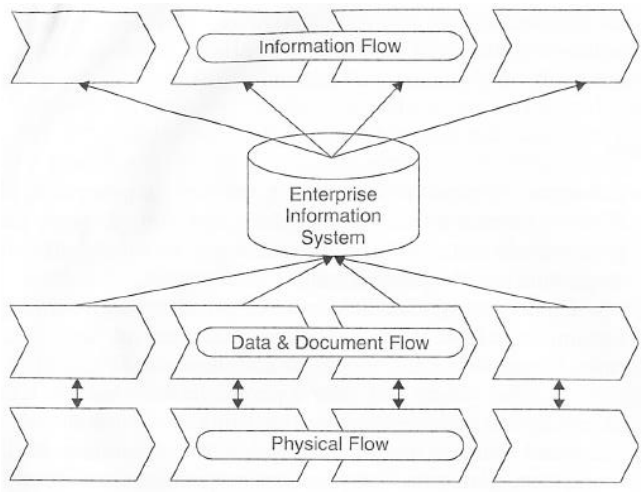


Figure 13 Process Flows (Word and Magal 2009, p.19)

Figure 13 above, represents different flows occurring in a business process, which will be the *information flow, data and document flow* and *physical flow*.
The data on the goods are modified when a shipment is conducted against a customer order. This ensures the shipment details have been incorporated into the information system process. Therefore the movement of the goods can be traced at any time. In addition other details on the goods like amount, locations, quantities and dates will be linked in the system. Documents and data will be modified or possibly created when steps in the process are performed.

The information flow is associated with all the steps in the process. Information may be utilized for stock, control, purchase orders, statistics and much more (Word and Magal 2009). The figure gives a general view of the optimal process flow. In reality there are several factors that might affect the flow.

For example, in such a model one might consider to show the interfaces between the various actors in the enterprise. One might also consider other risk factors like Economy, Policy, Alliance, Knowledge, Non sharing, Competition, Human error, Silo effect etc. However, this model will be of interest in this thesis because the information we are looking into will be related to a product and documents.

As mentioned earlier, information can be seen as a support function to the physical flow. However, information can be seen as a process in itself. The flow of information will have

a different input, transformation and output. Thus, the information process will be described below.

According to Chaffey and White (2011) information can be defined as: "*Organized data, meaningful and contextually relevant. Used for decision making.*" (Chaffey and White 2011, p.17). The term decision making is of interest, due to the fact that raw data itself might not be enough for taking right decisions.

In order to use data, it is therefore a need for transforming it into useful information. Information can then afterwards be seen as a resource that is used to achieve a purpose. By adding meaning becoming knowledge, it will contribute to a better understanding and also achievement of the purpose.

Resources can also relate to the human side, and what each person possesses in form of experience and knowledge which can contribute to add value. The term knowledge can be defined as: "*The combination of data and information to which is added expert opinion, skills and experience to result in a valuable asset which can be used to make decisions*" (Chaffey and White 2011, p.17).

Data, information and knowledge can therefore be seen together, where:

> *Data have commonly been seen as simple facts that can be structured to become information. Information, in turn, becomes knowledge when it is interpreted or put in context, or when meaning is added to It* (Tuomi 2000 , p.105).

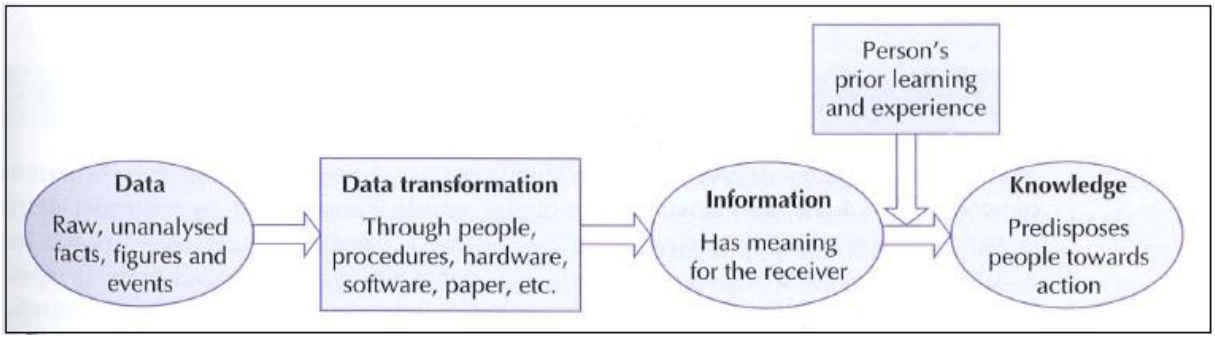


Figure 14 The links between data, information and knowledge (Boddy et al. 2008, p.7)

This figure above, derived from Boddy et al. (2008), shows how data, information and Knowledge is connected. It displays a type of process which concern information, where it is focused on the transformation of information. It can be related to production processes, where an output is produced.

Information can thus also be seen as a product, a product which gains more value as it is going through the transformation process from raw data to becoming knowledge through adding meaning (Polewa et al.1997).

In the case of information process, knowledge can be seen as the last step of adding value before information becomes clear for usage (Polewa et al.1997). The process can further be seen as an information value chain; where in relation to information the meaning of value usually means "*value-in-use or its benefit to the user, i.e. its meaning for the use*" (Polewa et al.1997, p.160).

In relation to information business process this can be seen as a figure that "produces" usable information from raw data at steps in the supply chain. In relation to a chain that includes several steps with different actors, the value chain of information produces usable information for a customer(the next step in the chain), where they all together contributes to the main chain where the end customer will be the final step that needs the information produced from all the previous step.
The information process also contribute to customer value in the sense that it is supporting the physical process, contributing to a continuously flow.

The objective of an information business process is to optimize profit by sharing information on each step and link in the business process. A new definition of an information business process should fit both an internal and external process. The process of information in itself can be said to be equally important to processes concerning physical goods.

Where there are physical processes, there will also be found information processes. Since there is no clear definition of information business process from the theory, the authors find it necessary to create a concrete definition of information business process (IBP). This definition is as following:

"*The input of information set by an actor that through transformation creates a useful output for the next receiver of the information in a process*." (Composed by the authors, 2013)

4.4.1 Decision phases within the IBP

The information in an IBP can further be divided into different phases.
According to Alter (1996) there are three separate activities occurring where there are participation in a business process. These are *Planning*, *Execution* and *Control.* First the process of *planning* is to make decisions on what to do, when to do it and what is going to be the output. The second process is the *execution* of the work and third is the process of *controlling* the work based on information from earlier performance. This is to ensure objectives are met and plans are fulfilled.

Information will be different for the three activity processes, in general plans are made for the future, whereas the present will be in the execution activity process and the control activity process is utilizing historical information to learn from the past. Consequently it is important to differentiate between these activities to ensure each process gets the adequate information, since each process requires different information (Alter 1996).

Planning activity creates work standards and the order in which work is to be done. In general planning is information. The execution activity generates information which is utilized in the control process. This information will be fed back to the execution and planning process to keep the process on schedule and reassures that the objective will be met. The control activity is basically using information. Therefore all types of control and planning require a lot of information; in addition any corrective action will also need information (Alter 1996). The IBP will have to be utilized for these three activities.

4.5 Information System

Chaffey and White (2011) are mentioning that in order to use information for decisions purposes, data needs to be changed into information, which can be done through information systems. Different kind of information systems are related and used for sending and receiving information between different actors at different stages and is essential for the information flow. Due to this it will be of interest to look into information systems which will be elaborated further below.

Information System (IS) can be defined as:
"*A computerized or manual system to capture data and transform them into information and/or knowledge*" (Chaffey and White 2011, p.17).

Information systems is containing procedures, resources and people, where data is collected and transformed, which also can be computer-based information system where communication and information is able to go faster and more widely across different boundaries. Information system can be said to be both by computer but also manually systems, where informal system and computer based systems is seen side by side (Boddy et al.2008).

From earlier it has been mentioned theory concerning information network. Thus, it might be necessary to differentiate between these concepts before moving forwards. From the definition composed by the authors information networks can be said to be linking "… *internal and external companies, ensuring information flow and driving the material flow*". The information systems on the other hand, are the enabling factors in this flow of information between actors, as a facilitator of the information flow.

Information can be coordinated by human or it can be coordinated through computer based systems. Although most computer based systems are combined with the need for human handling, it also needs to communicate with other organization with different systems.

Further it will first be looked into human based and paper based system, before computer based information system will be explained afterwards.

4.5.1 Human and Paper based information system

Although information becomes more digitalized with different computer based information systems, there is still a need for human and paper- based information systems in order to handle different work tasks.

Many companies are dependent on having good IT systems, although of the improved technology there is still a need for *paper-based information systems*. This is because information can come in form of a paper which follows the physical goods, or it can be important information that must be stored in an archive.

Many organizations have different routines in how they operate, and thus the paper-based systems are described underneath. The paper based systems is of relevance in this thesis when receiving physical goods and material.

Paper-based information systems are easy to implement and understand and the information comes in form of a paper and this system is often used when it is important to trace the transactional stages or if there is a high responsibility of a transaction (Boddy et al. 2008).

Most of the computer based systems need to be handled by humans. As in many organizations there will be a need for having human and IT systems in order to complete work tasks. Thus, human information system is suitable since a drilling process is dependent on having human as a catalyst for giving information.

Human information systems are informal systems and according to Boddy et al. (2008) mentions that everyone is an information systems. Humans use the information from the environment to create decisions. This can be done by communication verbally or study data (Boddy et al.2008).

4.5.2 Computer based information system

Most companies use information systems which are composed of several systems. This is in order to manage different tasks and for different purposes within and across company boundaries. However, in order to do so there is a need for having suitable information technology in order to handle companies' mission, especially when several actors are co-operating with different composed systems. In order to handle demand, there is a need for communication and composed data systems, which might make it easier and faster to handle their work tasks.

One examples of common used information system is the *Enterprise Resource Planning* which will be explained underneath.

Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is a class of application software. According to Klaus et al. (2000.) it seeks to integrate several different business processes and functions in one single solution. Further, ERP can be looked upon in several different ways.

First it can be seen as a product in form of software. Secondly, it can be seen as an integrative structure, such as mapping data and processes of an organization. Finally, it can be looked upon as an integrated infrastructure for a business.

ERP exist in three different forms which are generic, preconfigured and, installed. The characteristics of generic ERP software are that it must be adapted to each and every single organization before it can be used. The generic ERP software has been used in order to create templates for specific industry sectors. In these cases it is sold as a preconfigured package.

After the ERP software has been installed it needs to be individualized in order to meet the requirements of the particular organization. For the best possible configuration one needs to start with the generic software (Klaus et al.2000.). ERP is used to manage "*…information about organizational resources such as raw materials, products, staff and customers as a part of delivery a product or a service*" (Chaffey and White 2011, p.44).

The fact that ERP is an information system suggests that the users are of importance as well (Klaus et al. 2000.). This is of interest in this thesis because several of interview objects are using the ERP systems like SAP.

4.5.3 Different types of data within computer based information systems

There are different kinds of data related to computer based information systems, which can be classified depending on the purpose they are to be used for. According to Word and Magal (2009) there are three main types of data related to enterprise systems. These are *Master data*, *Organizational data* and *Transactional data*, which will be explained briefly below.

Master data

"*Master data define the key entities with whom an organization interacts, such as customers and suppliers*" (Word and Magal 2009, p.38).

Master data can be divided into three parts such as *places*, *people* and *things*. The places describe offices and different types of locations. People may be personnel, suppliers, vendors, and consumers. The word thing is related to assets, documents, accounts and products.

Standardization and synchronization is necessary for proper system integration. Normally Master data is relatively static data and it does not change as frequently as transactional data, however more often than organizational data (McGilvray 2008).

Master data is not related to a special process; however the data is required for certain process- steps in order to enable the execution of different processes (Word and Magal 2009). For example it is not possible to create sales orders, unless master data exists for a customer. Therefore, the master data must be shared across multiple functional areas and processes.

The master data must be maintained in order to correct and complete information in the organization (Word and Magal 2009).

Transactional data

"Transactional data reflect the day-to-day activities of the organization" (Word and Magal 2009, p.38) . Every time an activity occurs in the organization, data are created especially for these activities and therefore the transaction data are changing frequently (Word and Magal 2009).

The main part of the companies' data is transactional data. Transactional data includes *"…who did what, when and where"* (Word and Magal 2009, p.38), and it is data for a specific tasks. This type of data contains information related to a transaction or event occurring external or internal during the execution of a business. For example purchasing or sales orders, insurance claims, shipping documents or invoices (McGilvray 2008).

Organizational data

"*Organizational data are used to define the organizational structure of the business*" (Word and Magal 2009, p.38). In an organization it is necessary to have organizational data in order to accommodate business processes that spans across organizational units.

The structure is contributing to define how different activities are organized within the organization, and are supporting the business processes (Word and Magal 2009). This type of data does not change much over time; it is changing seldom in opposite to transactional data (Word and Magal 2009). Examples of such data are an origination's quality manual, HSE policy and work instructions, which functions as guidelines for its employees in their daily work.

There will be elements of *Master, Transactional* and *Organizational data* found in almost every data exchange within a computer based information systems. This means that when executing a transaction there might also be both master and organizational data involved in order to be able to complete the transaction.

There is no use of sending only master or organizational data separately, however they will complement the transactional data. When focusing on an operational level, most of the data will concern transactional data because it mainly concerns day-to-day information.
The information still needs details about the organization and fixed detail that enables the information to reach the next receiver. The amount of this data is not the main data which is transferred at an operational level. Therefore, in this thesis, at an operational level it will generally be only transactional data.

4.6 Coordination Theory

In every process that includes different activities, either internally within organizations or externally between organizations, different components and actors are linked together in some way. The way things are related affects how the process is flowing, the efficiency of the process and also the outcome of the process. This is based on how the actors work together.

An essential part of linking a process together is the information flow, but also sharing of the information. This is important for collaboration even though it is internally within an organization. Every actor in a process is dependent on information. If there were no information exchange between activities, it would be difficult to execute a process, which includes different actors and the process will not be utilized as a whole.
Also, when several actors are collaborating, the actors are even more dependent on the information sharing which becomes more complex.

When looking on the previously mentioned theories, the figures from Sadler and Boddy et al. can be criticized since they are not explicit taking these dependencies into consideration. This means that they are not looking into how different actors are dependent on information in order to perform their processes. This is important when looking at a network perspective where multiple parts are linked together in order to gain an overview of the critical links regarding information.
Thus the dependencies in relation to the information flow and the network will be of importance in this thesis.

Thomas W. Malone and Kevin Crowston (1994) has defined Coordination Theory (CT) in a broad and simple definition since coordination can occur in many kinds of systems. Their definition of coordination is: *coordination can be seen as the process of managing dependencies among activities* (Malone and Crowston 1994, p.87)**.**

However, in order to be able to identify dependencies, there is a need for mapping the company's activities by going more deeply into specific business processes.
Further the different examples of dependencies mentioned by Malone and Crowston (1994) will be briefly explained below.

4.6.1 Shared resources

This dependency concerns limited resources shared by several activities, for example *the time that an actor have,* but other examples of dependencies can also be *economic aspects* and *space used for storage* etc. (Malone and Crowston 1994).

Shared resources could be related to information that is used by more than one actor at a time. Different actors are dependent on having the same information in order to execute their activities and tasks. This can be for example an ERP system. Another problem that might occur, is if these are only few people that have this access. The ERP system for example, has several different user sites, and not all have access to everything. The same could be said when there are different actors from different firms collaborating through a chain, where not everybody has access to everything.

Shared resource dependency could also be related to if one actor has resources in form of knowledge or information that needs to be communicated to several other actors which performs different activities. The actor might be the one that receives first-hand information or being updated about an unforeseen event due to responsibility area. Other actors is therefore dependent on the information which the first actor that possess, and might not proceed before they receive the information. Due to that they might not have the knowledge about further procedures. If several steps afterwards use the same information, I could be said to be shared resource dependency where they all “share” the person that possesses this information.

4.6.2 Task assignment

This dependency concerns the dependency between task and actor. Where some tasks require specialized skills and the constraint will possibly be the lack of skilled craftsmen (Crowston et al. 2005). Any task dependency can be linked together with management allocation of resources, where the limited time an actor have to execute the work will determine the tasks that is going to be executed (Malone and Crowston 1994).

Different types of Computer based information systems may be used by a limited number of actors. This is because some of the workers might have special skills in form of training, education, authority and knowledge about certain areas and know how to use the systems. They are the ones that have the information, authority or knowledge to make the input into the systems. This can for example be related to an internal system used by a company, such as the accounting department or the purchasing department, which have access to certain areas to make an order or handling invoices. However, it could also be related to the ERP systems, which may have several different modules and where a limited number of workers have access to all the functions.

These examples also create problems in form of bottlenecks, since there are limited users that can operate the systems, in addition other personnel will be dependent on the input.

The task-actor dependency can also be related to what an actor possesses of special knowledge or having more responsibility. Some actors might have experience or knowledge about a certain task which means that the actor has some valuable information which others do not have. This may limit which actor that can perform the task, which will result in fewer alternatives for who can execute the tasks with the same information and knowledge.

4.6.3 Producers/ Consumer relationship

The producer and consumer dependency concerns tasks that create a resource which another actor is dependent on. Both human and computer systems are using information

that is produced in previous steps in the process and this dependency can therefore also be related to information (Malone and Crowston 1994).

There are also several dependencies found under the producer-consumer relationship.
The Prerequisite constraint dependency means that in order to proceed the previous task need to be finished, meaning that the next step cannot start before the previous one is completed (Malone and Crowston 1994).

This constraint is also relevant when it comes to information. In a process each actor is dependent on the information from the previous process in order to start.
As mentioned before, information is flowing before the physical process start, under and also after the physical process is finished. The need for information might be especially important during a process, where it is required to have information on when the tasks is finished, in order to start the next tasks.

Physical distances between the actors are more demanding when trying to coordinate a process taking place across organizational boundaries. An example is that an actor needs to be informed prior to picking up the goods when it is ready to be shipped from a supplier.

Even with a common information platform there will still be a certain degree of dependency, because procedures need to be created and followed to enable the actors to register, monitor and utilize the information. The actors are also dependent on access to the information system itself or receive information.

Transfer dependency is when something is produced, which is going to be utilized in the next step in the process needs to be transferred. When information is being transferred, the coordination activity of transfer will be communication (Malone and Crowston 1994).

When different actors are collaborating together across organizational boundaries, they are often using different kinds of information systems or same type of system might not be linked together. When data needs to be transferred to the next user, problems might occur. Additional communication will then be necessary in order to overcome the transfer dependency, where information sharing is necessary.

The essence of *Usability dependency* is that the produced outcome (product, service or information) should be useful for the step which receives it (Malone and Crowston 1994). There is a large amount of information flowing through the information systems which are used by different actors and the information must be useful for the receivers.

The input made by different actors in the different information systems need to be complete and relevant for the purpose it is intended for. Information systems that contain too much information can also be confusing, and important information can be overseen in the vast flow of information.

Missing information, lack of details or use of abbreviations can cause problems when handling incoming goods, especially if there are several systems that are being used.
In either case above, the usability of information that is available through the information systems might be causing less usability.

4.6.4 The Simultaneous constraint

This dependency arises when various tasks occur at the same time and scheduling, coordination and managing is required.
This dependency can be related to computer systems, where tasks can be executed individually or simultaneously. The challenge arises when resources and data must be shared (Malone and Crowston 1994).

4.6.5 Task/ sub task

The *task/sub task dependency* has to do with the concept of achieving a goal, where several activities are sub tasks for obtaining this overarching goal (Malone and Crowston 1994).
An example of Information systems can be related to when different actors are adding input at different stages in an ERP system. Each input is necessary in order to fulfill a complete process, for example a purchasing process. Information input can come from several different actors and systems when collaborating across inter organizational

boundaries. Each input and actor is therefore co-dependent on all the inputs in order to proceed. However the final result of the whole process also depends on that all the inputs from all the actors are fulfilled correctly in order to reach the final goal.

4.7 Information Flow Mapping Model (IFM)

In this thesis we have investigated several different theories regarding information flow in a supply network, supply chain management, supply chain and business process perspective. It is understood that information is seen as a support function for a product.

None of the theories manage to show or describe how the information flow can be mapped in a supply network nor have they clearly explained the dependencies between the different actors in regards to information. Therefore, in this respect we have developed an information flow mapping model (IFM).

The objective of this model is to use the related theories in this thesis to map information flow in a supply network. The theories concerning supply network, supply chain management, supply chain and business process will be the basis for the mapping part of the model, while the CT form Malone and Crowston will be applied in relation to identify dependencies.

This model expands the business process and supply chain view by looking at an external information business process perspective. The model will stepwise describe how to map an external information flow in a supply network at a process level. This will result in a foundation which is needed in order to further highlight different kind of general and critical dependencies that could be found within the information network. The developed IFM model is shown below, and will further be explained step by step.

The IFM Model

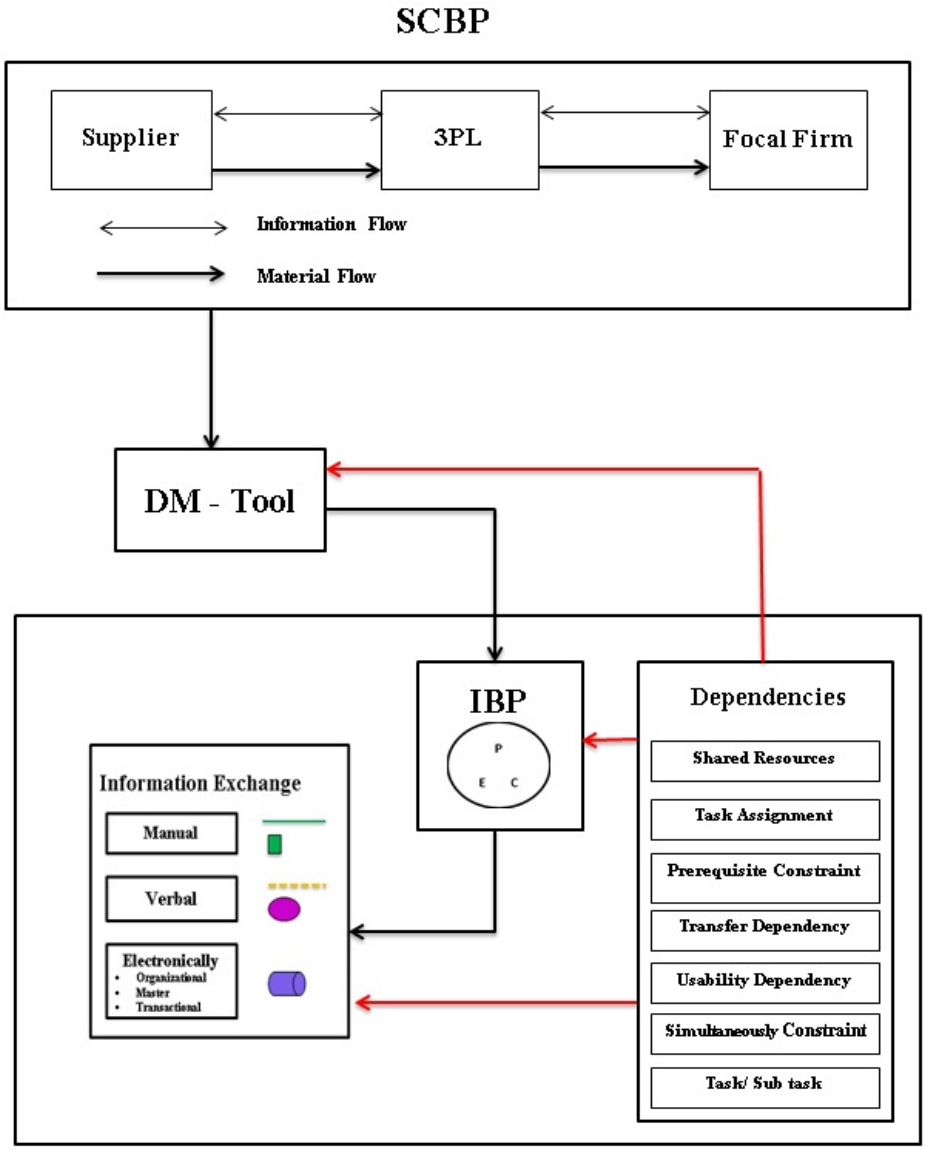


Figure 15 Information Flow Mapping Model (IFM).

The model shows a general Supply Network consisting of physical flow of goods, processes and information flow. For simplicity the model only shows one supplier, a third party logistic provider (3PL) and a focal company integrated within a SCBP. In addition we also see the link with the DM, IBP, the information exchange and dependencies.

4.7.1 Supply Chain Business Process (SCBP)

In general a supply network consists of several actors. The various actors are linked together as seen in the model. The supply network is a complex inter-firm relation, because the actors are cooperating through company boarders.

Goods are crossing the different SCBP, through various actors like suppliers, manufacturers, distributers and retailers. The input can be information, people, finance, material etc. The input will be transformed in the process and the output could be goods, information, services, reputation or waste etc.

Several functions will take place in the SCBP. This will be similar both for internal and external processes. However, in this model we will focus on an external process.

Material is going in one direction from the supplier via the 3PL and to the customer (focal firm) also utilizing the 3PL. The material is crossing inter-organizational boundaries. Still, goods cannot flow without information which may be seen as a support function or a driver for the physical flow. The information is needed in order to ensure the materials moves as intended and in a seamless flow. It links the internal activities within companies together with external actors. Therefore, it is important with sufficient information.

The Define and Map tool (DM), Information Business Process (IBP) and the information exchange are processes and tools utilized within the Supply Chain Business Process (SCBP). The dependencies will visualize how the actors are dependent with each other regarding information. On the model they are drawn as if they are separated from the SCBP, but in real life they are integrated within the SCBP.

4.7.2 Define and Map (DM)

In order to identify IBP the DM tool need to be created. DM stands for *Define and Map. Define* and Map from the DM tool identifies information required in the supply network for different actors, as seen in the figure below .

Product required	Decision phases	Information from Customer	Suppliers (identification of information)	Manufacturer (identification of information)	Distribution (identification of information)	Retailer (identification of information)
	Planning	• Address /location • Quantity • Quality • Price /cost • Date required	• Address /location • Stock availability (Quantity) • Quality • Lead time • Price/ Cost	• Address/location • Products available for manufacturer • Stock availability (quantity) • Quality • Lead times • Price	• What product • Where to • What mode • What price	• What product • Where to • What mode • What price
	Execution	• Address /location • Quantity • Quality • Price • /cost • Date required	• Address /location • Stock availability (Quantity) • Quality • Lead time • Price	• Address/location • Products available for manufacturer • Stock availability (quantity) • Quality • Lead times • Price	• What product • Where to • What mode • What price	• What product • Where to • What mode • What price
	Control	• Address /location • Quantity • Quality • Price /cost • Date required	• Address /location • Stock availability (Quantity) • Quality • Lead time • Price	• Address/location • Products available for manufacturer • Stock availability (quantity) • Quality • Lead times • Price	• What product • Where to • What mode • What price	• What product • Where to • What mode • What price

Table 2 Define Information (the figure is modified by the authors on the basis of Ian Sadler (2007, p.127) supply chain information framework and Ola Bø`s SCIMN Structure model)

This information will be related to the decision phases. In this thesis only planning, execution and control have been discussed. The information may vary in these decision

phases depending on the information needed for each actor in these phases. Thus, the information will be divided into these phases.

The information will be related to what each actor receive in order to handle their activities. The information will be about the product such as quality, quantity (stock availability), price or cost. Also the information will concern about the sender and receiver, such as address or location and the date required.
The findings from the DM tool uncover the Information business process (IBP) in the network. The information in the IBP will further be exchanged in various forms between the actors.

4.7.3 Classifying Information Exchange

It has previously been mentioned different views of information, information systems and also types of data that could be exchanged within various information systems.
However, information might also be exchanged in different ways.
The theory about information does not specifically classify information exchange. This is of relevance because it might be more difficult to gain an overview of the information flow. When looking into how information is coordinated between actors within an information network it is also important to include the way of exchanging information. Thus, classifying different ways of information exchange will be elaborated on below in relation to the model.

Information will further be divided into three main forms of information exchange in this thesis. These are: *Physical, verbal* and *electronically* information exchange in relation to the mentioned factors above. It might make it easier to categorize the information in the different ways it could be exchanged, by categorizing what kind of information it is concerning, what systems that are used and if it is tangible or not. All these factors are contributing to a more complete picture of the context of the information exchange, which makes the type of exchange more clearly.

Actors		Tangible/ Intangible	IS	Information Type	Information Exchange
Sender	Receiver				
		Tangible	Paper Based	Physical Documents	Manually
		Intangible	Human Based	Communication	Verbally
		Tangible	Computer Based	**Data:** • Organizational • Master • Transactional	Electronically

Table 3 Classifying different types of information exchange

The figure above displays how the three dimensions are connected to the previously mentioned theory related to information that has been used. It also additional contains a column where the sender and the receiver of the information are displayed. This contributes to a systematically way of mapping the exchange of information for gaining an overview over where the exchange takes place.

The table is built up in a way that might make it easier to categorize the context related to the exchange of information systematically. The last table categorizes the three main classifications of information exchange that will be used for the analysis of the Upstream information network.

Manual information exchange

Physical information exchange will contain physical documents that are exchanged between the different actors. This can for example be related to physical documents like certificates, delivery tickets, manifest for transportation, labeling of goods and so on.

The papers might be following the goods that are delivered or it can be printed documents that are used for further handling of goods that contain information about further progress.

It can further be seen as underlying a paper based information system, where documents also can be archived. It can also be defined as underlying tangible information.

Verbal information Exchange

Verbal information exchange might take place between different actors both within a company and externally between actors from different companies. It can be related to communication on a regularly basis concerning daily execution of work tasks, and also information concerning updating current information. However, it might also be verbal information exchange when an unexpected situation occurs and faster information sharing is required. Verbal information exchange can be related to intangible information, information-as-process and information-as-knowledge, where the information which is known is being communicated further. It will underlie a human based information system.

Electronically information Exchange

Electronically information exchange is underlying computer based information systems both within organizations and externally between several different organizations. The three different types of data complements each other, where they together support flow of information through systems. It should be mentioned that when it comes to organizational data and master data, this is a type of data that are created and reused afterwards, however when it comes to transactional data, it might change frequently. Electronically information exchange can also be related to tangible information as physical information; due to that it can be "stored and retrieved" within information system. This means that people can use it as a "track and trace" function which might give important information for those who need it. However, it might also be related to information processing, where previous information can be basis for new informational documents or information within a system. An example could be when people receive a purchase order through the system, and use this information to make a delivery ticket that further will be sent together with goods that are going to be delivered.

4.7.4 Mapping dependencies

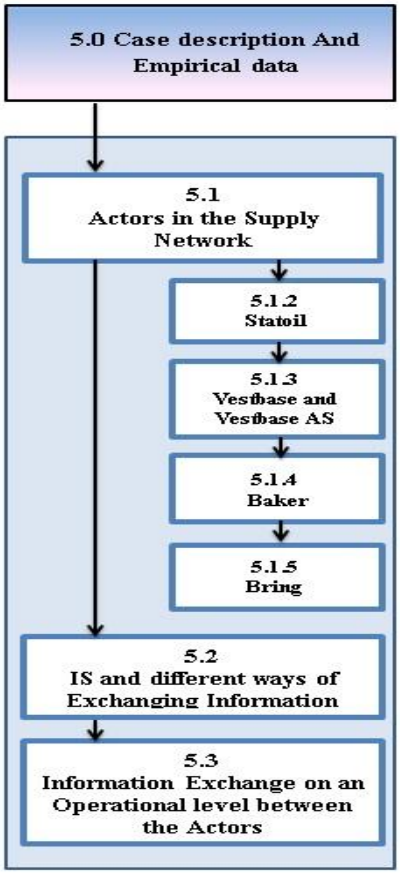
Previously in this model it has been mentioned the relations between the actors and the SCBP. It have been described a possible way information, business processes and actors can be analyzed and mapped, which have revealed information business processes. This has further resulted in a description of how information business processes can be mapped. It has also been described different ways information can be exchanged. Thus it could be

said that the foundation of mapping the information flow is set and that one further can proceed with investigating and mapping the dependencies between activities performed by different actors in form of information. These dependencies will be in accordance with the mentioned dependencies by Malone and Crowston (1994).

However, when looking into dependencies there usually are some sort of informational dependencies between most of the actors and activities**.**
In many cases it may be difficult if one needs to take into account every single dependency that may occur. With objective of identifying dependencies that affects the information flow it will most likely be useful to focus on the most critical dependencies. I.e. the dependencies which prevent the overall information flow. When identifying dependency, it will concern defining where the most critical stages could be found and relate them to those dependencies of relevance to Malone and Crowston (1994)**.** A critical point might also be related to more than one dependency.

When dependencies have been mapped, the model could be said to be completed in relation to its purpose, which is to map the information flow and the relation between the actors and activities that are found within the information network. By this point it should be possible to achieve an overall view of the information network and its elements as a whole, and achieved a better understanding of how the elements are related to each other.

5.0 Case Description and Empirical data



In this chapter, the different actors which are found within the upstream Supply network will be described.

Further the information systems used by the different actors will be showed, before looking into what kind of information that is exchanged at an operational level.

The data from this chapter will be basis for analyzing.

5.1 The Actors

5.1.1 Statoil

Statoil is an oil company which was founded in 1972, and has been an important actor within the oil industry in Norway (Statoil 2007).

It is a partially state-owned public limited company, where the Norwegian state has a holding of 67% (Statoil 2010). Statoil is the third largest net seller of crude oil in the world and also trades in natural gas and petroleum products among others (Statoil 2012c), and is operating in 35 countries and has approximately 23.000 employees around the world. The head office is located in Stavanger in Norway (Statoil 2009).

Statoil has its main office for the operation and drilling environment for mid- Norway in Stjørdal (Interview with Silseth and Taknæs, 02.02.2013.).

In Stjørdal there are several actors present, operation representatives, drilling representatives, engineers and Drilling supply Managers (further referred to as DSM). One of the supply sections they are serving is Statoil at Vestbase in Kristiansund (Interview with Statoil Drilling Supply Manager, 11.04.2013).

Statoil is operating on several oil fields along the Norwegian coast (Statoil 2012b), with offshore production at oil platforms and rigs. The installation needs to be supplied, and most of this is done by sea freight on supply vessels, passing through Vestbase` supply base where it is shipped (Interview with Statoil Drilling Supply Manager, 11.04.2013).

Statoil core business is production and exploration of oil (Interview with Statoil Drilling Supply Manager, 11.04.2013), and most of the logistics is outsourced.
However, the only part they have not outsourced is a coordination function, where Statoil have physical representatives that are coordinating operations located at the supply base Vestbase. This coordination function is called an "Operation Group" (Further referred to as SBOG- Statoil Base Operation Group) (Interview with Statoil Drilling Supply Manager, 11.04.2013).
Here they are leading, administrating and controlling the physical and informational flow, ensuring that Vestbase AS is doing their job (Interview with Silseth and Taknæs, 02.02.2013.).

The ships that are carrying goods are controlled by Statoil Marine department located in Bergen for shipping of cargo going offshore. Statoil does not own the drilling rigs or the ships, they are only leasing them from rig contractors and supply ship companies (Mail svar fra Tommy, 15.03.2013). Onboard the rigs, Statoil have just a small number of own personnel, the rest are leased rig contractors and service company personnel working together with Statoil in the daily operation of the rig (Interview with Silseth and Taknæs, 02.04.2013.)

In this thesis the rigs and the ships will be seen as Statoil in order to simplify.

Statoil presence at the drilling rig

On a drilling rig there are several different actors including 2-4 Statoil employees which represents Statoil ASA during the drilling operation. Their purpose on the rig is to coordinate and control that various tasks are executed according to the agreed plan. The drilling rigs are leased to Statoil from different rig owners (Interview with Silseth and Taknæs, 02.04.2013.)

Logistical tasks of drilling rigs and production platforms

Vestbase AS is serving both drilling rigs and oil platforms for Statoil (Interview with Silseth and Taknæs, 02.04.2013.). However, in this thesis the focus will be on a drilling rig which is being described below. The logistical activities of a drilling rig can be split in two parts; a marine and an operational part. The marine part for a drilling rig has a need for regular supply of spare parts and chemicals. In addition there is a basic requirement for food and catering supplies, diesel, fresh water and personnel.

During the operational part, the drilling rig has continuous sequential operations. The drilling operation requires various equipment, for instance bottom hole assemblies (used in the drilling string), casing, drilling bits, chemicals for drilling fluids and cement. In addition to this, return of rental equipment is needed in order to keep the cost down. Further, there will be return of various goods such as Oil Base Mud, cuttings skips and garbage.

On a drilling rig, unplanned operations frequently occur; the unforeseen events will cause priority demands. Then relevant equipment, which are mainly rental, is shipped to the rig with high priority (Follow up e-mail from Tommy Taknæs, 22.04.2013)

In this thesis it has not been distinguished between the different types of drilling wells, thus they will only be described briefly below.

Exploration, production and injection wells

Vestbase AS is currently supplying three different types of drilling operations: Drilling of *exploration wells, production and injection wells*. Much of the equipment for these different wells is the same, such as casing, tubing, drillpipe, supply lines, chemicals and other drilling equipment (Interview with Silseth and Taknæs, 02.04.2013.)

From geophysical surveys and geological studies the presence of hydrocarbons will be identified. The wells are planned, and a drilling rig with required equipment will be set up to start drilling an exploration well. In addition to the planned equipment, unforeseen events might occur, which can cause priority orders for equipment which is difficult to predict in advance (Follow up e-mail from Tommy Taknæs, 22.04.2013)

Exploration wells will provide information about the occurrence of hydrocarbons in the formations being drilled and form the basis for a decision of field development (Interview with Silseth and Taknæs, 02.04.2013.)

Statoil presence at Stjørdal

Statoil's office for the operating and drilling environment in middle of Norway is located in Stjørdal, where the drilling and well operation for Statoil is managed (Interview with Silseth and Taknæs, 02.04.2013.)

The drilling environment in Stjørdal consist of different actors included engineers and DSM and it is spread over three different places within Norway (Interview with Statoil Drilling Supply Manager, 11.04.2013). However, in this thesis the drilling environment will be mentioned as Statoil Stjørdal, where the DSM and engineers will have key roles in the process.

The engineer has the knowledge of what equipment is needed and has the responsibility for making sure that the right equipment is being ordered. The DSM has the responsibility for ordering and making sure that the equipment is delivered to the right place at the right time (Interview with Statoil Drilling Supply Manager, 11.04.2013). Statoil Stjørdal receives information from the rigs about needs that appears. The drilling environment has regular videoconferences and some of the parties that are present during this meeting are: the rig, Statoil in Stjørdal and the external supplier Baker. They discuss the plan for the day. If the plan is in order or if they have to change anything, in case of prioritizes that must be handled.

They are also planning ahead on a weekly and monthly basis (Interview with Statoil Drilling Supply Manager, 11.04.2013). The DSM and engineers have most of the contact with the supplier, especially when things appear after the morning meetings (Interview with Statoil Drilling Supply Manager, 11.04.2013).

Statoil base Operation Group (SBOG)

SBOG was before located at the terminal unit at Vestbase AS, they have recently moved their office located nearby the base area close to Vestbase AS (Interview with SBOG 04.04.2013.)

Before, each personnel at SBOG had the responsibility for only one specific installation. Today their area of responsibility is larger since they now have the responsibility for different installations simultaneously (Interview with SBOG 04.04.2013.)

Their main function is to coordinate sailing routes and material flow at Vestbase AS for Statoil (Interview with SBOG 04.04.2013.)

They are rotating their work tasks between personnel at SBOG, so the operation is not dependent on one single worker. This increases their knowledge in several areas of the operations (Interview with Statoil Drilling Supply Manager, 11.04.2013). Their work tasks are divided into four groups Backload, Plan and projects, Outgoing cargo and Material flow. However, in this thesis the focus will only be on the two latter.

The responsibilities for personnel handling the Outgoing cargo are daily planning, supply vessels and storage vessel and bulk. They also manage priorities and have the

responsibility of the loading meeting for the vessel. They are updating status, printing out loading lists and checking the weather forecasts at the beginning of the day.

The responsibility of the personnel concerning the *Material Flow* is to follow up the Loading-Renting Log and Technical services. They have the responsibility to inform enterprise regarding the material flow (Follow up e-mail from SBOG, 08.05.2013)
SBOG are not doing much physical work, except handing out documents for the meetings (Interview with SBOG 04.04.2013.)

Statoil presence on the Ships - Statoil Marine

The ships go offshore from the supply base and are handled by the marine department in Bergen. Statoil is in charge of the goods when the ship is at sea. The ship receives documents concerning the cargo from the loading meeting, before the ship is loaded (Follow up e-mail from Tommy Taknæs, 22.04.2013).
The supply ship is planned to go offshore according to a sailing plan (Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013).
The ship is in contact with Statoil Marine department when they are at sea (Interview with Silseth and Taknæs, 02.04.2013.)

5.1.2 Vestbase and Vestbase AS

Vestbase

The supply base Vestbase is located at a harbor in Kristiansund, in the middle of the Norwegian continental shelf as a strategic hub for activities related to the petroleum industry (Interview with Silseth and Taknæs, 02.04.2013.).

Vestbase is currently the largest oil related industrial park in mid-Norway, with approximately 60-70 different companies established at the base area and around 30 additional outside (Interview with Silseth and Taknæs, 02.02.2013.).

The companies within the supply base and the other closely located companies both competing and cooperate. A port is found within the harbor of Vestbase connected to the industrial park, where the actors present are related to port activities.

Vestbase AS

Vestbase AS is found within the supply base Vestbase, which is managing and carrying out specialized logistics operations at the supply base (NorseaGroup). It is owned by the NorSea Group AS. It is an organization that offers services adapted to the requirements of the oil and gas industry along the Norwegian and a leading actor in Norway when it comes to port and base operations (Interview with Silseth and Taknæs, 02.02.2013).

Vestbase AS has three main departments; these are the Logistics and Base Operations Department, Technical Department and Property Department (Interview with Silseth and Taknæs, 02.02.2013.).
The main focus will concern units underlying Logistics and Base Operations Department which are the *base operations* and *terminal operations* (Interview with Silseth and Taknæs, 02.04.2013.).

Logistics and Base Operations (VBO)

This Logistics and base operations, further referred to as VBO, consist of personnel and equipment, moving cargo within the base area and loading and unloading cargo from the ships and vessels (Interview with Silseth and Taknæs, 02.04.2013.)

They are handling special transportation and lifts, handling of drill pipe and casing, inter transport at the base area and unloading and loading of vehicles and vessels (Interview with Silseth and Taknæs, 02.04.2013.).

The VBO is represented by Vestbase AS employees, and are handling physical movements of goods internal at the base area (Interview with Silseth and Taknæs, 02.04.2013). This unit also do loading and unloading of Vessel's and ships where Vestbase AS is loading ships for Statoil (Interview with SBOG 04.04.2013).

The loading foreman is working under VBO and has the responsibility for executing tasks and activities. He also has responsibility for planning, delegating, following up and control resources, transport and personnel etc. (Mail interview with Vestbase AS -Terminal Coordinator, 29.04.2013).
The loading foreman is also attending the loading meeting with Statoil (SBOG) and the foreman of the ship (Interview with SBOG 04.04.2013).

Terminal Operations (Enterprise and Technical service (TT)

Statoil ASA has also entered into a leasing agreement with Norsea Group AS. This contract is called Enterprise. It is based on that all handling of physical goods is being done by NorSea Group personnel (Vestbase AS personnel) (Mail interview with Vestbase AS -Terminal Coordinator, 29.04.2013).
They are using Statoil`s operation system and Vestbase AS`s RMC system for their daily operations. In this thesis the enterprise will be seen as Vestbase AS employees in order to make the organizational separation clear (Interview with Silseth and Taknæs, 02.04.2013.)

In this unit receiving, handling and packing goods are done, along with documentation handling and preparation of documents required for loading and shipping offshore (Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013). They have broad knowledge and skills of equipment and important areas of terminal operations (Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013). This includes: material coordination, material management, offshore material coordinators, experts in transport, coordination of marine activities, dangerous goods, management, general storage management, document control, receiving inspection of equipment that require special skills and freight forwarding (NorseaGroup).

Enterprise is handling incoming equipment which includes the technical service function that is checking specifications and safety requirements (Interview with Silseth and Taknæs, 02.02.2013.).

The main working task for the enterprise personnel is taking goods receipt and physical handling and securing of the goods (Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013)
They are responsible for the goods from it arrive until it is finished handled (Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013)

Customer Center

The *customer center* (further referred to as CC) receives orders, delegate work tasks, work orders and handle invoices for the logistics and base operations department. The CC delegates tasks and activities to employees at Vestbase AS (Interview with Silseth and Taknæs, 02.04.2013.)

5.1.3 Baker Hughes

Baker Hughes, further referred to as Baker, is supplying Statoil with drilling services for 25 fields on the Norwegian continental shelf (Statoil 2012a). Statoil has awarded Baker a contract for the delivery of integrated drilling services. These services entails delivery of directional drilling services, personnel, mud logging, logging while drilling (LWD), measurement while drilling (MWD) and other online support services 24 hours a day (Statoil 2012a).
The directional drilling equipment is basically used to steer the drill string and the hole to the required position down in the formations. They also measure while drilling and supply personnel to operate the tools and to conduct the services. (Follow up e-mail from Tommy Taknæs, 15.03.2013; Interview with Statoil Drilling Supply Manager, 11.04.2013)
The Baker headquartered is located in Stavanger, where most of the supplies to Statoil come from, but they also have divisions in Kristiansund, Bergen and Harstad (Interview with Silseth and Taknæs, 02.04.2013.)

Baker is supplying rental equipment to Statoil (Interview with Statoil Drilling Supply Manager, 11.04.2013). Baker is producing or purchasing materials and assembles a rental

product. They also deliver documents together with the goods, to the DSM and engineers in Stjørdal (Interview with Silseth and Taknæs, 02.02.2013; Interview with Statoil Drilling Supply Manager, 11.04.2013)

The suppliers receive an order from Statoil in Stjørdal. When the products are finished and packed with the necessary documentation, they contact the transporter (Interview with Silseth and Taknæs, 02.02.2013.). The lead time of an express delivery will take approximately 18-20 hours (Interview with Statoil Drilling Supply Manager, 11.04.2013).

The booking of transport should be given to Bring within four hours before departure, which is at 16.00hrs on regular delivery. However when it concern rush orders this will go around the clock (Interview with Bring Logistics coordinator 29.04.2013)

5.1.4 Bring

Bring is a transport company, and has recently been awarded with a new agreement for transportation and forwarding services for Statoil, which is the largest Norwegian logistics contract at the moment (Bring). These services involve delivering materials and goods for Statoil`s suppliers to and from supply bases and offices by using car, sea, air and rail. The duration of the framework agreement is for four years as of 2013 (Bring), (Interview with Silseth and Taknæs, 02.02.2013.).

Bring has an in- house coordinator working at several different supply bases, this is to increase service responsiveness (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013) Statoil ASA is using Bring for handling all transport services, ordinary and express deliveries but also back loading of cargo (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

Different information systems and information documents are used for exchanging different information through the chain. Since there are many actors, systems and documents involved it might be useful to gain an overview of these. First different information systems will be looked into, while different information documents will be explained afterwards.

5.2 Information systems and different ways of exchanging information

In a supply network different computer based information systems may be used. The reason for this is that each company has different tasks which require different systems made for each actor. Therefore, all the different information system used within the upstream supply network will be mentioned below.

One of the main systems used externally between several of the actors is the ERP system SAP. This is the main system Statoil use, which several of the other actors also have access to.

System Application production in Data Processing (SAP)

SAP is the ERP system Statoil uses for their operations. It provides access to applications, important data and analytical tools for different actors with different roles within the company. It is used for many different tasks, however in this thesis the important tasks that SAP utilized for will be for managing operations like logistics processes and procurement. Baker has access to SAP in connection with purchasing orders made for equipment needed for different operations. The enterprise at Vestbase AS has access in SAP through the enterprise contract with Statoil. Enterprise has limited access in SAP, meaning that the access is related to their work tasks. This includes taking goods of receipt at the warehouse, allocating of cargo to storage, loading list (LL) and manifest of the cargo (Interview with Silseth and Taknæs, 02.04.2013.).

Bring only has access to backload cargo coming from the installations (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013), which will not be the main focus in this thesis. As seen in the figure below Statoil`s actors are all SAP users.

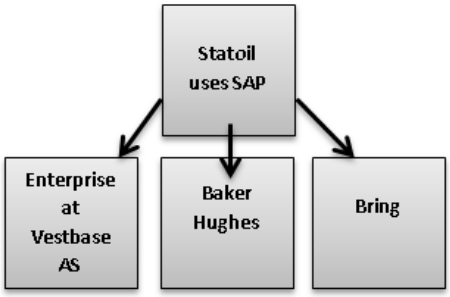


Figure 16 SAP users

Another system used in the drilling process external which also is seen as an ERP system is Lotus Notes.

Lotus Notes

Statoil is the main user of this information system. The Enterprise also has partly access to this system, where the function they use is called Loading Renting Log (LRL). This system is used for daily planning of deliveries for each installation for Statoil (Follow up e-mail from SBOG, 08.05.2013). However, Statoil has now started to use a function in SAP instead of Lotus Notes, but the new system contains the same as the function used in Lotus Notes (Follow up e-mail from SBOG, 08.05.2013). They are changing into a new system because it is integrated in SAP. This will contribute to lower the amount of different systems used, and make it easier for the users. In this thesis we will continue calling it LRL, due to it is performing the same job (Interview with Statoil Drilling Supply Manager, 11.04.2013).

Another reason is that Statoil started to use the new system during this thesis.

A third system which is used by external actors is the planning system the Project planner.

Project Planner

The project planner is used by Statoil and it is a project management system. The function can be found within the daily drilling report (DDR) system. It contains information about the whole drilling process for each installation and is planned carefully and far in advance. This planning system gives information about the equipment that is being used in 15 minutes work sections of the drilling process (Interview with Statoil Drilling Supply Manager, 11.04.2013).

The rig, Statoil Stjørdal and Baker have access to this system (Interview with Statoil Drilling Supply Manager, 11.04.2013)

The transport company Bring has its own system for information which is elaborated on below.

Axiafrakt, Sysped and MinE

Bring uses Axiafrakt which is an application software. This system is only used by Bring. It transfers all waybills from customers by using EDI over to a system called Sysped which is also only used by Bring (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013).

Sysped has solutions for forwarding, transport by land, sea and air, electronic customs clearance, PDA with signature in car navigation and fleet management. However, Statoil only has access to a small part of Sysped called MinE (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

This is a customer service page. Here all the information about the distribution of goods made for Statoil is documented and it includes tracking system (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

Vestbase AS, have also different internal systems. Their main system, the RMC is utilized by the customers to a certain extent. They use their limited access for setting orders.

Resource Management System (RMC)

Resource Management Coordination System (RMC) is an ordering process system, which is an ERP module, developed by Vestbase AS (Follow up e-mail from Tommy Taknæs, 22.04.2013).

It is their operational system. This is an external and internal system where customers can apply for work orders if they need services for handling of goods. The work orders and ordering online with requirements can be done electronically, and they will be automatically registered in RMC (Interview with Silseth and Taknæs, 02.02.2013.)."

The customer can follow the whole process of RMC, from the order is set, until the work is finished and the invoice is sent (Follow up e-mail from Tommy Taknæs, 22.04.2013).

Vestbase AS uses this system for allocating work tasks internally at the supply base (Interview with Silseth and Taknæs, 02.04.2013.). This system provides information about work tasks and personnel. It also provides information about jobs that are initiated, or available equipment and personnel used for handling these work tasks (Interview with Silseth and Taknæs, 02.02.2013.)."

Adding information into the RMC system can be done by the customer center (CC), by each department or unit at Vestbase AS, or external customers such as Statoil (Interview with Silseth and Taknæs, 02.02.2013.).

Statoil (SBOG) uses this system only if they need extra services, for example when a crane is needed (Interview with Silseth and Taknæs, 02.04.2013; Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013). Bring or Baker does not have access to this system and nor are they using the RMC system. However, there are other ways the actors are exchanging information. This is done through meeting, telephone or E-mail.

5.3 Information Exchanged on an Operational Level between the actors

Different IS structures has been mentioned when looking into different types of IS that is used by the actors. It is therefore also natural to look into what information is flowing between the actors. Most of the information is flowing through the already mentioned IS. However, information between the actors also goes by other methods like E-mail, through meetings or by physical information documents that are provided.

These will further be described below as important information sources regarding the processes, what different actors are depending on in order to proceed.

Daily Drilling Report (DDR)

Project Planner

The project planner in the DDR system is updated constantly and it contains information about the drilling progress and plans for each installation. This breaks down the process into 15 minutes work processes (Interview with Statoil Drilling Supply Manager, 11.04.2013). The actors` who has access to this planning system is the Statoil (Rig, Engineer, DSM and SBOG) and Baker (Classification telecom with Statoil DSM, 23.04.2013)

SAP

Purchase Order (PO)

A purchaser in Statoil (DSM) creates a purchasing order (PO) after it has been agreed on between the Baker and an engineer at Statoil Stjørdal (Interview with Statoil Drilling Supply Manager, 11.04.2013). The PO contains information about the goods, quantity, price, discounts, delivery date, place of delivery and code, installation name and code, PO number, contact person name and code, vendor name and code, posting data, due date etc. Statoil (Engineer, DSM and SBOG), Baker and Vestbase AS (Enterprise) has access to the purchasing order in SAP (Interview with Statoil Drilling Supply Manager, 11.04.2013)

SAP

Goods Receipt

Goods receipt is done by the Enterprise personnel at Vestbase AS in the SAP after they have received the equipment and delivery ticket (Mail interview with Vestbase AS - Terminal Coordinator, 29.04.2013).

The delivery note contains the PO number which is entered into SAP. Statoil (Engineer, DSM and SBOG) and Vestbase AS (Enterprise) has access to necessary information in SAP (Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013)

SAP

Requisition- Network

The engineers' at Statoil Stjørdal creates a requisition for the equipment that the rig needs in SAP, which is sent to the supplier through SAP (Classification telecom with Statoil DSM, 23.04.2013).

Baker must publish the equipment they can offer in SAP. When Baker has applied, the engineer has to approve this requisition (Classification telecom with Statoil DSM, 23.04.2013).

This requisition can be seen by Statoil (Engineer and DSM) and Baker.

SAP

Manifest Document

The manifest is first created in SAP by the Statoil (SBOG) (Mail interview with Vestbase AS -Terminal Coordinator, 29.04.2013). Further the manifest is handled by the enterprise

where they add information about the equipment which is being sent to the installation that day. This manifest includes information about the deliveries from the loading renting log and the goods receipt in SAP. All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest (Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013)

The manifest will further be given to the Statoil (SBOG) including certificates of the equipment, which further gives this list to the Loading foreman, the captain of the ship and the rig (Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013)

Statoil (DSM and SBOG) and Vestbase AS (enterprise) have access to the manifest in SAP.

SAP

Loading List

Loading List (LL) is made by Vestbase AS (Enterprise) in SAP and it gives information about containers, goods and material that are being shipped the current day (Interview with SBOG 04.04.2013.)

The information given is the size of the loading carriers including weight, number of units, what the carriers is containing, if there is any hazardous goods, location where the containers is stored, installation name and which side the carrier will be unloaded from onto the installation (Interview with Silseth and Taknæs, 02.04.2013.)

The LL is further being used by Statoil (SBOG), Vestbase AS Loading foreman (VBO) and Statoil captain to arrange best possible loading of the ship. This list will also be the basis for invoices for enterprise (Mail interview with Vestbase AS -Terminal Coordinator, 29.04.2013). The LL is made on the basis of manifest and the LRL and is used by the Statoil (DSM and SBOG) and Vestbase AS (Enterprise) (Interview with Silseth and Taknæs, 02.04.2013.)

Mobilization E-Mail

The Statoil (DSM) sends out a mobilization E-mail to Baker, Statoil (Rig and SBOG) and Vestbase AS (Enterprise) (Interview with Statoil Drilling Supply Manager, 11.04.2013).

This E-mail contains information about the changes in the drilling operation, and what product and which supplier these changes affects. The E-mail includes an overview of the LRL and DDR **(**Interview with Statoil Drilling Supply Manager, 11.04.2013).

Baker E-Mail to Bring

When Baker needs transportation, they will send an E-mail to Bring with the transportation order (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013; Interview with Statoil Drilling Supply Manager, 11.04.2013).

The E-mail will contain PO number, name of the personnel ordering the delivery, recipient's address, quantity, measures and weight (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

Baker will specify if they will send the goods with express and in case mark the e-mail with "Express". The express number will be added into the e-mail sent to Bring (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

Bakers` Delivery Ticket

Baker attaches a delivery ticket on the goods sent with the transport company Bring.

This delivery ticket is also given to the Statoil (DSM) in Stjørdal, who puts this ticket on the LRL (Interview with Statoil Drilling Supply Manager, 11.04.2013).

This delivery ticket will be received at the supply base together with the goods, where it is checked against the PO in SAP (Interview with Silseth and Taknæs, 02.02.2013.).

The delivery ticket will contain quantity, price, address and the recipient's name, customer name, date of delivery and PO number. Statoil (Engineer, DSM and SBOG) and Vestbase AS (Enterprise) can see the delivery ticket in LRL and enterprise will receive the delivery ticket along with the equipment delivered to the base (Interview with Statoil Drilling Supply Manager, 11.04.2013)

Bakers` Certificate

Baker sends several certificates that e.g. describes how to use the equipment in an explosive atmosphere (IEC 2012b), for instance on a drilling rig or in oil refineries (IEC 2012a). Such certificate is a guideline for handling equipment in complex and hazardous areas to avoid explosion or fires (IEC). Required certificates always needs to be sent with

the equipment, and is also e-mailed to the DSM in Stjørdal (Interview with Statoil Drilling Supply Manager, 11.04.2013)
This is further added into LRL which can be seen by Statoil (SBOG) and Vestbase AS (Enterprise).

Brings `Consignment Note

Bring sends a consignment note to anyone who is involved with the shipment. The consignment note needs to be signed and given to the transmitter site, delivery point and the receiver which are Baker and Vestbase AS (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013). This consignment note contains information of the location and day of acceptance of the goods, description of the goods or number, receivers name and address, volume or gross weight, quantity of goods delivered and marked, name of the driver and address, place of destination and receivers name and address (Bring). The content of the goods need to be written by the sender and a consignment note needs to be aligned with the goods and the labeling of the goods (Bring). The original consignment note is always delivered with the package (Bring). Baker and Vestbase AS (Enterprise) will receive a consignment note from Bring (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

Bring E-Mail

Bring external will send a daily e-mail to Bring in-house at Vestbase AS, this e-mail will be further sent to Statoil (SBOG) and Vestbase AS (Enterprise) of the deliveries arriving the next day (Interview with Bring Logistics coordinator 29.04.2013).
It includes a description of the cargo, quantity, if the goods contain hazardous material, arrival time, the name of the sender and the driver, if there are any delays and if the goods are sent with regular transportation or express (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013; Interview with SBOG 04.04.2013.)
Bring will mark the e-mail with “Express” if it contains any priorities (express deliveries) (Follow up e-mail from with Bring Logistics coordinator, 22.05.2013; (Interview with SBOG 04.04.2013; (Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013)

Sysped

All deliveries made by Bring will be registered in Sysped. There will also be registered Bring `s driver arrival time Follow up e-mail from with Bring Logistics coordinator, 22.05.2013)

When customers order transportation, this order is put into Sysped with PO number, express number, delivery date and time, name of receiver and transmitter, this will also be put into Statoil site MinE (Interview with Bring Logistics coordinator 29.04.2013)

They are recording all the orders into Sysped which contains information about the trucks and what they carry. The trucks are also marked with GPS (Interview with Bring Logistics coordinator 29.04.2013).

Sysped can only be seen by Bring (Interview with Bring Logistics coordinator 29.04.2013)

MinE

Bring registers all information about the transportation for Statoil into MinE, which is first registered in Sysped and it is also containing track and tracing (Interview with Bring Logistics coordinator 29.04.2013)

This can be seen by Bring, Statoil (Rig, Engineer, DSM and SBOG) and Vestbase AS (Enterprise).

Lotus Notes

Loading Renting Log

The Statoil (DSM) at Stjørdal adds first into the LRL which can be done week in advance (Interview with Statoil Drilling Supply Manager, 11.04.2013). This contains the name of installation, quantity, delivery date, name of supplier, purchasing order number, express number, name of contact person, well number, some description of the equipment and also extra notification if needed (Interview with Statoil Drilling Supply Manager, 11.04.2013)

In addition the delivery ticket and certificate on the equipment will be added.

After the goods have been packed into containers and manifested, the enterprise at Vestbase AS will add container number, manifest number, installation name, date of delivery, name of contact person, name of the supply boat and if the carriers contains hazardous material (Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013). Statoil (Rig, Engineer, DSM, and SBOG) and Vestbase AS (Enterprise) has access to the

LRL (Interview with Statoil Drilling Supply Manager, 11.04.2013; Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013; (Interview with SBOG 04.04.2013.)

Daily meetings

Videoconference

Every morning Statoil (Rig, Engineer and DSM) and Baker have a videoconference. During this meeting the rig will update what has happened the last 24 hours and how far in the drilling process they have come (Interview with Statoil Drilling Supply Manager, 11.04.2013). This is a regular routine for how the partners will be kept up to date on what is happening onshore and offshore. During the videoconference they use a planning system DDR which shows how the drilling progress is going from day to day, broken down into 15 minutes work (Interview with Statoil Drilling Supply Manager, 11.04.2013).

The Daily Planning Meeting

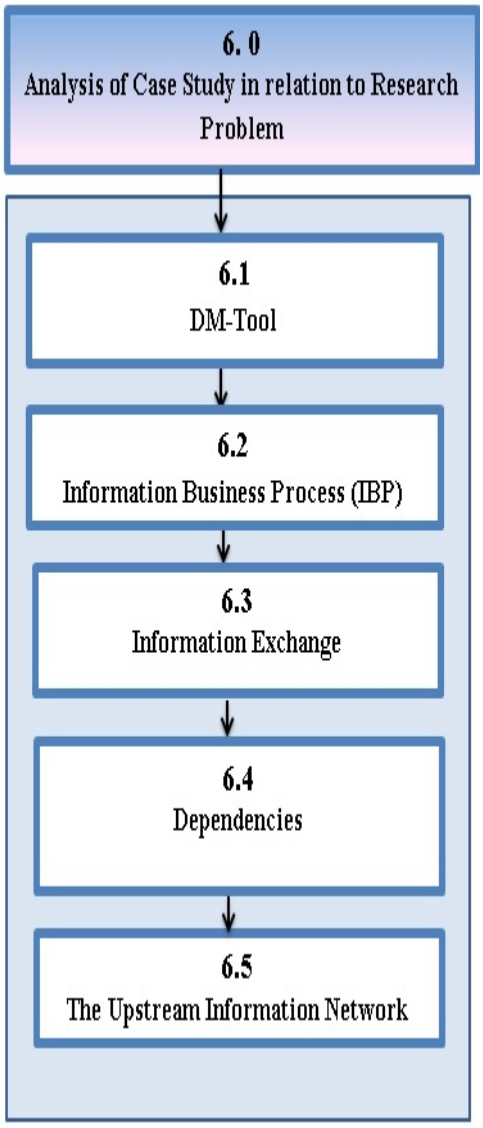
Every morning Statoil (SBOG) and Vestbase AS (Enterprise included technical service personnel and CC) has a daily morning meeting (Mail interview with Vestbase AS - Terminal Coordinator, 16.04.2013; Interview with SBOG 04.04.2013). They will go through the current load and the load for the next day which is used for planning of vessels and capacity (Interview with SBOG 04.04.2013).

Loading Meeting

Loading meeting is held every day at 12:30, with Statoil (SBOG), Vestbase AS (Loading Chairman from the VBO) and Statoil Captain of the ship (Interview with SBOG 04.04.2013; Mail interview with Vestbase AS -Terminal Coordinator, 16.04.2013). Where they discuss how the load should be allocated on the ship and sailing routes for different installations (Interview with SBOG 04.04.2013; Follow up e-mail from Tommy Taknæs, 15.03.2013)

The Statoil (SBOG) will also give LL and manifest to these representatives during this meeting

6.0 Analysis of the empirical case study



The actors Statoil, Baker, Bring and Vestbase AS in this supply network have already been defined. The process starts with a demand for drilling rental equipment from the customer Statoil. The demand is first raised internally within Statoil at the rig which is thereafter given to the external companies. The duration of this process takes place over two days. The first day is called "the day before arrival day" and the second is called "arrival day". This thesis only deals with the external process, but will briefly involve some internal process related to some of the actors. However, the main focus will be on the information flow related to the participants in the upstream supply network.

In this chapter the Information flow mapping model (IFM) will be explained step- by- step. Further the DM tool will be define and map information which will uncover the IBP. The Information Exchange tool will be used in order to map the way of exchanging information in the upstream information network. Further dependencies will be exposed in order to identify possible critical dependencies that might affect the information flow.

The second research question will be conducted in this chapter.

A recommendation for the reader is to have the figures next to this chapter. This will help the reader following the analysis steps and to get a better overview over the process. It can be mentioned that it is higher degree of details displayed in the analysis compared to the empirical data. This because the authors did not find it convenience to insert the data both

places and that it would be sufficient enough to show them in the analysis part of the IFM model.

6.1 Define and Map Tool (DM-Tool)

In order to identify IBP the DM tool was created. The DM tool means *Define and Map*. The tool has identified the information each actor have received in the process.
The duration of the information concerning the Drilling tool demand process for rental equipment from Baker, will be going over two days. The information has been divided into the three phases, planning, execution and control.

The first three tables will reflect a Drilling tool demand process and what information is given the day before the product is arriving. The last three will reflect the information given on the day of arrival. Hence, each day will have information concerning all the three decision phases. In this thesis we have therefore made six tables utilizing the DM tool to identify the information. These different phases are added into the models since the information might vary in each phase.

Information given to every actor has been mapped for each decision phase. For all the information given there is an identification number which shows what step it will be found in our upstream supply network figures.

The findings from the DM tool uncover the Information business process (IBP). This information will then be utilized by all the actors to operate the process, planning, execution and control.

The planning phase the day before

The information will reflect what is required to fulfill the customers demand.

Product required	Decision phases	Information Received by Statoil	Information Received by Baker	Information Received by Bring	Information Received by Vestbase AS
Rental Equipment	Planning	• (2)Information about need at the Rig (Product Specification, Quantity, Quality, Date required, Cost) • (5) List of available Equipment from Baker (product Specification, Quantity, Quality, Date of delivery, Price)	• (3)Checking available equipment (Product Specification, Quantity Quality, Time and Date required Address /location(receiver) Price) • (4) make Requisition (product Specification, Quantity, Quality, Date required) • (9) Planning for transportation order (PO and Express number)	• (10B) Information about Transport order (PO number/ Express, Quantity (size, weight) Time and Date required Address /location (receiver/Transmitter) Price(Transport mode) and Time, date)	• (11B) Information about need - phone (Product Specification, Quantity Date of Delivery) • (13B) Additional Specification of resources needed- RMC (Product specification (Size, weight), resources for handling and Specific equipment and personnel needed) (14A) Detailed information about incoming delivery (Name of installation, quantity, delivery date, name of supplier, purchasing order number, express number, name of contact person, well number, some description of the equipment, Delivery tickets from Baker (quantity, price, address and the recipient's name, customer name, date of delivery and PO number) and Certificates(guideline for handling equipment)

Table 4 The Planning Phase the day before arrival

As can be seen from the table the information given is divided in between all the actors in order to plan the process. Each actor requires different type of information to fulfill their step in the process. The information will typically be the requirements starting internally within Statoil from the Rig and via Baker and Bring, ending up at Vestbase AS. The table will reflect the information flow between the actors regarding the demand, location, product requirements like quantity, quality, transportation order information and delivery date. As mentioned the table will be split between actors and numbers will identify the step in the process. All the sequential details will be found in the explanation to our model.

The Execution phase the day before

Product required	Decision phases	Information Needed by Statoil	Information Needed by Baker	Information Needed by Bring	Information Needed by Vestbase AS
Rental Equipment	Execution	• (3)Contact Baker about Equipment (Product Specification, Quantity, Quality, Date required, Cost) • (4) make Requisition (product Specification, Quantity, Quality, Date required) • (8) make PO/ Express number (Approval of Equipment and Requisition (product Specification, Quantity, Quality, Date required) • (9) Sending PO/ Express Number (Output from Network SAP) • (11B) Updating Vestbase AS (Product Specification, Quantity, Date of Delivery) • (13B) Additional Specification of resources needed- RMC (Product specification (Size, weight), resources for handling) • (14A) Input in LRL (Name of installation, quantity, delivery date, name of supplier, purchasing order number, express number, name of contact person, well number, some description of the equipment and also extra notification if needed, Delivery tickets from Baker (quantity, price, address and the recipient's name, customer name, date of delivery and PO number) and Certificates (guideline for handling equipment). • (16A)Mobilization E-mail (Information about the changes in the drilling process, and what product and which supplier these changes affects, an simple overview of LRL: name of installation, quantity, delivery date, name of supplier, purchasing order number, express number, name of contact person, well number, some description of the equipment and also extra notification if needed and DDR updates.)	• (5) List of available Equipment (product Specification, Quantity, Quality, Date of delivery, Price) • (10B)Transport order to Bring (PO number, name of the personnel ordering the delivery, recipient's address, quantity, measures and weight, Express number and Time, date) • (13A) Order confirmation from Bring (Arrival time, mode of Transport) • (18 A/B) Goods delivered to Bring (Electronically and manually signature on Consignment Note: location and day of acceptance of the goods, description of the goods or number, receivers name and address, volume or gross weight, quantity of goods delivered and marked, name of the driver and address, place of destination and receivers name and address)	• (11A) Input in MinE (PO number, express number, delivery date and time, name of receiver and transmitter) • (12) Confirmation E-mail to Baker (Transport order: PO number/ Express, Quantity size, weight, Time and Date required Address /location, receiver/Transmitter, Price, Transport mode) • (15B) Driving to Pick up Destination (Pickup and delivery address, Time/date) • (18 A/B)Goods, delivery tickets and certificates received from Baker (Electronically and manually signature on Consignment Note: location and day of acceptance of the goods, description of the goods or number, receivers name and address, volume or gross weight, quantity of goods delivered and marked, name of the driver and address, place of destination and receivers name and address) Delivery ticket (quantity, price, address and the recipient's name, customer name, date of delivery and PO number), certificate (guideline for handling equipment)	

Table 5 The Execution phase the day before arrival

As can be seen from the table, all the actors will be given information in order to execute the process. Each actor requires different types of information to fulfill their step in the process. To a certain extent, the information will be similar as in the planning phase. Statoil will utilize the information to produce the LRL and they will send a mobilization e-mail to all the actors. This will end up in the actors execution phase apart from Vestbase AS which will receive it in their planning phase.

Therefore, it should be noted that the information needed by Statoil in the execution phase, is actually going to Vestbase AS in the planning phase. Vestbase AS does not receive any information in the execution phase this day. The reason is that this happens a day before the product is arriving at Vestbase AS.

In the execution phase Baker will ensure to start moving the goods utilizing Bring. All information regarding this is in the table. This means that the product is on route the day before. Similar to the planning phase, the information is not shown in a sequence; it is split up by the different actors. A sequential explanation will be found where the figure is explained.

The control phase the day before

Product required	Decision phases	Information Needed by Statoil	Information Needed by Baker	Information Needed by Bring	Information Needed by Vestbase AS
Rental Equipment	Control	• (6) Approval of Equipment (Product Specification, Quantity, Quality, Date, Cost.) • (9) Confirmation from Baker (received Message through Phone about PO and Express number) • (11A) Control of Transportation (Input in MinE: PO number, express number, delivery date and time, name of receiver and transmitter) • (11B) Control from Vestbase AS (received Message through Phone) • (13 A) Confirmation of Transport time and progress (E-mail from Baker and Delivery ticket: quantity, price, address and the recipient's name, customer name, date of delivery and PO number) and Certificates:(guideline for handling equipment) • (14B) Control of RMC input (received Message through Phone) • (17) Confirmation of arrival at the pickup place (electronically signature in MinE from Bring) • (18 A/B) Confirmation of pick up at Bring (electronically signature from baker in MinE)	• (10B)Order control from Bring (received message through Phone about transport order) • (12) Order confirmation of Transport (received E-mail about Arrival time, mode of Transport) • (16A) confirmation of changes through Mobilization E-mail (received Message)	• (18 A/B) Confirmation of pick up at Bring (electronically signature from baker in MinE)	• (11A) Control of Transportation (Input in MinE: PO number, express number, delivery date and time, name of receiver and transmitter) • (16A) confirmation of changes through Mobilization E-mail (received Message) • (17) Confirmation of arrival at the pickup place (electronically signature in MinE from Bring) • (18 A/B) Confirmation of pick up at Bring (electronically signature from baker in MinE)

Table 6 The Control Phase the day before arrival

As can be seen from the table all the actors will be given information in order to control the process. To a certain extent, the information will be similar as in the planning and execution phase.

Statoil will control all the information from Baker, Bring and Vestbase AS. Statoil has therefore control of all the phases the day before. Baker ensures they have full control of the delivery of their goods. Baker control that the transport is ordered and picked up at Baker and moved towards Vestbase AS. After the goods are picked up at the Baker

location, they will send the documents to Statoil. Baker does not have any monitoring after this.
Therefore, Statoil is responsible for possible action required after this. This means if there is any delay in the delivery or if there is some error with the goods Statoil will be monitoring this via Bring and Vestbase AS. In this phase Bring will inform about pickup time and delivery in MinE, which means that any delays will be reported in their system.

Vestbase AS will control that the goods have been sent from Baker via MinE.
Similar to the planning and execution phase, the information is not shown in a sequence; it is split up by the different actors. A sequential explanation will be found where the figure is explained.

Arrival day

The Planning Phase for the arrival day

Product required	Decision phases	Information Received by Statoil	Information Received by Baker	Information Received by Bring	Information Received by Vestbase AS
Rental Equipment	Planning	• (1A) Bring E-mail: (description of the cargo, quantity, if the goods contain hazardous material, arrival time, the name of the sender and the driver, if there are any delays and if the goods are sent with regular transportation or express) • (2)Videoconference: (Information about current situation/ Process. Using DDR which contains information about the drilling progress and plans for each installation.) • (4) Daily Planning Meeting (Updating about the plan for the day.) • (21) Loading meeting: Planning of loading (Information about loading: (Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers are containing, if there are any hazardous goods, location where the containers are stored, installation name and which side the carrier will be unloaded from onto the installation). Manifest: (Includes information about the deliveries from the Loading Renting Log (LRL) and the goods receipt in SAP. All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest). Certificate: (Specification of handling goods)	• (2) Videoconference: (Information about current situation/ Process. Using DDR which contains information about the drilling progress and plans for each installation.)		• (1B) Bring E-mail: (description of the cargo, quantity, if the goods contain hazardous material, arrival time, the name of the sender and the driver, if there are any delays and if the goods are sent with regular transportation or express) • (4) Daily Planning Meeting (Updating about the plan for the day.) • (21) Loading meeting: Planning of loading (Information about loading: (Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers are containing, if there are any hazardous goods, location where the containers are stored, installation name and which side the carrier will be unloaded from onto the installation). Manifest: (Includes information about the deliveries from the Loading Renting Log (LRL) and the goods receipt in SAP. All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest). Certificate: (Specification of handling goods)

Table 7 The Planning Phase for the Arrival day

The table shows the information received in the planning phase on the arrival day. Statoil will be informed via e-mail and meetings from the other actors about the status of the delivery and plan for the day. Baker will be informed in the videoconference. Bring is not informed in this planning phase for the arrival day. Vestbase AS will be informed by Bring via e-mail and by Statoil via daily planning and loading meetings. It also shows clearly that Vestbase AS is gradually taken over control which is natural since the goods will arrive this day.

Similar to the tables from the phases the day before, the information is not shown in a sequence; it is split up by the different actors. A sequential explanation will be found where the figure is explained.

The Execution phase for the Arrival day

Product required	Decision phases	Information Received by Statoil	Information Received by Baker	Information Received by Bring	Information Received by Vestbase AS
Rental Equipment	Execution	• (20) Bringing Loading List (LL) and Manifest included certificate on the Loading meeting. (Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers are containing, if there are any hazardous goods, location where the containers are stored, installation name and which side the carrier will be unloaded from onto the installation). Manifest: (Includes information about the deliveries from the Loading Renting Log (LRL) and the goods receipt in SAP. All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest). Certificate: (Specification of handling goods)) • (22) Loading the ship: (Information from Loading Meeting. The Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers is containing, if there is any hazardous goods, location where the containers is stored, installation name and which side the carrier will be unloaded from onto the installation. Manifest: (manifest: All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel) Certificate: (Specification of handling goods) • (23) Ship leaves the dock: (The Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers are containing, if there is any hazardous goods, location where the containers are stored, installation name and which side the carrier will be unloaded from onto the installation. Manifest: (All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel) Certificate: (Specification of handling goods)		(6A/B) Delivering of goods, delivery tickets and certificates (electronically and manual signature on consignment note: Consignment Note: location and day of acceptance of the goods, description of the goods or number, receivers name and address, volume or gross weight, quantity of goods delivered and marked, name of the driver and address, place of destination and receivers name and address)	• (1C) Start Manifestation (Manifest number, included installation name and number) • (6A/B) Receiving Goods, delivery tickets and certificates (Sign electronically and manual on consignment note: Consignment Note: location and day of acceptance of the goods, description of the goods or number, receivers name and address, volume or gross weight, quantity of goods delivered and marked, name of the driver and address, place of destination and receivers name and address)) • • (9) Make goods receipt in SAP: (The Purchasing order number (PO) from delivery ticket: (quantity, price, address and the recipient's name, customer name, date of delivery and PO number) • (12) Manifestation in SAP: (numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest) • (13)Input in Loading Renting Log (LRL) :(Manifest and container number and container number) • (17)Completing Manifestation in SAP: (Goods receipt, Manifestation of the goods) • (18) Adding information in Loading List (LL) in SAP: (size of the loading carriers including weight, number of units, what the carriers is containing, if there is any hazardous goods, location where the containers is stored, installation name and which side the carrier will be unloaded from onto the installation) • (19) Delivering Manifest , including certificate (Output of Loading Renting Log (LRL) and the goods receipt in SAP. (All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel are included in the manifest). Certificate: (Specification of handling goods)) • (22) Loading the ship: (Information from Loading Meeting. The Loading List (LL): the size of the loading carriers including weight, number of units, what the carriers is containing, if there is any hazardous goods, location where the containers is stored, installation name and which side the carrier will be unloaded from onto the installation. Manifest: (All numbers of the containers, installation name and code, certificates and description of the goods and weight of each unit loaded onto the supply vessel) Certificate: (Specification of handling goods)

Table 8 The Execution Day for the Arrival Day

The table shows the information received in the execution phase on the arrival day. In the execution phase Baker will not be in the information loop. The reason for this is when Baker has sent the goods to Bring, and therefore they do not have any responsibility for it. This is similar to Bring, when they deliver the goods to Vestbase AS their responsibility for the goods is transferred to Vestbase AS.

Both Vestbase AS and Statoil have several similar execution phases, meaning that they are following each other in the loop of information. Statoil is monitoring Vestbase in each step but in addition they are also in cooperating. For instance during loading of the ship which is conducted by Vestbase AS, and the ship is controlled by Statoil.

Similar to the table from the phases the day before, the information is not shown in a sequence; it is split up by the different actors. A sequential explanation will be found where the figure is explained.

The control phase for the Arrival day

Product required	Decision phases	Information Received by Statoil	Information Received by Baker	Information Received by Bring	Information Received by Vestbase AS
Rental Equipment	Control	• (2) Videoconference: (Confirmation that there are no changes. Using DDR which contains information about the drilling progress and plans for each installation.) • (4)Daily Planning meeting: (Confirmation that there are no changes.) • (5) Control Transport arrival time (Register in MinE). • (6 A/B) Control of signing delivered goods: (Electronically signature in MinE) • (9) Control of goods receipt in SAP (Purchasing order (PO) number) • (12)Control manifestation in SAP (Information about goods in containers) • (13) Confirmation of input in Loading Renting Log (LRL): (Manifest number and container number) • (17)Control of Complete Manifestation in SAP (Manifest number) • (18) Confirmation of input in SAP (Loading List (LL)) • (19) Confirmation of completed manifest in SAP.	• (2) Videoconference: (Confirmation that there are no changes. Using DDR which contains information about the drilling progress and plans for each installation.)	• (6 A/B) Control of delivered goods (Electronically signature in MinE)	• (4) Daily Planning meeting: (Confirmation that there are no changes.) • (5) Control of Transport arrival time (Register in MinE). • (6 A/B) Control of signing delivered goods: (Electronically signature in MinE)

Table 9 The Control for the Arrival Day

The table shows the information received in the control phase on the arrival day.
In the control phase the table shows that Statoil has control over all of the information from the other three actors. This is from meetings, electronic systems and e-mail from the actors. It is controlled that the goods have arrived at Vestbase AS and that Vestbase AS is handling the goods.

Baker has limited control over the information via the morning videoconference. Bring will only have control over that the goods have been delivered at Vestbase AS.

From the time Vestbase AS performs control receipt of the goods, they have responsibility and control over the goods until it is loaded on to the ship. Both Vestbase AS and Statoil have several similar information loops in the control phases. This means that Statoil can monitor Vestbase AS.

To a certain extent, the information will be similar as in the planning and execution phase. This means there will be control in all the three phases the day of arrival.
Similar to the figures from the phases the day before, the information is not shown in a sequence; it is split up by the different actors. A sequential explanation will be found where the figure is explained.

The maps are complex, and to make it simpler for the reader, the figures have been divided up into several steps. This is to visualize the details within the processes utilizing the DM-Tool. A sequential explanation will be found where the figure is explained. The first three figures are from the *day before arrival day*, the latter three is *explaining the arrival day.*

A) The day before arrival

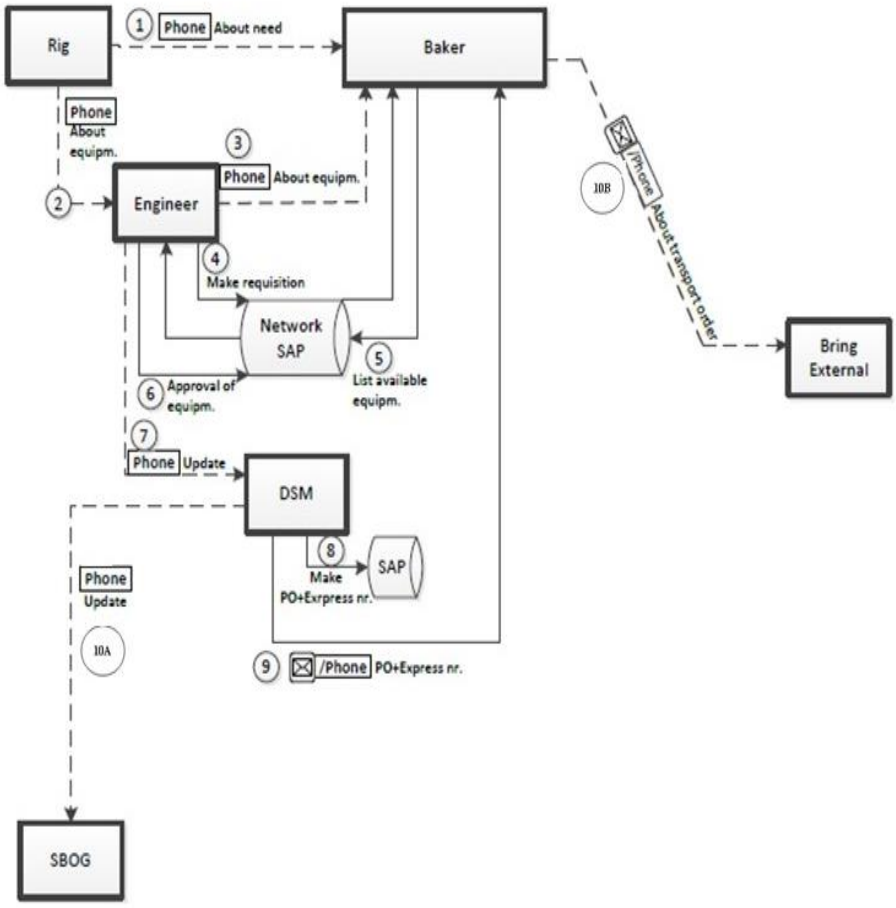


Figure 17 The day before arrival day (A)

(1) Baker located on the rig will call Baker on-shore to update on the current situation. (2) The rig will make a phone call to an engineer at Statoil Stjørdalen about the equipment needed. (3) The engineer will make a phone call to Baker and make them aware of the equipment needed and that a requisition will be made.

(4) The engineer will then create a needlist in network SAP, which (5) Baker will correspond to by adding the requested equipment in this needlist. (6) After that the engineer will approve the requisition. (7) When this is done the engineer will call DSM for the request for entering a manual PO in SAP.

(8) The DSM makes the PO and express number in SAP (9) this is then sent by E-mail to Baker included a phone call. (10 A) After this the DSM calls SBOG about the current situation, (10 B) while Baker sends an e- mail and a phone call asking for an express transport order to Bring external.

B) The day before arrival

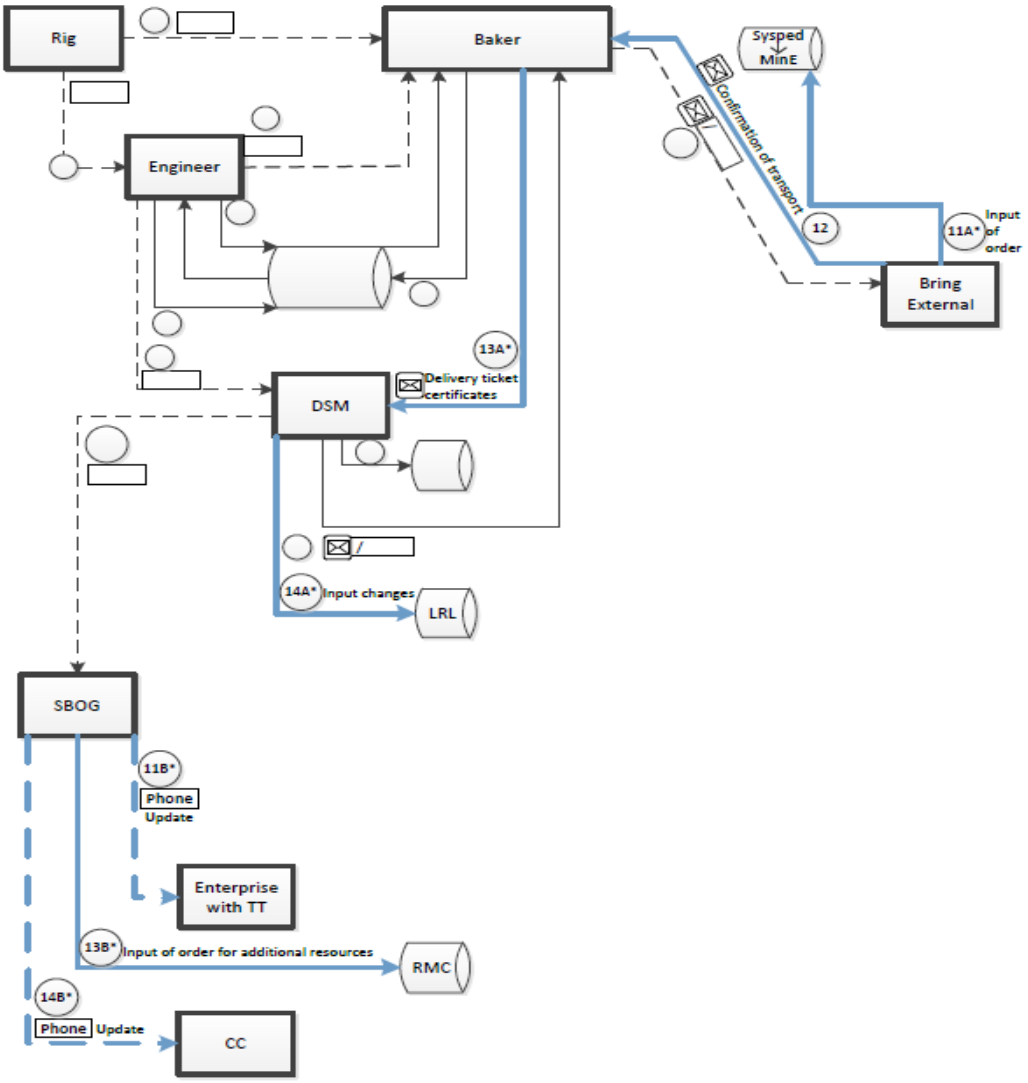


Figure 18 The day before arrival day (B)

(11A) Bring external will add the transportation order from Baker into Sysped and MinE. (11B)While this is happening SBOG calls enterprise at Vestbase AS about the situation. (12) Bring sends a confirmation E-mail back to Baker about the requested express transportation. (13A)When this is done Baker sends certificate and delivery ticket to DSM by E-mail, which is a confirmation that everything is in order. (13B)Simultaneously the SBOG makes a work order in Vestbase AS RMC system if it is necessary with additional processing of the equipment. (14A) The DSM puts out the delivery ticket and certificate into LRL which is sent from Baker by E- mail. (14B) While this is happening the SBOG calls CC to let them know about the current situation and also if it is necessary with additional processing of the equipment.

C) The day before the arrival

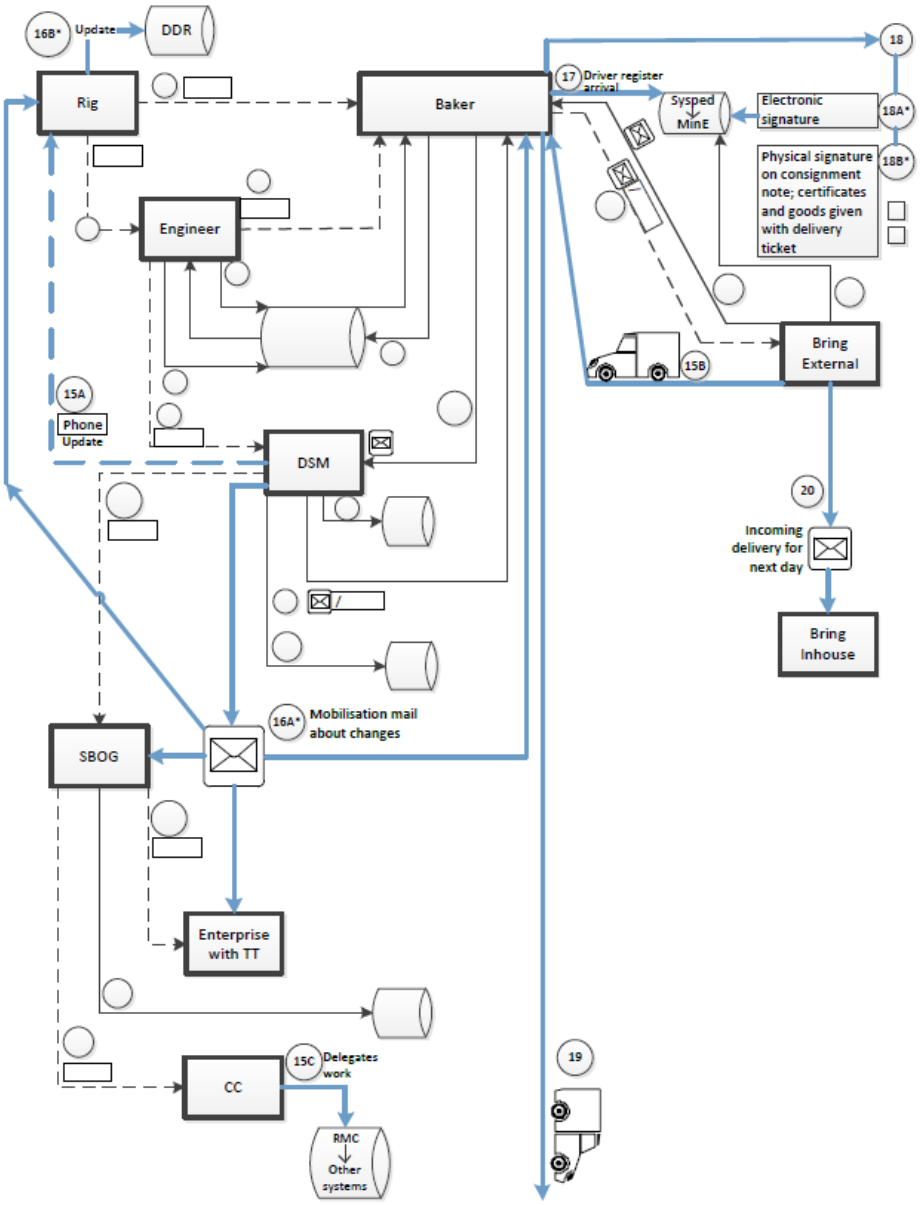


Figure 19 The day before arrival day (C)

(15A) The DSM makes a phone call to the rig personnel to give them confirmation that the priority equipment is in order. (15B)Simultaneously the Bring driver starts to drive to the pickup point. (15C)While this is happening the CC is delegating work order to the units at Vestbase AS into the RMC system.

(16A) The DSM sends out mobilization E-mail containing information about the changes including a picture of DDR and LRL. This E-mail is sent to the rig, Statoil Stjørdal, SBOG, Baker and Enterprise at Vestbase AS. (16B)While this is happening the DDR will be updated by personnel at the rig.

(17) When the Bring driver arrives at Baker they will register their arrival time in Sysped.

(18A, B) Baker gives the equipment with delivery ticket and certificate to Bring, while signing manually on a consignment note and electronically into the Brings system Sysped. This will be shown in Brings system but also into MinE.

(19) When this is done the Bring driver start their journey from Stavanger to Vestbase AS in Kristiansund, which takes 18-20 hours.

(20) Bring external sends their daily E-mail to Bring in-house about the incoming deliveries which will be arriving at the Vestbase AS the next day.

A) The arrival Day

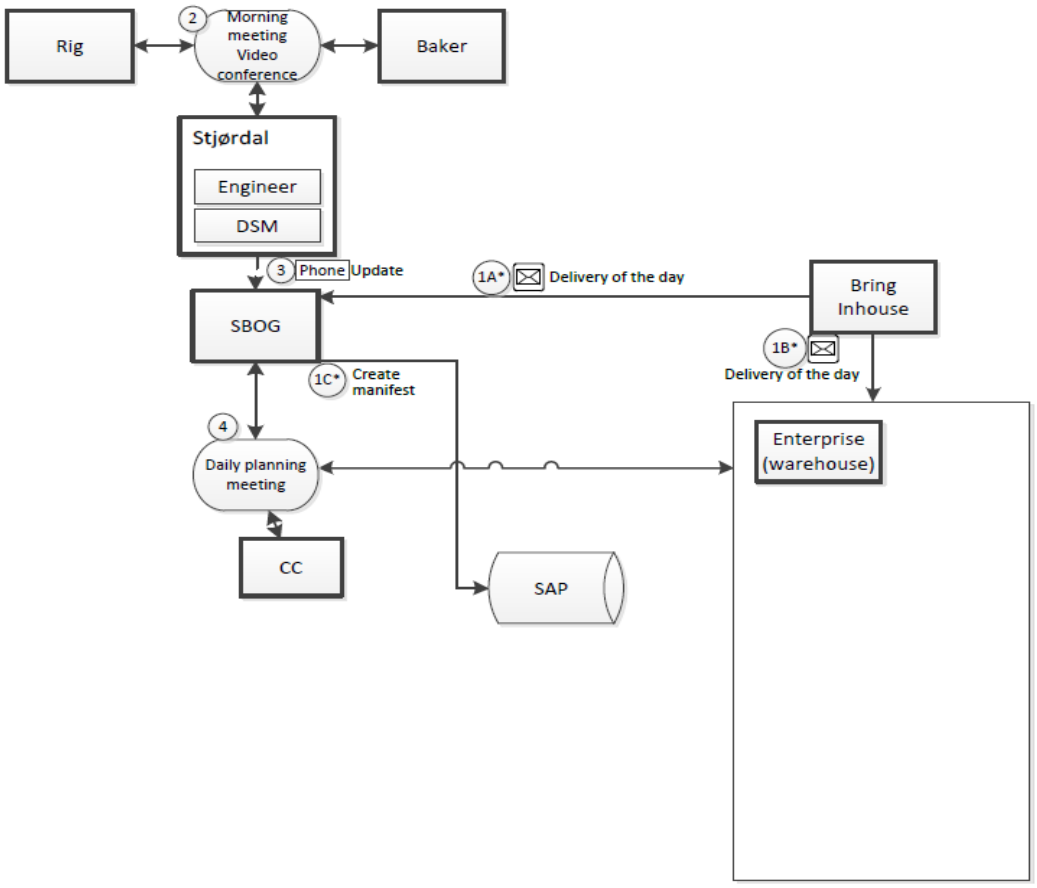


Figure 20 The Arrival Day (A)

(1A) In the morning Baker in-house sends a daily E-mail to SBOG and (1B) Enterprise about the incoming equipment arriving at the base that day. (1C) Simultaneously a manifest is created in SAP by SBOG. (2) The Rig, DSM, engineers and Baker has their daily videoconference in the morning. (3) After this videoconference the DSM calls SBOG for updating about the drilling process. (4) SBOG, Enterprise and CC have their daily planning meeting.

B) The Arrival Day

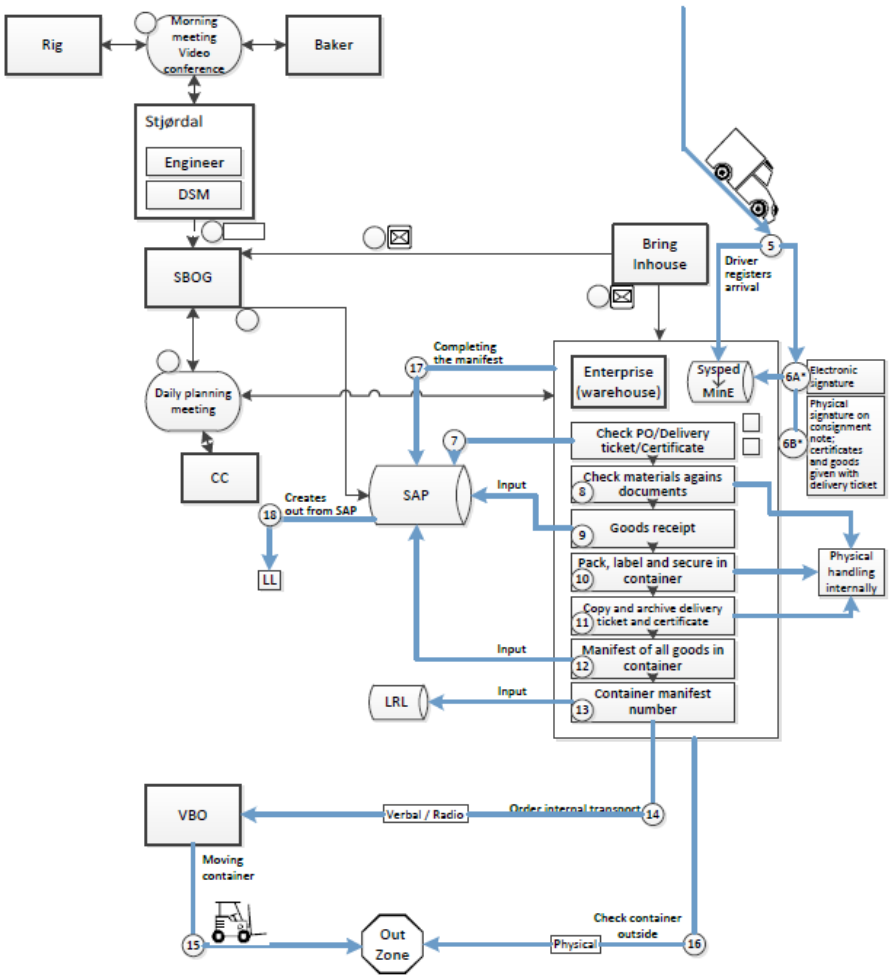


Figure 21 The Arrival Day (B)

(5) The Bring driver arrives at Vestbase AS where they register their arrival in Sysped and MinE. (6A/B) Enterprise will then sign manually on a consignment note and electronically in Brings Sysped while Enterprise receives the equipment included delivery ticket and certificate.

(7) The enterprise will first check the equipment delivery ticket and certificate in SAP. (8) After that they physically check the equipment with the certificate delivered. (9) When this is done the enterprise personnel makes a goods receipt in SAP. (10) Then they start packing, labeling and securing the equipment into containers. (11) When this is done they copy and archive the documents for the equipment which they have taken goods receipt on. (12) Further the enterprise is adding the container number that the equipment is packed into in a manifest in SAP, (13) after this they add this container number and manifest

number in LRL. (14) The enterprise will order internal transportation over radio or verbal to VBO and let them know that a container is ready to be transported to the dock. (15) When the containers are placed at the outbound zone, (16) the enterprise personnel have a physical check of the containers before it is loaded onto the ship. (17) Enterprise will complete the manifest and use the manifest as a base (18) when LL is made in SAP.

C) The Arrival Day

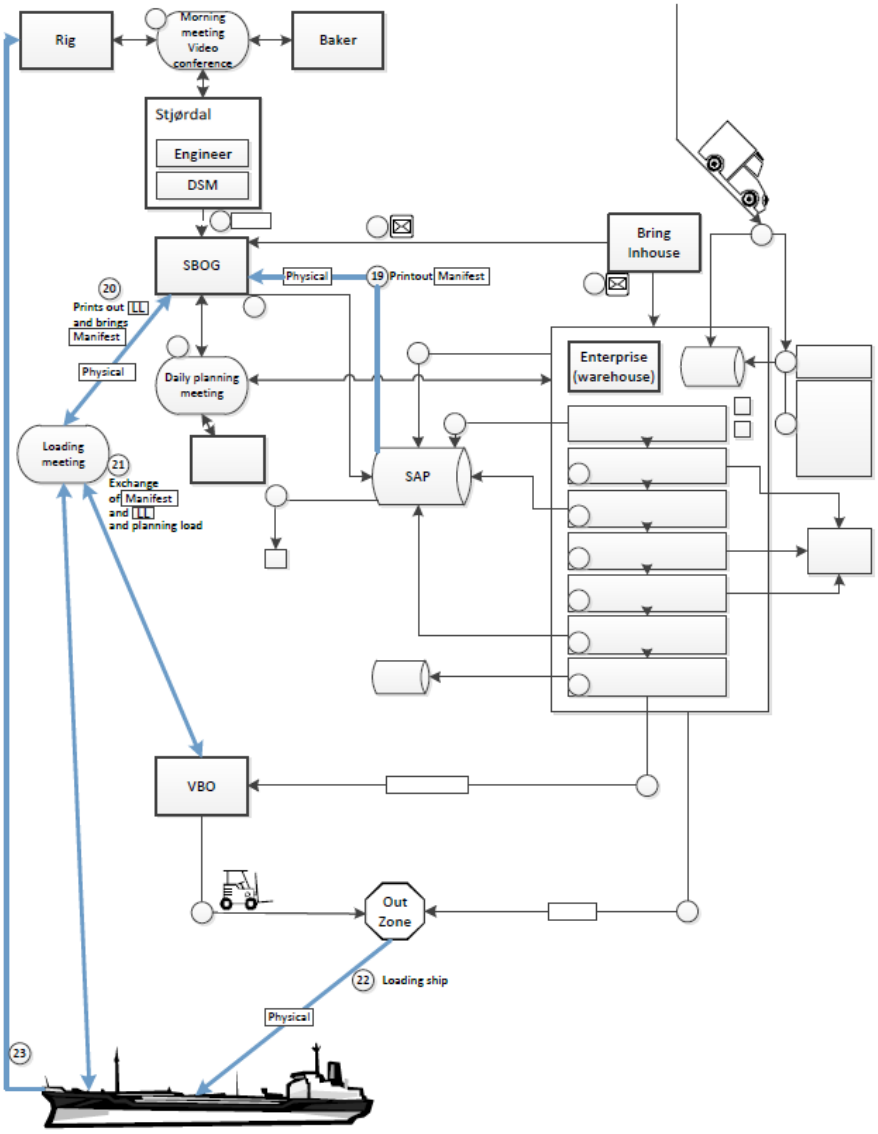


Figure 22 The Arrival Day (C)

(19) The manifest will include certificates of the equipment, and is physically given to SBOG. 20) SBOG prints out the LL and (21) gives the manifest and LL during the loading meeting to VBO and captain of the ship. (22) After the meeting is done the containers will be loaded onto the ship. (23) when the ship is finished loaded it will leave the dock sailing to the installation.

6.2 Information Exchange

General about the tables

After having defined and mapped the information received from each actor, the type of information exchange will be mapped. The tables below show how the mapped information is exchanged between the activities and actors in order to see the complete picture of the information flow. The tables will also be useful for stepwise mapping of which actors are exchanging the information and the frame around the exchange. The tables will also contribute to see that concrete information is exchanged and make the complete upstream information network figures more understandable. The frame will contribute to find what kind of information systems that are utilized to exchange information and what type of information is exchanged

The tables are divided into two, the first is information exchange the day before arrival day the product planned and the second is showing information exchange for the arrival day. The information exchange is divided into three; Manual, Verbal and Electronic.

Number	Actors		Tangible/ Intangible	IS	Information Type	Information Exchange
	Sender	Receiver				
(2)	Statoil (Rig)	Statoil (Engineer and DSM)	Intangible	Human Based	Communication (Phone)	**Verbal**
(3)	Statoil (Engineer)	Baker	Intangible	Human Based	Communication (Phone)	**Verbal**
(4)	Statoil (Engineer)	Baker	Tangible	Computer Based (Network SAP), ERP	Transactional	**Electronically**
(5)	Baker	Statoil (Engineer)	Tangible	Computer Based (Network SAP), ERP	Transactional	**Electronically**
(6)	Statoil (Engineer)	Baker	Tangible	Computer Based (Network SAP), ERP	Transactional	**Electronically**
(8)	Statoil (DSM)	Vestbase AS (Enterprise)	Tangible	Computer Based (SAP), ERP	Transactional	**Electronically**
(9)	Statoil (DSM)	Baker	Tangible	Paper Based	Physical Document (Mail)	**Manual**
			Intangible	Human Based	Communication (Phone)	**Verbally**
(10B)	Baker	Bring	Tangible	Paper Based	Physical Document (Mail)	**Manual**
			Intangible	Human Based	Communication (Phone)	**Verbally**
(11A)*	Bring	Statoil and Vestbase AS (Enterprise)	Tangible	Computer Based (Sysped-MinE), ERP	Transactional	**Electronically**
(11B)*	Statoil (SBOG)	Vestbase AS	Intangible	Human Based	Communication (Phone)	**Verbal**
(12)	Bring	Baker	Tangible	Paper Based	Physical Document (Mail)	**Manual**
(13A)*	Baker	Statoil (DSM)	Tangible	Paper Based	Physical Document (Mail)	**Manual**
(13B)*	Statoil (SBOG)	Vestbase AS	Tangible	Computer Based (RMC), ERP	Transactional	**Electronically**
(14A)*	Statoil (DSM)	Vestbase AS	Tangible	Computer Based (LRL), ERP	Transactional	**Electronically**
(14B)*	Vestbase AS (CC)	Statoil (SBOG)	Intangible	Human Based	Communication (Phone)	**Verbally**
(16A)*	Statoil (DSM)	Vesbase AS (Enterprise), Baker, Statoil (SBOG), Statoil (Rig)	Tangible	Paper Based	Physical Document (Mail)	**Manual**
(16B)*	Statoil (Rig)	Statoil (Stjørdal), Baker	Tangible	Computer Based (DDR), ERP	Transactional	**Electronically**
(17)	Bring	Statoil, Vestbase AS (Enterprise), Bring	Tangible	Computer Based, ERP	Transactional	**Electronically**
(18A/B)*	Bring	Baker	Tangible	Paper Based	Physical Document (Consignment Note)	**Manual**
(18A/B)*	Baker	Bring	Tangible	Paper Based	Physical Document (Delivery Ticket, Certificates)	**Manual**
(18A/B)*	Bring	Statoil, Vestbase AS (Enterprise), Bring	Tangible	Computer Based, ERP	Transactional (signature)	**Electronically**

Table 10 Information Exchange for the day before

Number	Actors		Tangible/ Intangible	IS	Information Type	Information Exchange
	Sender	Receiver				
(1A/B)*	Bring	Statoil (SBOG)/ Vestbase AS (Enterprise)	Tangible	Paper Based	Physical Documents (Mail)	**Manual**
(1C)*	Statoil (SBOG)	Vestbase AS (Enterprise)	Tangible	Computer Based (SAP), ERP	Transaction (Manifest)	**Electronically**
(2)	Statoil (Rig)	Baker and Statoil (Engineer and DSM)	Intangible	Human Based	Communication (Videoconference)	**Verbal**
(4)	Statoil (SBOG)	Vestbase AS (Enterprise and CC)	Intangible	Human Based	Communication (Daily Planning Meeting)	**Verbal**
(5)	Bring	Statoil and Vestbase AS	Tangible	Computer Based (Sysped-MinE), ERP	Transaction	**Electronically**
(6A/B)*	Bring	Vestbase AS (Enterprise)	Tangible	Paper Based	Physical Documents/ (Consignment Note, Delivery ticket and Certificate)	**Manual**
(6A/B)*	Vestbase AS (Enterprise)	Bring	Tangible	Computer Based, (Sysped-MinE), ERP	Transaction (Consignment Note)	**Electronically**
(6A/B)*	Vestbase AS (Enterprise)	Bring	Tangible	Paper Based	Physical documents (Consignment Note)	**Manual**
(9)	Vestbase AS (Enterprise)	Statoil	Tangible	Computer Based (SAP), ERP	Transaction (Goods receipt)	**Electronically**
(12)	Vestbase AS (Enterprise)	Statoil	Tangible	Computer Based (SAP), ERP	Transaction (Manifest)	**Electronically**
(13)	Vestbase As (Enterprise)	Statoil	Tangible	Computer Based (LRL), ERP	Transaction	**Electronically**
(17)	Vestbase AS (Enterprise)	Statoil	Tangible	Computer Based (SAP), ERP	Transaction (Manifest)	**Electronically**
(18)	Vestbase AS (Enterprise)	Statoil	Tangible	Computer Based (SAP), ERP	Transaction (LL)	**Electronically**
(19)	Vestbase AS (Enterprise)	Statoil (SBOG)	Tangible	Paper Based	Physical Document (Manifest with Certificates)	**Manual**
(20)	Statoil (SBOG)	Vestbase AS (VBO) and Statoil (ship)	Tangible	Paper Based	Physical Document (LL)	**Manual**
(21)	Statoil (SBOG)	Vestbase AS (VBO) and Statoil (ship)	Intangible	Human Based	Communication(Loading Meeting)	**Verbal**
			Tangible	Paper Based	Physical Documents (Manifest with certificate and LL)	**Manual**
(22)	Statoil (SBOG)	Vestbase AS (VBO) and Statoil (ship)	Tangible	Paper Based	Physical Document (LL)	**Manual**
(23)	Statoil (SBOG)	Statoil (ship)	Tangible	Paper Based	Physical Document (LL and Manifest with Certificates)	**Manual**

Table 11 Information Exchange for Arrival Day

The **first** column in the figures shows that the information is exchange between the actors, and the activities is divided into sequential numbers. The process is ranged in a chronologically order.
In the **second** and **third** columns shows the sender and the receiver that is exchanging information. As mentioned before, the focused is on an external process. However, the demand will start internally within Statoil from the rig. There are internal departments that will be involved in the exchange of information to an external actor. Therefore, the internal departments involved can be found within Statoil and within Vestbase AS. This is in order to make it clear for the reader.
Column **four** shows the information dived into tangible or intangible. Intangible information will in this process be seen as information that cannot be stored and retrieved, in opposite to tangible information.
Column **five** and **six** shows information systems and information type. , In this process there are three main categories information systems that have been chosen. These are human based-, manual- and computer based information systems.

Human based information systems will be seen in relation to people that interact with each other. This can be to giving verbal messages that must be performed, in addition to inputs in systems made by a phone call, which is not tangible. This information would be classified as *verbal information exchange.*

Paper based information systems have been categorized as *physical papers* that contains information documents. This will be related to tangible information. These types of information will be physical documents that follow the product, or information that could be seen as a part of the product delivered to the customer. For example consignment notes delivery tickets, manifests or Loading Lists. However, these documents were also added into other information systems, to be used or seen by others actors.

E-mail is categorized into two: *paper based system* and *manual information exchange.*
The output from a computer based system would contain physical information that could be stored and retrieved. In theory E-mail could be classified as electronically information. However, in accordance to this process it will be classified as paper based system and as a manual information exchange. This is because it is not related to a specific computer based system and E-mail is dependent on manual input such as adding a document.

The *computer based system*, can be classified into several systems. By simplifying the analysis and in accordance with the interview objects it has been divided into ERP systems. The different systems used in this thesis have several modules, which could be categorized additionally. But, they will not be classified further in this thesis. It has only been pointed out that it can be seen as an ERP system. The names of the computer based system will be SAP, Network SAP, Sysped, MinE and RMC.

The *computer based systems* might contain different information such as master data, organizational data and transactional data. However, in this thesis all the information will be classified as transactional data. This is because we are looking into an operational process, which mostly concerns transactional data shared by the different actors.
The rental product is rented several times, which means it is repurchased, and the related data will already exist in the system. When mentioning transactional data in this thesis, it will be seen as electronically exchange of information.

Some information is exchange is classified as happening in two ways. An example is number 9, were both e-mail and a phone update is exchanged. This type of information exchange is done between the same actors.

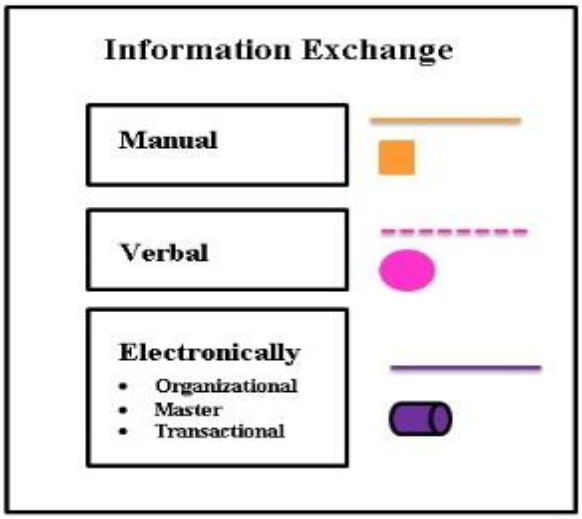


Figure 23 Information Exchange

There are also information exchanges that happen simultaneously, and these are marked with a star next to the number.

The upstream information network has been analyzed and the result has been visualized below. This shows an overall picture of how the information is exchanged. The information exchanged is visualized by using colors. The color codes can be seen in figure 23.

D) The day before arrival

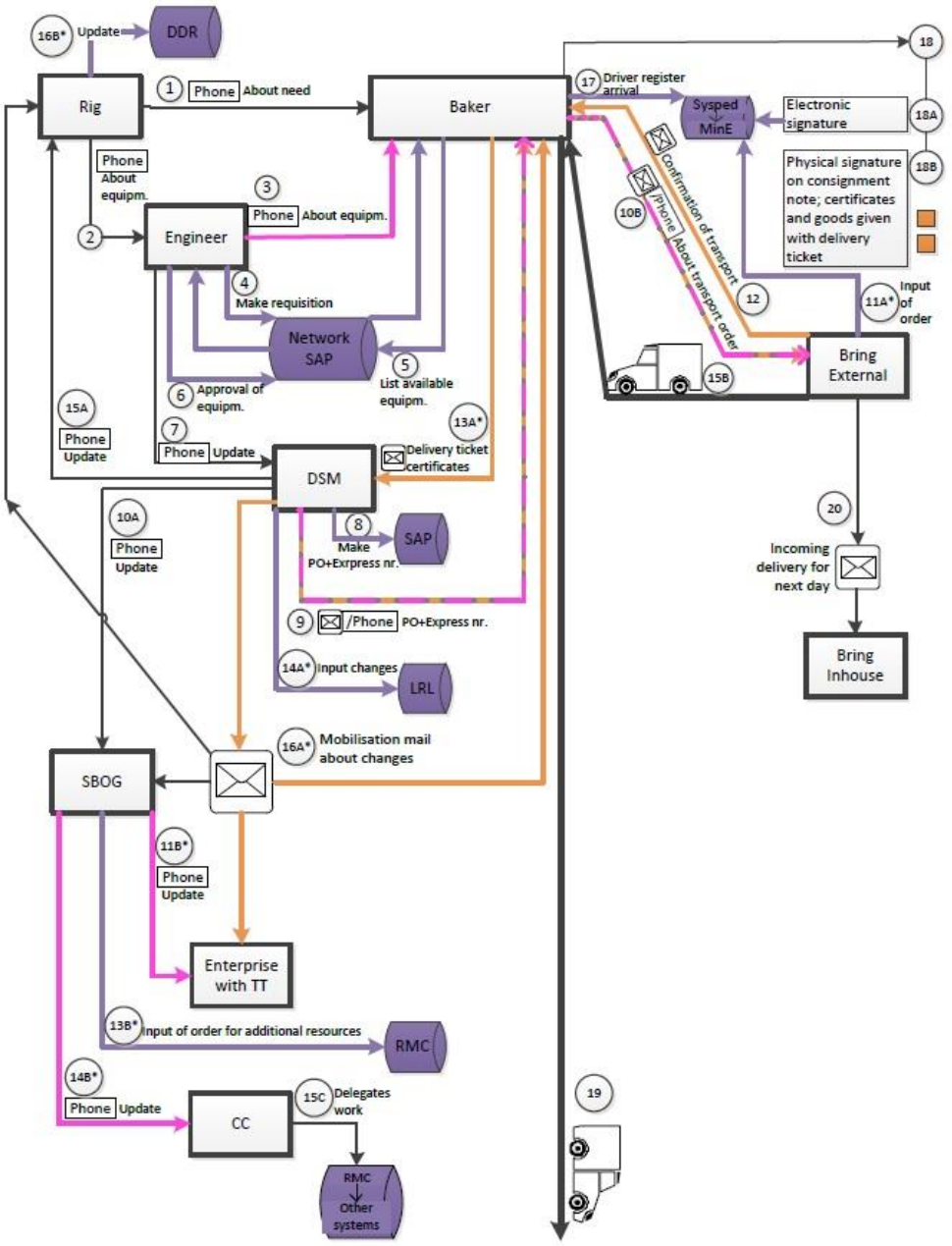


Figure 24 The day before arrival day (D)

D) The arrival Day

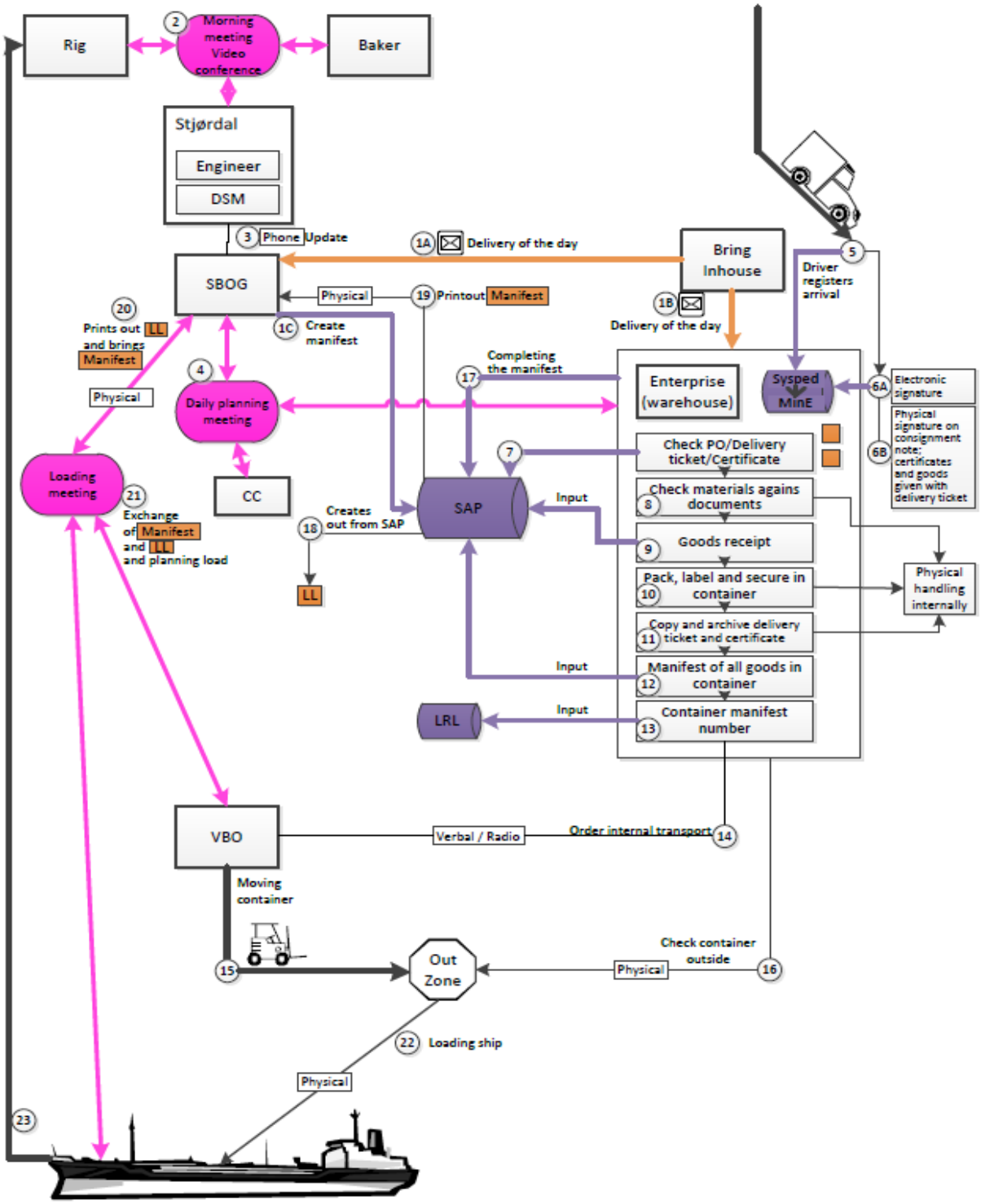


Figure 25 The Arrival day (D)

After the information flow in the upstream supply network has been mapped, it is then important to find the informational dependency between actors and activities. This is in order to identify critical links in the processes.

6.3 Dependencies

6.3.1 General examples of Dependencies

Through applying coordination theory in line with Malone and Croxton's (1994) framework, process dependencies can be exposed. Through this we can elaborate how the described information processes are interlinked in relation to each other. It will further below be shown examples of dependencies that could be found, before pointing out examples of dependencies that could be said to be more critical.

Shared resources dependency

Examples of shared resources can be when both Baker and the engineers at Stjørdal need to be contacted about the need from the Rig, where the resources are the personnel from the rig. However, they cannot be contacted at the same time. Thus it is found a *shared resource dependency*, and their time has to be allocated to different tasks.

Another example could be the manifest made by Vestbase AS (Enterprise), which Statoil (SBOG and Ship) and Vestbase (VBO) are dependent on for allocating the goods on the ship. The *resource* in this case will be the information in the manifest document.

Task assignment

When looking at task assignment dependency, one example could be pointed out at number 2-3 in the day before arrival. This because the engineers have the knowledge to find the right equipment suitable for solving the rig needs. Thus it needs to go through the engineers before Baker gets more information about what they need to prepare, even though they have got a call from the rig earlier. This is because the engineers are the expert, and this selection cannot be done by the other actors.

Prerequisite constraint

When it comes to *prerequisite constraint,* this dependency could be found several places during the preceding of the process. Examples can be Vestbase AS which cannot start to plan or execute any activity before they receive information about the need through the LRL, RMC or being notified by SBOG. However, SBOG or DSM cannot inform Vestbase AS before the previous one has finished their tasks of giving them the information. Another example could also be that the manifest cannot be completed before previous inputs are done.

Simultaneously constraint

Simultaneously constraint can be related to the different meetings that takes place during the arrival day. Different actors need to synchronize planning and updating of several parts, where they need the information at the same time. For example execute meetings earlier at the day or before the ship is leaves the dock. In this way they can share the resource, which will be related to the information each actor have.

Usability dependency

Every step that receive some kind of information is dependent on that the information that is given can be useful for what is attend to be used for, or can be understood in the way it was intended to be understood from the one who send the information. If the information is not useful for the receiver, it will also lead to wrong decisions or wrong input, which also further gives a wrong output. The dependency could also be related to access of information. If there is no access, the information would also not be useful for the one which needs it. On the other hand, if all the actors had access to all information it would not necessary mean that it would be of value for everyone. This could for example be the information that the actors receive on the morning meeting at the rig. Before the need is clarified and equipment approved, it would only be confusing for the enterprise personnel and the people working at VBO to get to know that something will come, without knowing delivery time, amount or specification for handling the equipment. It is also not useful to receive information about delivery time before the driver leaves Baker, if there are delays. Information could also be less useful if it comes many weeks in advance. This is because

there is a large amount of information every day, and thus important information might be forgotten by the time it is becoming relevant.

Transfer dependency

When it comes to the *transfer dependability,* all information needs to be transferred in order to be used by the next receiver. The information cannot be valuable if it is kept by each actors, thus it is necessary to transfer it further in order to use it. It is important that the information is communicated further, and also important that the information is set into the different kinds of systems so it becomes available for those who need it to the right time. One example can be that the information DSM is inserted into SAP in order to be available for other actors, which could be said about every input to the different ERP systems and phone calls for updating next step in the process. The physical documents for example, also have to be delivered to Vestbase AS in order to be checked against the equipment. Malone and Crowston mentioned that a coordination activity could be communication. However, in relation to this case it could also be related to manual and electronically information exchange.

Task/ sub task dependency

This dependency can be said to concern both the processes, the day before arrival and arrival day. This is because the goal of executing these processes, to serve the customer and deliver the goods offshore is depending on all the individual processes, seen as sub tasks, throughout the whole chain. Each sub tasks need to be fulfilled but also need to be fulfilled as a whole in order to be able to finish the process ending in loading the ship with the specific equipment. This means that in order to deliver the equipment to the rig, the goods need to be planned and ordered, sent by Baker, transported by Bring, processed by Vestbase AS and finished loaded on the ships. Every information step throughout this process is contributing to the main task of deliver the goods.

6.3.2 Critical Dependency

When looking at the two processes, "the day before and the arrival day", there are several dependencies in relation to ensuring a seamless information flow. Further below it will be pointed out some examples of the most critical dependencies. Some of these will be analyzed from the upstream information network figures that have been made. These have been chosen on the basis of the problem they may cause.

It should be noted that these are only some examples of critical dependencies, and that there might be several of critical dependencies. This is depending on what view from which actor it is looked upon. In this thesis it has only been focused on some examples that the authors find important. These critical dependencies that are used as examples are connected to the ERP system SAP, the PO number and the actor Statoil (SBOG). These will be explained below.

SAP

The various ERP systems contain important information that is used by more than one actor. SAP is one system that is more important than others. This in relation to who has access to the system which means who will be reached by the system and how many actors need to utilize SAP in order to perform tasks.

1. **Dependency related to SAP**

Baker, Vestbase AS and Statoil can also be said to have *shared resource dependency*. This means that they are all dependent on having the same resource in form of information. This is critical in order to cooperate across the organizational boundaries and execute own activities. The only way they could use the same information is by having access to a common system, which in this case is SAP. Due to that they all are dependent on this system, it also make it an even more critical link.

The figure below shows the shared resource dependencies marked with red lines.

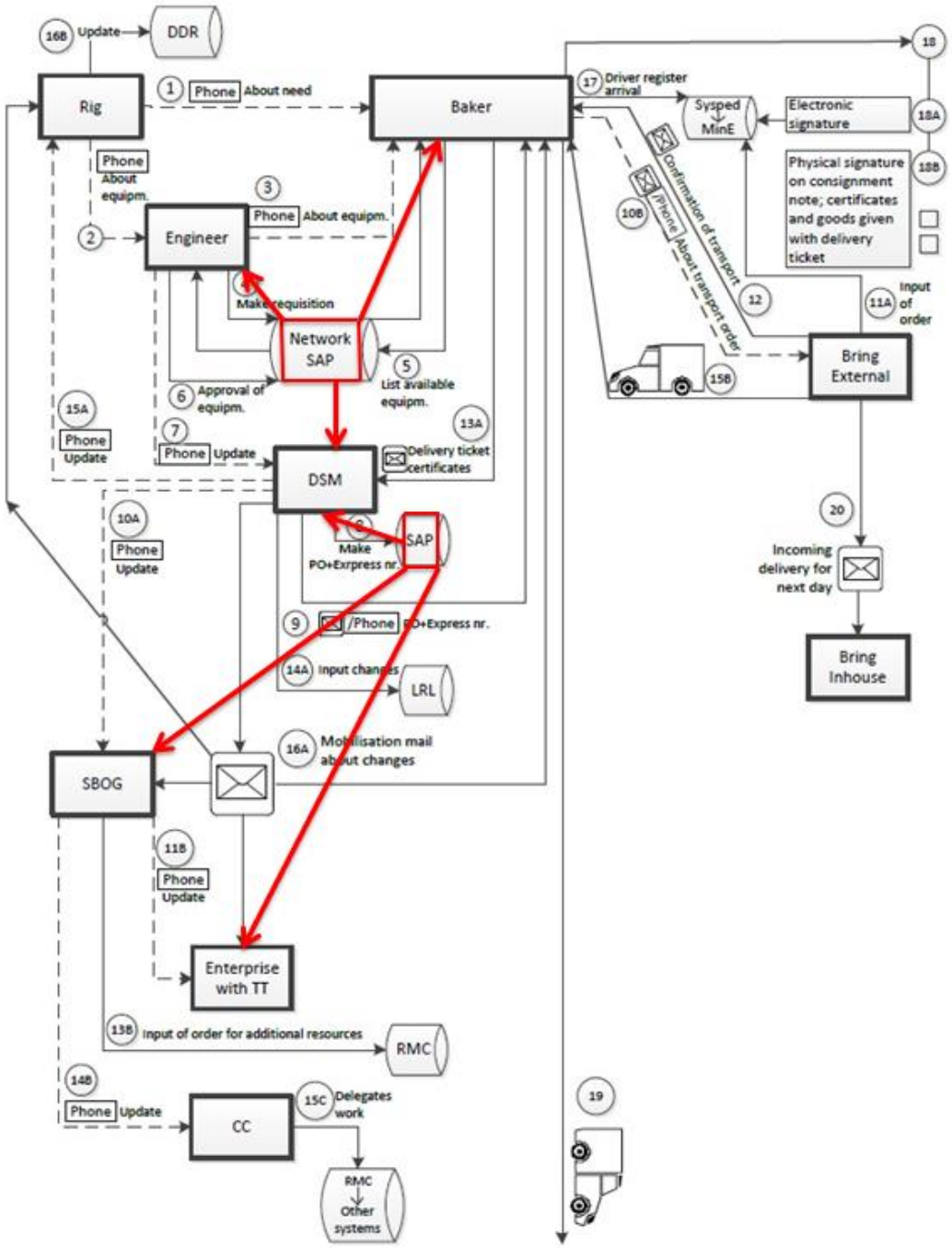


Figure 26 Shared resource dependencies related to SAP - The day before arrival

The reason why SAP is more critical than the other is:

The accessibility of the system

Vestbase AS, Baker and Statoil have access to SAP and use this system when it concerns orders for Statoil. These actors do most of the handling and planning on how to get the equipment to the rig.

Necessary Level of details

SAP also contains several details which are important regarding the process of delivering and handling of the goods. SAP is divided into several modules. The Network SAP has more technical information about the equipment needed. The details are important and will contribute with the necessary information in the purchase order in SAP.
Further the Purchase order in SAP will contribute to necessary information is added into LRL, documents like manifests and loading list.

This is opposite to Sysped and MinE, which does not contain any amount of detail and is only related to the transportation of the goods.
The DDR system will show the overall picture of changes in a drilling process. It will visualize the equipment used or in use in the process. However, the DDR is not important for all the actors, since it do not contain any detail of deliveries or ordering of the product, only the use of it.

The RMC concerns additional resources required to handle incoming equipment. This system is only useful for Statoil and Vestbase AS, since it concern extra resources required in order handling the equipment at Vestbase AS.
The LRL contains simple information concerning the deliveries and purchasing order number. This system is only used by Statoil and Vestbase AS.

Use of the SAP system

The information that is inserted into SAP is used for different purposes, such as making requisition of equipment, purchasing orders, goods receipt, use PO for ordering transportation, creating manifests and loading lists for the ship and rig. This affects actors such as Statoil, Vestbase AS, Baker and Bring. There are different actors using and contributing to the information that are inserted in SAP, such as Statoil, Baker and Vestbase AS.

2. Dependency related to SAP

Another critical dependencies that can be found in relation to the input in SAP, is the *prerequisite constraint*. This will be related because in order to proceed, the insert of data have to be completed before the next step can use it. This will be information of high importance regarding specification of the goods.

As seen in the figure, one of the most critical links regarding SAP will be the input which is entered into Network SAP.

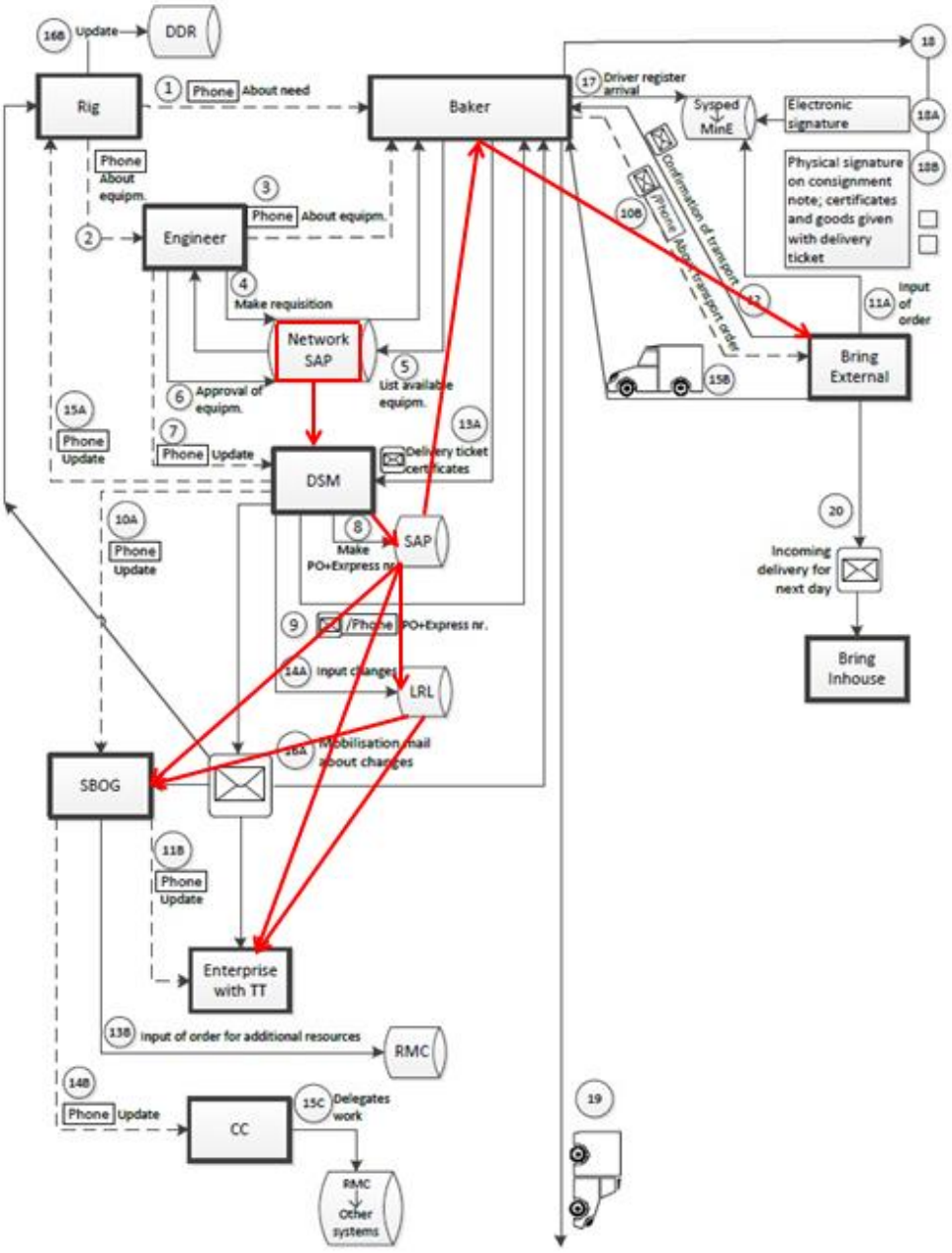


Figure 27 Prerequisite Constraint Dependency related to SAP – The day before arrival

The inserted data in the Network SAP is necessary for further progress and will affects other actors further in the process.

First a requisition must be created in Network SAP.
If this information is missing in the requisition in Network SAP, it will affect;

- The purchasing order in SAP handled by Statoil (DSM)
- The creating of delivery ticket with the necessary PO number from Baker,
- The delivery ticket with the PO number in LRL by Statoil (DSM)
- This will affect Statoil (SBOG) which cannot plan the shipping route correctly.
- Booking of transportation from Baker to Bring and
- Handling of the goods at Vestbase AS.

The prerequisite constraint dependency will bring consequences for the next day, the arrival day. As mentioned before, Vestbase AS cannot handle the goods without having the PO number. This will effect different departments within Vestbase AS, but it will also affect the Statoil (ship) in the sense that the goods that are not affiliated with a PO number cannot be shipped to the rig.

Purchasing Order (PO) in SAP

1. **Dependency related to PO**

The next critical dependency that can be pointed out is related to the *usability dependency*. When actors receive information, they are dependent on that the information is useful for what it is attended for. Useful might be related to the necessary details that are given for informing about the equipment. When details are missing it may lead to either making wrong decisions or even stop the process.

Some details are more important than others and these might give larger negative effects further down in the process. One critical detail that is used for several purposes is the PO number which is created in SAP. The figure below shows usability dependency concerning the PO number.

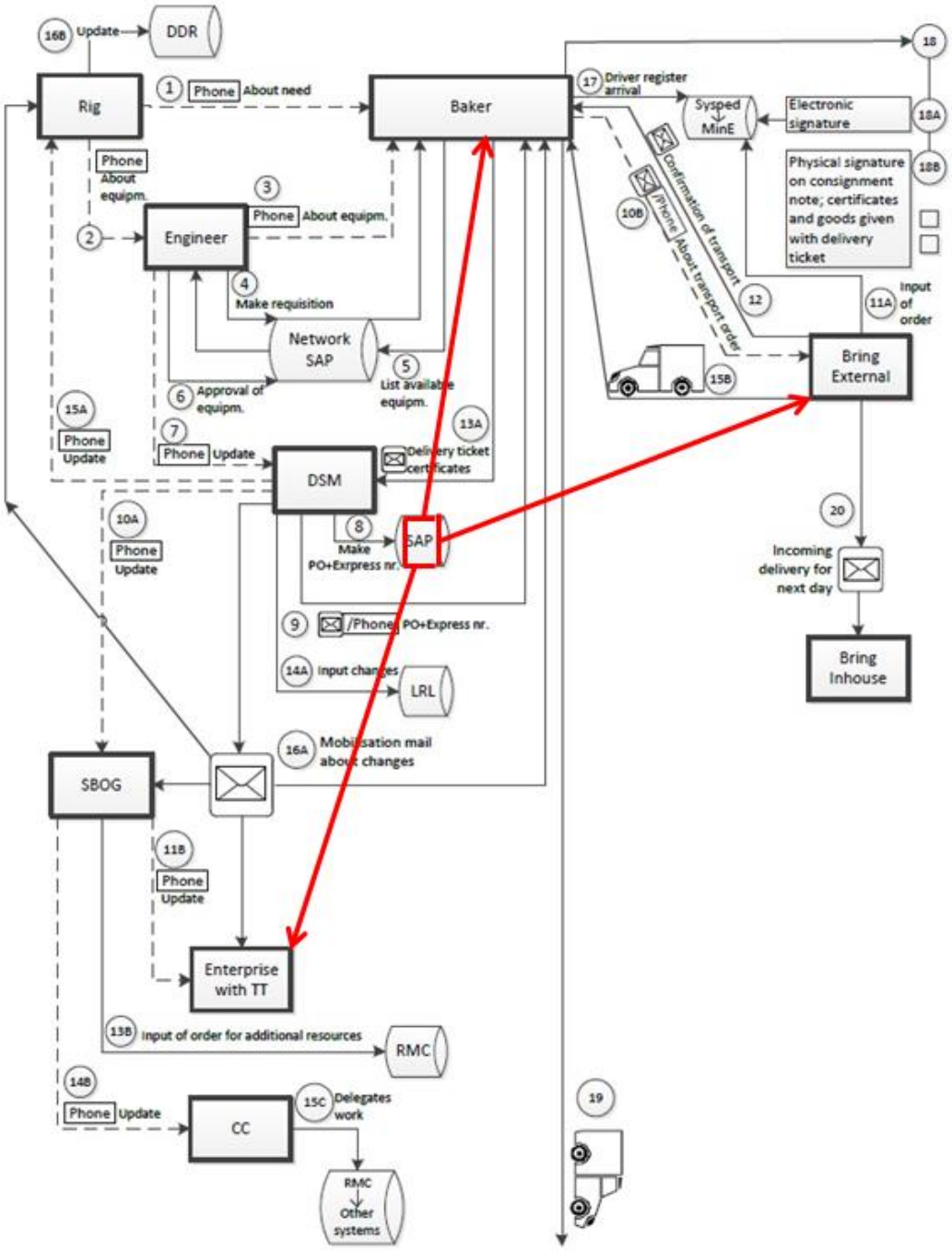


Figure 28 The Usability Dependency related to PO in SAP – The day before arrival

If the PO number is not created, it will affect;

- **Transportation**

  The PO number is used for ordering transportation. This is because Bring is billing Statoil and has to have a PO connected to a certain product. If this does not happen, Bring will not get paid for the transportation.

- **Equipment**

  Handling, packaging and loading the ship at Vestbase AS will not take place without taking good receipt in SAP. In order to take goods receipt the goods need to be connected to a PO number in order to send the goods further. This information has to be entered in order to be able to insert more information along the process and is essential for creating manifest and loading list in SAP.

  In order for Baker to book transportation for the required goods, a PO number must be added. This is because Statoil is requiring all goods to be connected to a PO number for invoice purposes.

PO is critical because Baker, Bring and Vestbase AS cannot proceed with their activity without having a PO connected with the equipment. This will lead to the equipment not being delivered to Statoil Rig. This will also have an effect on the arrival day, such as the goods will not be handled and shipped offshore.

2. Dependency related to PO

The PO number could also be seen in relation to *prerequisite constraint*. If the purchasing order is not created or given to the actors, it could affect the Manifest and loading list of the equipment, transportation, shipping to the rig, loading of the equipment and packaging of the equipment.

Mail from Baker or Delivery Ticket and Certificate from Baker

1. **Dependency related to mail, Delivery Ticket and Certificate from Baker**

The E-mail and documents from Baker can be said to be another *prerequisite dependency* that might be more critical in order to have a seamless information flow. The delivery ticket and certificates are important. Statoil and Vestbase AS are dependent on these documents. The figure below shows prerequisite dependency.

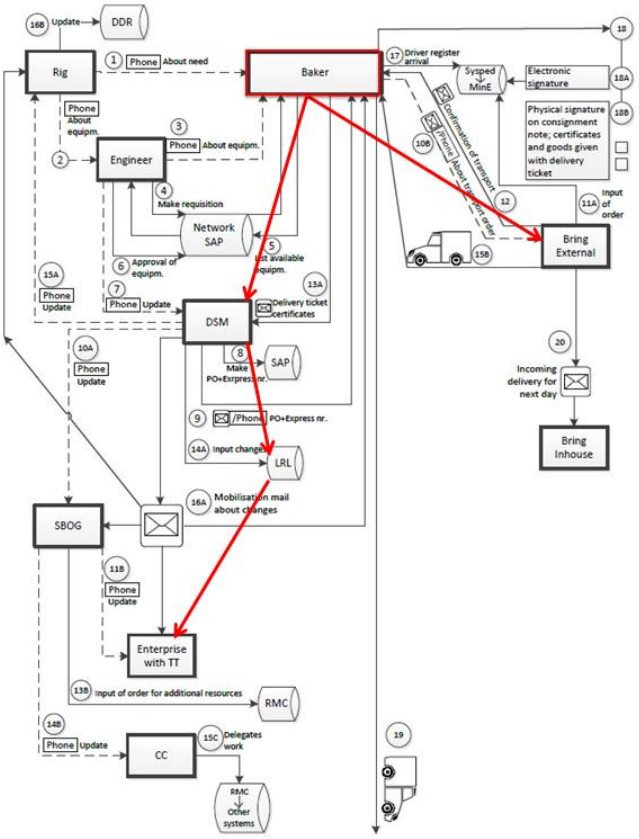


Figure 29 Prerequisite Dependency related to e-mail and documents from Baker - The day before arrival day

The prerequisite dependency will effect:

- The delivery ticket and certificate documents are sent by E-mail from Baker to Statoil (DSM), and are a confirmation that the equipment is being sent by Bring. If this E-mail is not sent, Statoil (DSM) will not know if the equipment is sent to Vestbase AS.
- Without getting these documents on E-mail, will affect the input in LRL. This will affect Vestbase AS planning phase.

- The delivery ticket should be market with a PO number, and without this number Bring cannot deliver the goods.
- Delivery ticket and certificate are usually being sent along with the goods by Bring to Vestbase AS. However, if the delivery ticket is not sent along with the goods, then Vestbase AS cannot take goods receipt, pack and send the equipment to the rig.

  In addition if the certificate is missing on the goods, it cannot be sent offshore due to security reasons.

It is important for Statoil and Vestbase AS that they receive the E-mail and the along with the goods.
This because they are dependent on the information contained in the delivery ticket and certificates, for planning of handling and control. In addition they will get the "knowledge" that the goods have been sent, which is a confirmation that everything is in order.

This will also affect the arrival day. Vestbase AS (Enterprise and VBO) cannot execute their tasks without getting the document belonging to the equipment. This will also affect Statoil (SBOG and Ship) for planning the daily load of the ship.

2. Dependency related to mail, Delivery Ticket and Certificate from Baker

The transfer dependency occurs when something is produced which is going to be utilized in the next step in the process which means it will have to be transferred. The figure below shows transfer dependency between Baker and Statoil (DSM).

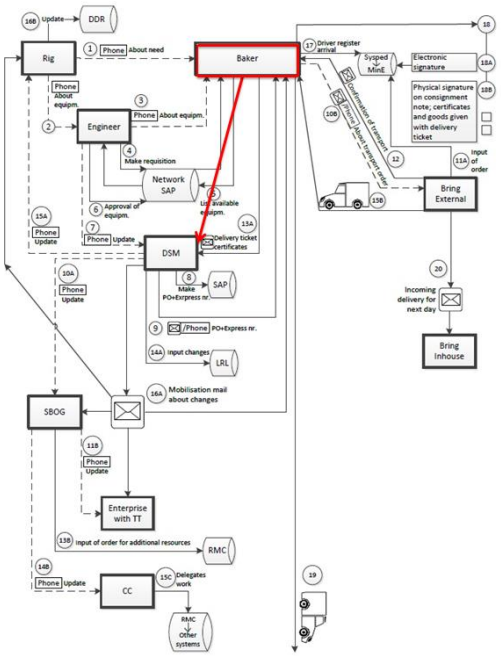


Figure 30 Transfer Dependency related to e-mail from baker - The day before arrival

In this process transfer dependency can be found in almost all of the tasks occurring. There is one activity that is checked twice. The information that is checked is the delivery ticket and certificate. First Baker is sending the documents to Statoil (DSM) which adds them into LRL. Vestbase AS has access to the LRL. This is a confirmation that the goods are being delivered from Baker. However, these documents are also attached to the product, which Vestbase AS receives. If Baker forgets to send these documents with the goods, they can still be found in the LRL by Vestbase AS. This means that these documents are so crucial for Vestbase AS to performing their activities. That is the reason for having these documents available in LRL. By adding these documents in LRL affects Vestbase AS planning for the arrival day of the goods.

Statoil (SBOG)

Dependency related to Statoil (SBOG)

The *task assignment dependency* concerns dependency between task and actor. The tasks assignment may require special skills. The constraint could be the lack of craftsmen.

The figure XX below shows task assignment dependency.

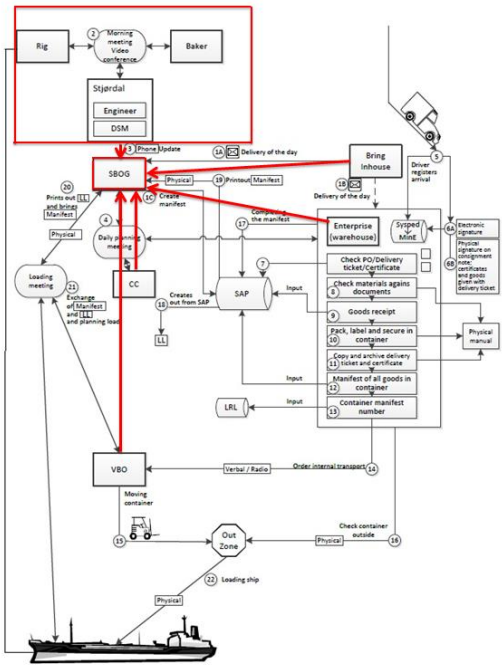


Figure 31 The task assignment dependency related to SBOG - The arrival day

In this case the Statoil (SBOG) is the link between several actors and can be seen as having special skills. Statoil (SBOG) would be the dependency between:

- The department SBOG is the intermediary between Bring and Vestbase AS. If something unexpected occurs Statoil (SBOG) has the responsibility to inform Vestbase AS and Bring. This is also the other way around. If some unexpected event occurs with Bring, they are contacting Statoil (SBOG) and not Vestbase AS. Further, Vestbase AS needs to contact the department Statoil (SBOG) if there are any problems.
- Statoil (SBOG) department is also an intermediary between the department at Statoil Stjørdal (Engineer and DSM), Vestbase AS and Bring. This means that they are dependent on SBOG to keep each actor updated when needed.

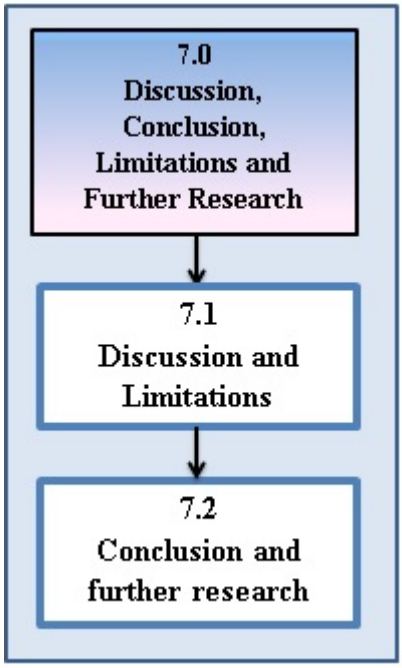
- Statoil (SBOG) is the only actor (department) within Statoil that orders extras resources in the Vestbase AS system RMC. Statoil (SBOG) has the knowledge or skills to perform order in this system.
- Statoil (SBOG) is the only actor that informs Vestbase AS verbally, and in this dependency usually verbal information means that something unexpected or something wrong has happened. Vestbase AS is dependent on Statoil (SBOG) to inform them about changes or unexpected events.

The constraint here is Statoil (SBOG). This is because the company Statoil has organized different responsibility areas to the SBOG department. They have gotten the responsibility to inform and be the intermediary between Bring, Vestbase AS and other departments within Statoil.

This dependency will also affect the day before arrival. Statoil (SBOG) has to inform if unexpected events occur at the day before arrival. This makes Vestbase AS, Bring and DSM dependent on SBOG, which will affect their planning and execution of tasks.

In this chapter we have proven that the model we have made, is seemingly working well performing an empirical case study. Further, this will be discussed in chapter 7.

7.0 Discussion and Conclusion



In this chapter the discussion of the analysis will be discussed in relation to the Research Question. Thereafter, the strength and weaknesses of the IFM model will be discussed. Then a conclusion will be made.

7.1 Discussion

In in accordance with the introduction for the research problem, two research problem was found which should be answered:

• ***Develop a descriptive model that is useful for mapping the information flow in a supply chain network***

• ***Do an empirical case study of an information flow connected to an Upstream supply network process by using the developed model.***

From the theoretical part it has been shown that it was possible to develop a descriptive model for mapping information flow based on several theories. This resulted in the IFM model.

Additionally it has been conducted an analysis in relation to a real life case, where the IFM model has been used as a basis. It can be seen that this has been successfully fulfilled because all the steps within this model has been conducted and each of them have given a result.
The overall result from the analysis using the IFM model, shows that it has resulted in an overview of the studied information network, that is found in the upstream supply network.

The model gives an overall view of the information network and there are both strengths and weaknesses related to the IFM model.

The strength and weaknesses of the IFM model will be discussed. The discussion will be based on the results from the analysis of the upstream information network using the IFM model in order to see if it was useful for its purpose.

7.1.1 Strengths and weaknesses of the IFM model

Combine an internal business process view with supply chain view

Compared to the model by Coopert and Lambert, and the internal business process view which focus on activities, the model has a broader perspective which also focuses on information flow. This is useful because many organizations are cooperating across organizational boundaries and internal views of business processes might not be sufficient.

Most organizations are not working alone. According to Harrison and Hoek (2008, p.9), *"The focal firm is embedded within the chain…".* The companies are linked together with several external actors and cannot be seen separately in order to increase the overall efficiency. Information exchange between organizations becomes more important and the

internal perspective will be too narrow when sharing information between external parts. This is also clearly seen with our empery, where our four companies are linked together in a supply network.

By having external supply chain business processes that run through functions in a supply network, this will according to Word and Magal, contribute to avoid the silo effect. This is obtained by having cross functional business processes, where information will be shared. This is also the case with our information supply network. The information is spread in the SCBP and not only in the functions.

As mentioned, the model that has been developed is also focusing on the information flow, as in information processes. This is a new way of looking at business processes in opposite to general business processes that tend to focus on activities. The IFM model has a "step by step" process view, which usually focus on activities that takes place internally within organizations. However, in the IFM model the activity focus has been replaced with a solely focusing on information flow and also extended to be seen in a larger context with a network view.

By also taking into account the specific "step-by-step" view, the model will contribute to a more specific way of how a process is proceeding. This is different to Coopert and Lambert, because their theory concerning supply chain business processes might be too general when mapping a process.

A simple and general model

One of the strengths of the model is that it is a rather simple model. The concept of the model is easy to understand and should be feasible to use for most purposes. This is due to its few elements and stepwise approach. When the model was made it was taken into consideration that it could be used "step-by-step". This was in order to map the information flow by categorizing the important elements which all together created an overall picture.

Researchers have mentioned that information is secondary to the product; however in the IFM model it maps the information and is most essential for the model. This is because the

material flow cannot take place without an information flow. Therefore, the information flow is visualized showing the flow going in both directions, while the material is going in one direction. This is similar to Harrison and Hoek figure "Network in Context". This makes the information easy to visualize.

The IFM model divides the information exchange into several parts. It can also be sub-divided into more detailed exchange of information. This is in opposite compared to Word and Magal`s process flow figure, which divides the information flow only related to computer based information. The IFM model has the strength of being more flexible and general.

The IFM model could also be considered to be general. This is because it is not linked to a specific industry, company or actors. It is made with the purpose of being usable for any situation that concerns an information flow in any industry. Still, it has been used with a focus on upstream supply network.

The authors find it possible that the model might also be useful for internal applications within an organization.

The complexity is different from internal within organizations to external between organizations. It will be less complex internally due to that personnel will use common information platforms and IS, where the personnel most likely have access to the same information. Therefore, IBP will be less complex and smaller. The IBP will also be better exposed and it is feasible to show the steps in a much simpler way.

In general the personnel within a firm would know the entire IBP. This is different to an external IBP, where the various actors use different system and where none of them would have the overall overview of the complete information flow. Collaboration across organizational boundaries is sometimes difficult. This is especially the case when there are large distances between the actors and also when the firms do not have enough knowledge about each other.

However, the model, which have been analyzed and used regarding an upstream information network, which is rather complex. This is due to that it involves four main actors and the process is going over two days.

The upstream information network also contained several details concerning information that is given/ received, and it was feasible to map the information flow overall. On this basis it would be manageable to use it for a more complex network. Most likely it might be feasible to use it for a simplified IBP, internally within an organization, even though it would have a different complexity level. The model was developed of the purpose of mapping an information network. Still, it cannot explicitly be said to be exclusively used for network. This is because the model is made general, in order to suit different industries. It can therefore also be said that it might be wrong to state that this model is specifically developed for mapping information network, due to its general nature. This is because it does not specifically take into consideration a network perspective. Still, it is strength that the model can be suitable for both internal and external processes. This is because an information network is more complex than an internal business process.

The IFM model exposes factors that might affect the information flow

One other strength of the IFM model is that one of the steps within the model that needs to be focused on, is the different factors that might affect the information flow. These factors will be related to the dependencies that could be exposed. The model takes into account the dependencies between the different actors regarding the information. It is important to display how each actor is linked together when trying to gain an overview on how the elements are related together in a network. Dependencies should be highlighted in order to be aware of them.

If there are weak links, they might have to be paid extra attention to in order to prevent breakdowns, failures or inefficiency. Strengthening of these links could be done in order to safeguarding against this. The model does not say anything about if the dependencies actually have led to a negative or positive result. Yet it may be seen as strength that they are highlighted in order to see the critical links. This dependency between actors has not been taken into consideration in Ola Bø`s(2012) SCIMN structure model.

By using the dependency from the coordination theory in our model, it will be possible to identify factors that affect the information flow. His figure do not take into account that the actors and information elements can be inter dependent, which might have some effect on

the process**.** By using the dependency in our model, we have identified some critical links which makes it possible to identify factors that affect the information flow.

Displaying different aspects of information

Strength of the IFM model is that it shows different aspect of the information by categorizing three different types of information exchange, which is related to the figure by Buckland (1991). The reason why it is strength is that information is more difficult to gain an overview over, in opposite to the material flow. Different forms of information could be found within every exchange of information. By including these while categorizing information exchange, the content around what kind of information it concerns becomes more clearly. This further makes it easier to classify the information that takes place, as an element within the information exchange model that has been developed.

And as seen from the figure by Buckland, the IFM model also contribute to classify information in a way that it becomes visual in relation to what kind of information that could be found between both processes and entities and also if the information is tangible/ intangible. By including all these elements, which together constitute mapping of the information exchange, it gives a clear picture of what type of information it is and how the information is transformed (IS) , which parts who exchange information and what type of data that is exchanged.

The authors have not found any similar way of classifying information exchange yet, and therefore it might be seen as a contribution on how to specifically execute this.

In relation to the empirical model, the categorizing of actors and the information flow has been visualized. One can see that the different steps of the IBP have come forward in detail. But here it may be mentioned that if the map had not been enumerated, it would have been difficult to read. Numbering is therefore an important detail which has not been mentioned in the model. One can therefore say that it can easily become confusing when visualize information flow that occurs in the network. When it comes to the categorization

of information exchange, this has also worked well in the conditions that they are somewhat rough cut, since we have not taken into account the many possible classification methods. Still, the overall model can be said to be working.

Specifying IBP

The IFM model also takes into consideration the informational inputs and outputs that occurs between the various actors by using the DM tool and the information exchange table. The DM tool maps the input and output between the different actors for the different activities. On the other hand, it does not show how it is exchanged. As mentioned from the figures by Boddy et al.(2008), the information needs to go through a transformation, which can be related to the use of information systems which is a part of the classification of information exchange. There are inputs and outputs between all the actors, containing different information which is processed through different systems.

The information exchange table will therefore be related to the systems which are used for transforming and exchanging the information from input to output and complements the DM tool.

The model might therefore be seen as strength due to that it specifies the IBP, step by step. This is in opposite the figure by **Lambert et al. (1998)**, which have the weakness for being too general.

7.1.2 Weaknesses of the IFM model

More complexity makes it more demanding

The concept of the model is simple, but in reality it is probably a little more complex than portrayed here.

The steps in the IFM model, requires details and things will be more nuanced.

To identify larger types of networking, the work scope grows and makes things more time consuming and difficult. It would be desirable to set up a possible empirical model of an

information process chronologically. This has proven to be rather difficult to achieve in reality. The final overview of the information flow can be difficult to interpret, as the arrows will go in all directions. This can lead to less overview of the overall picture, which was clearly was shown during the mapping of the upstream information network.

Although it is basically a relatively simple model, it is debatable whether it is as easy to implement in reality looking at a larger and more detailed network. The reason for this is primarily that the steps are not difficult to follow, but it will be more time consuming.

The authors chose to roughly categorize information systems, data type and the type of information exchange which simplified the mapping of the information network, and this might be the reason why the steps were easier to follow.

The model is designed in a way that more details can be inserted if needed, in terms of categorizing things more specific. However, this will then be more time consuming and demanding for the one who execute the work.

The "Network in context" figure by Harrison and Hoek (2005) visualizes the time flowing in both directions along with the information and material flow. The time is not taken into consideration in the IFM model.

On the other side, the time is essential, since the time starts when the information process starts and lasts until the material flow stops and the information concerning the product has ended. This should have been taken into consideration in the IFM model. This is because the time can be important when looking at the efficiency of the process.

This is especially important for a process where time is essential and where information must be exchanged quickly. In our upstream information network process, where equipment is required on the rig, time is a critical factor.

Therefore a smooth information network which exchange information quickly and effectively is of high importance. This is of course also the case of other industries.

Reducing the response time of exchanging information could be seen as an improved information flow.

One example related to improvements could be a joint electronic information system, which could take effect and "alert", when something unexpected has occurred to get information out fast.
Nevertheless, this is not the case for the actors in the upstream supply network. They are currently using verbal communication included electronic information exchange, when unexpected event occur. This is more time consuming.

Our model has been designed in accordance with the information network definition: "*Information network links internal and external companies, ensuring information flow and driving the material flow."* This definition does not focus or mentions the time. Hence our model complies with the information network definition. This is a weakness with our model and our definition.

The model also could be said to have some deficiencies which could be mentioned.

One deficiency of the model is that it does not explicit say anything about to what extent the human factor actually affects the information flow one way or another. It only assumes that it is an underlying factor which needs to be included when processing information.
It is reasonable to believe that this factor has a certain effect on the exchange of the information and how the information is perceived. This further affects how well the information flow is running.

On the other side the human factor is involved within the IFM model, through the transformation of data from input to output. This is focused on in the mentioned models from **Buckland(1991) and** Boddy et al.(2008)**,** and is in reality happening in every step where information is exchanged. When the information is given/ received, there will most likely be human factor involved, in relation to processing of information but also knowledge and experience in relation to making decisions and exchanging of information. It could therefore be said that even though it is not explicit shown, it is presence within the model as an underlying element and part of the IBP.

We will try to give an example of this from the upstream information network figures. In these figures it shows that a lot of the information is given verbally and has no formal information standards. Therefore tacit knowledge which an actor has might have a certain effect on how the information is understood and further how this information is delivered further on.

One example can be related to Baker which has been collaborating with Statoil over a long period. Baker is familiar with the needs that may arise from Statoil. They might use this knowledge when they are trying to find the right equipment, which might further contribute to a faster and more efficient information handling and also a smoother flow of information.

Another example can be the SBOG who might have more information about what is happening at Stjørdal. Before passing the information on to Vestbase AS, it is necessary to process the information and remove unnecessary details or adjust the information in order to make it fit for purpose. Vestbase AS might only need information about the most important things, like size and arrival day of the equipment and if there are additional resources needed.
Based on this, it could be said that the model might be more explicit to visualize the human factor.

The IFM model also does not say anything about the quality of information that is exchanged between the parts could be said to be good or bad. The quality of information could also be seen different, depending on which side one are looking at. Quality could also be related to different thing, such as if the information is sufficient enough, if the information is timely or if the information is complete. It might therefore be difficult to define what the good quality could be.

Sufficient information can for example be related to different levels of details given in different forms of information exchange. In case of verbal information exchange, it is seen that the information would contain less detail. However, it does not say anything about "how much information is enough" or "how much information is too little/ too much".

Another example related to for example if the information is timely, it can be seen in the upstream information network that Vestbase AS will always be the last actor which is notified verbally. The question is if they receive the information when they need it in order to be prepared, which will be timely information. They need to handle the goods within a short time frame and therefore timely might be to receive the information earlier. This is in opposite to when Baker send the delivery tickets to DSM, which is an indicator of that the goods have start moving. Timely information will in this case be to receive the information when it is done, not earlier where the goods still are in Stavanger.

It might be useful to take quality of information into consideration due to that it might be an indicator for if the information flow could be better. On the other hand, *improvements* and *possible new solutions* are not the focus of the model.

This is not the purpose of IFM model, but might have been a basis for further research by expanding the model. The model purpose is to gain an overview of the information flow, and this could be the basis for further going more deeply into the mentioned issues above.

7.2 Conclusion and Further Research

Conclusion

In this thesis we have developed a model, IFM, which can be used for the purpose to understand and map an information flow at a process level. The model is used for a specific process in order to illustrate the information flow within an upstream supply network.

On the other hand, the general and flexible approach in the way which the model is formulated makes it appropriate for other processes, tough this needs to be further investigated.

By using an empirical case, we have shown the complexity of an information process mapping and analyzing of an empirical case study. Also, the model adapts this complexity by using the dependencies within the coordination theory.

It shows the importance of the information flow exchange between actors and that the information for some actors is more critical than for others. However, this might change as the information process proceeds in the supply network. Therefore, the model takes into account that the information might differ in the decision phases.

Our study indicates that there are aspects which this model does not take into consideration. Nevertheless, our conclusion is that the IFM model can be a useful mapping tool, also an easy model for stepwise information mapping of a network. In such cases it might be more complex and time consuming in relation to increased level of details in a real life situations.

By following the few steps- approach it is considered feasible to categorize different aspects of the information. The level of details when categorizing might also be adjusted to the desired level of overview.

It might be time consuming to execute an analysis. Even if the level is approximately, the mapping might provide an overall view of the information flow. This could be helpful in order to gain a better understanding of the complexity and might further be a foundation for looking more deeply into details if needed.

It is proven that the IFM model overall may work well for an empirical case study. The IFM model has shown an overview of the information flow for a supply network. Each step of the model has been mapped and each step has given a result. Therefore, the research questions for this thesis have been answered.

Further Research

The model is made general which makes it appropriate for other processes. However, it has only been used on an upstream supply network. It should be investigated further with other business processes and also other businesses.
The IFM model is designed for mapping the external SCBP, however, it may be utilized as an internal process as well. This may be further researched.
The IFM model does not consider the time aspects and quality concerning information. Time and quality may be essential and should be investigated for further research.
Neither does the IFM model take into consideration possible improvements.
If one may wish to take this into consideration, it had been necessary to go deeper into the coordination theory about possible alternative coordination mechanisms that could be used instead of the currently used, in order to improve the information flow. However, in order to coordinate differently, there will be a need for defining what needs to be improved. For example if the quality of information is not satisfying and what is defined as effective information flow.

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9.0 Appendices

9.1 References from Interviews

1. ”Initial conversation with Silseth, Svein and Taknæs, Tommy B. 02.02.2013.Vestbase AS, Kristiansund.”
2. “Follow up conversation with Silseth, Svein and Taknæs, Tommy B. 02.04.2013.Vestbase AS, Kristiansund.”
3. “Interview with Statoil Base Operation Group (SBOG) 04.04.2013.Statoil, Kristiansund.”
4. “Interview with Statoil Drilling Supply Manager 11.04.2013, Statoil, Kristiansund.”
5. “Classification telecom with Statoil Drilling Supply Manager (DSM), 23.04.2013, Statoil Kristiansund”.
6. “Follow up e-mail from Bring Logistics coordinator 22.05.2013, Bring, Kristiansund.”
7. “Follow up e-mail from Statoil Base Operation Group (SBOG) 08.05.2013, Statoil, Kristiansund.”
8. “Interview with Bring Logistics coordinator 29.04.2013, Bring, Kristiansund.”
9. “Follow up e-mail with Taknæs, Tommy B. 15.03.2013, Vestbase AS, Kristiansund.”
10. “Follow up e-mail with Taknæs, Tommy B. 22.04.2013, Vestbase AS, Kristiansund.”
11. “Mail interview with Vestbase AS -Terminal Coordinator 16.04.2013, Vestbase AS, Kristiansund.”
12. “Interview with Vestbase AS- Terminal Coordinator 29.04.2013, Vestbase AS, Kristiansund.”
13. “Mail interview with Vestbase AS- Terminal Coordinator 22.05.2013, Vestbase AS, Kristiansund.”

9.2 Interview Guide

General questions that are asked for all the interview Objects

Spørsmål for «hvert steg» i en generell prosess

1. *Hvem får informasjon fra dette trinnet*

2. *Hvilken kommunikasjonsmetode brukes vanligvis for en generell prosess fra dette trinnet*? (Mail, Tlf, SAP)

3. *Hva slags informasjon får de forskjellige partene fra dette trinnet?*

4. *Når informasjon ankommer, blir det umiddelbart sendt videre fra dette trinnet*? (eventuelt timer, dager)

5. *Hva blir lagt inn av informasjon på et data system fra dette trinnet?* (muntlig, skriftlig informasjon)

6. *Hvordan vet dere at informasjonen er mottatt fra dette trinnet*? (bekreftelse, sjekke selv)

7. *Hva slags innsyn har andre parter i det som skjer fra dette trinnet, utenom det de spesifikt får*?
   - *Hvor har de innsyn? (SAP, andre data systemer)*
   - *Hva kan de se av informasjon?*
   - *Har de mulighet til å få innsyn i mer om ønskelig? I så fall hvordan?*
   - *Er det Vestbase Statoil eller Vestbase ansatte som kan få/har mer innsyn?*

Spørsmål for «hvert steg» i en prioritets prosess

1. ***Hvem får informasjon om at behov har oppstått fra dette trinnet?***
   - Hvor ofte hender det at de som skal få informasjonen ikke får den? daglig, ukentlig, mnd. etc.)
   - Hva kan være årsaken til dette?
     - Hva er problemet? Hvorfor har problemet oppstått?
     - Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

2. **Hvilken kommunikasjonsmetode brukes vanligvis for en haste-ordre *fra dette trinnet*?** (Mail, SAP, muntlig, tlf. etc.)
   - Hvor ofte hender det at kommunikasjonsmetode varierer for de forskjellige? (daglig, ukentlig, mnd.)
   - Hva kan være årsaken til variasjon på kommunikasjonsmetode?
   - Om det ikke er stor variasjon, har dere noen standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne)

3. ***Hvilken informasjon får de forskjellige partene fra dette trinnet***?
   - Hvor ofte hender det at informasjon blir utelatt/ det blir gitt ufullstendig informasjon? (Daglig, ukentlig, mnd.)
   - Hva kan være årsaken til dette?
     - Hva er problemet?, Hvorfor har problemet oppstått?
     - Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.
   - Hva blir lagt inn av informasjon i datasystemer? (av muntlig, skriftlig, SAP)
     - Hvilke data systemer? (SAP eller andre interne system)

4. ***Når informasjon kommer, blir det sendt umiddelbart videre fra dette trinnet?***
   - Om det ikke blir sendt umiddelbart, hvor lang tid tar det før det blir sendt? (Timer, dager)

- Hvor ofte hender det at informasjon ikke blir sendt så raskt(umiddelbart/ X tid) som det skal?
- Hva kan være årsaken til dette?
    - Hva er problemet?, Hvorfor har problemet oppstått?
    - Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

5. ***Hvordan vet dere at informasjon er mottatt fra dette trinnet?*** (Bekreftelse eller må man sjekke dette selv?)

- Hvordan får dere bekreftelse/ kan sjekke selv? (Mail, SAP, muntlig, tlf etc.)
- Hvor ofte hender det at dere ikke får bekreftelse / Må sjekke selv? (daglig, ukentlig, mnd etc.)
- Skjer dette ofte med noen spesielle? (Rig ,Stjørdal, leverandører, VB (VB eller Statoil ansatte?), Bring etc.)
    - OM det er slik at det er vanlig å få en bekreftelse, og man ikke får det: Hva gjør man da?
    - Hva kan være årsaken til at man ikke får bekreftelse?
        - Hva er problemet?, Hvorfor har problemet oppstått?
        - Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

6. **Hva slags innsyn har andre aktører** (HVEM?) **i det som skjer fra dette trinnet, uten om det de spesifikk får?**

- Hvor har de innsyn? (Systemer, SAP)
- Hva kan de se av informasjon?
- Har de mulighet til å få innsyn i mer om ønskelig?
- Hvordan kan de få mer innsyn?
- Er det Vestbase ansatte eller Statoil ansatte som har innsyn?

Additional Interview Questions for Statoil

Generell Prosess

- **Hva er viktig for Statoil når det kommer til en optimal service/ levering for en generell prosess?**

Eksempler kan være:

- Feilfritt produkt (merking (label), 0 skade, riktig produkt i henhold til spesifikasjoner)
- Tilgjengelighet, tilpasningsevne (uforutsette hendelser), få egen individuelle behandling av 3PL
- Minimere ledetiden- så fort så mulig, eller til avtalt tid
- Kostnadsramme (pris/kostnad)- Billig så mulig eller er det av ingen betydning
- Levering i henhold til avtalt, pålitelighet, forutsigbarhet

Prioritets Prosess

- **Hva er viktig for Statoil når det kommer til en optimal service/ levering for en haste prosess?**
    - Feilfritt produkt (merking (label), 0 skade, riktig produkt i henhold til spesifikasjoner)
    - Tilgjengelighet, tilpasningsevne (uforutsette hendelser), få egen individuelle behandling av 3PL
    - Minimere ledetiden- så fort så mulig, eller til avtalt tid
    - Kostnadsramme (pris/kostnad)- Billig så mulig eller er det av ingen betydning
    - Levering i henhold til avtalt, pålitelighet, forutsigbarhet

- **Er det noe utstyr/ væske som ofte blir sendt som en rush ordre? (Hasteordre som ofte går igjen)**
    - Hvem er leverandørene for dette?
    - Er de eksterne eller er de lokalisert på Vestbases område?

Mer utdypende om siste leddet i en hasteprosess (Leddet hvor det går fra eksternt til internt innad i Vestbase)

- Hvilken avdeling får først beskjed om en hasteordre? (Statoil eller Vestbase ansatte)
    - Hvordan får de vanligvis beskjed? (SAP, tlf, mail, muntlig)
- Hvem kontakter avdelingen fra eksternt? Dvs. hvem får de beskjeden fra. (Rig, Statoil Stjørdalen, Bring, Leverandører)
- Hvordan blir dette kommunisert videre til det når de som skal delegere/ forberede arbeidsoppgavene og planlegger for hasteordre? (Systemer, SAP, mail, muntlig etc.)
    - Hvem er de som delegerer/planlegger/forbereder for hasteordren? (avdeling, enkeltpersoner)
    - Hvor legger blir det «delegert ut»? (Systemer, SAP, mail, muntlig etc.)

Mer utdypende om siste leddet i en generell prosess (Leddet hvor det går fra eksternt til internt)

- Hvordan blir ordren i en generell prosess i «siste leddet»? (Dvs. hvordan får de som skal delegere/ forberede arbeidsoppgavene og planlegger for ordren den, innad i VB)
    - Blir det lagt inn i system, og noen legger til ansatte for å utføre dette dag for dag, slik at det går automatisk eller blir det gitt via mail, muntlig etc.

Kontrakter

Hva slags kontrakter Statoil har med Vestbase?

- Fortell
- Varighet, Tonn/time pris, «Hva de omhandler» generelt.

Hva slags kontrakter Statoil har med Bring

- Fortell litt hva den går ut på og hva forskjellen er fra den gamle til den nye kontrakten
- Varighet
- Er bring lokalisert på Vestbasen og har de alltid vært det?

SAP

- Når blir SAP og når blir RMC brukt av Statoil?
    - Er det forskjell på hva en bruker til en generell prosess og en hasteprosess?
- Hvem fra Statoil er inne på RMC? (Hva gjør de her, og hvem er de?)
- Hvem bruker SAP ift. Statoil?(VB , Statoil folk?)
- Hvordan får VB vite om ordrer i SAP ift rush og en generell prosess?
- Hvem internt(avdeling, enhet) får informasjonen fra SAP ift rush og en generell prosess?
    - Hvordan sendes informasjon fra SAP videre?(Mail, muntlig, RMC etc?)
        - Er det forskjell på hva en bruker til en generell prosess og en hasteprosess?
- Vet der hva VB kan følge på SAP? (hvilke områder har de innsyn i og hvem som har tilgang, grovt sett)

Kommunikasjon med Vestbase

Enhetsnivå

- ***Hvem*** kommuniserer Statoil med innad i Vestbase på dette nivået?
- ***Hvor*** ofte kommuniseres det her?
- ***Hva*** kommuniseres det om her?
- ***Hvordan*** kommuniseres det her?
-

Avdelingsnivå

- ***Hvem*** kommuniserer Statoil med innad i Vestbase på dette nivået?
- ***Hvor*** ofte kommuniseres det her?
- ***Hva*** kommuniseres det om her?
- ***Hvordan*** kommuniseres det her?

Selskapsnivå

- ***Hvem*** kommuniserer Statoil med innad i Vestbase på dette nivået?
- ***Hvor*** ofte kommuniseres det her?
- ***Hva*** kommuniseres det om her?
- ***Hvordan*** kommuniseres det her?

Konsernnivå

- ***Hvem*** kommuniserer Statoil med innad i Vestbase på dette nivået?
- ***Hvor*** ofte kommuniseres det her?
- ***Hva*** kommuniseres det om her?
- ***Hvordan*** kommuniseres det her?

Additional Interview Questions for Bring

Generelle spørsmål ang. Bring

- Hva gjør Bring eksternt og hva gjør bring in-house? (ansvarsområder/ arbeidsoppgaver)?
- Gir Bring en fraktseddel til leverandør når de henter varen? Blir denne gitt i papirform eller elektronisk?
- Hvor ofte hender det at fraktseddelen mangler vesentlig informasjon? (for eksempel. Tracking nummer) Og kan leverandøren sjekke opp godset via internett?
- Hvor ofte hender det at varen ikke er klar til å hentes når den er bestilt fra Baker? Og hva kan være grunnen til dette?

Additional Interview Questions for Baker

Spørsmål for en vanlig bore prosess uten prioriteringer
(Generell prosess ift. leie utstyr fra Baker)

1. For en vanlig bestillingsordre, som ingeniøren i Stjørdal lager, hvordan får Baker vite om denne? (Blir denne bare generert i SAP, får dere mail fra ingeniør, tlf., eller går dette via Communicator?)
    1. Hva pleier en bestillings ordre å inneholde?
    2. Hva er viktig for dere å vite?

2. Når Baker har lagt inn hva gods de kan tilby i nettverket i SAP, blir det da generert automatisk «over natten», eller sender Baker en mail/ Tlf./ Communicator til ingeniør og forteller at man har svart på ordren?
    1. Hva legger dere inn som er viktig for ingeniøren å vite?

3. Hvor lang tid i forveien blir det ca. lagt inn ordre for en bestillings fra ingeniøren? (dager, uker, mnd.)

4. Hvor lang tid tar det for dere å svare på denne ordren? (samme dag som den blir lagt ut av ingeniør, et par dager etterpå, uke, mnd.?)

5. Når blir Bring kontaktet ang. Leveranse fra dere som er planlagt i forveien og som ikke har noen prioritet? (Et par dager før leveransen skal bli plukket opp, en uke i forveien, en mnd.)
    1. Hvordan kontakter dere Bring ang. leveranse? (Tlf., mail, SAP eller andre systemer)

6. Når sender dere deliveryticket (pakkseddel) og sertifikat for godset til BFA Statoil Kristiansund? (Et par dager før leveranse, samme dag som leveranse, en uke i forveien, mnd.)

7. Når Bring henter godset, får dere en fraktseddel av dem?
    1. Blir denne fraktseddelen også sendt til BFA og evt. Andre?(Hvem)
    2. Hvordan blir denne fraktseddelen evt. gitt videre fra dere? (Mail, SAP, communicator, andre systemer)
    3. Er det mulig om vi kunne fått en screens shot av en delivery ticket(Pakkseddel) og en fraktseddel?

8. På fraktseddelen dere evt. Får av Bring, kan dere da følge godset via track-and-trace?
    1. Og kan også andre følge godset (BFA, Operasjonsgruppe Statoil Kristiansund)

9. Har dere noe kontakt med operasjonsgruppen Statoil i Kristiansund?
    1. Hva gjelder det da?
    2. Hvordan blir Operasjonsgruppen kontaktet?(Mail, Tlf., SAP, Communicator)

10. Får dere bekreftelse av Bring at varen har ankommet Vestbasen?
    1. Hvordan får dere denne bekreftelsen?(Mail, Tlf., andre måter?)

11. Har Vestbase noe innsyn i det som skjer hos dere?
    1. Om de har: hva har de innsyn i?
    2. Om ikke: Hva er årsaken til dette?
    3. Evt. Hva kunne de ha fått mer innsyn i?

Ekstra spørsmål

1. Hva slags utstyr blir generelt send ift en drilling prosess når det er leie utstyr?
2. Er det noe leie utstyr som ofte blir sendt som en prioritets ordre? (Prioritets ordre som ofte går igjen)

Spørsmål for en boreprosess med prioriteringer

(I forhold til leie utstyr fra Baker)

Om en prioritering skjer før morgen møte

1. **Er det vanlig for dere å få vite om en prioritering har oppstått før morgen møtet?**
    a. Hvem får dere vite dette av?
    b. Hvordan blir det kommunisert til dere? (Tlf., Mail, SAP, Communicator, andre systemer, evt. Flere enn en metode samtidig?)
        I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
        II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
        III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne
    c. Hva slags informasjon får dere?(Fyll gjerne ut litt)
    d. Hvor ofte hender det at dere ikke får beskjed om dette før morgen møtet? (Daglig, ukentlig, mnd. etc.)
    e. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

Om en prioritering blir tatt opp <u>på</u> Morgen møte

1. Hva blir tatt opp på morgenmøtet når en prioritet har oppstått?

a. Blir det avklart hva slags utstyr som kan dekke behovet på morgen møtet?
b. Blir det avklart hva dere har på morgen møtet?
c. Blir det avklart når utstyret skal sendes på morgen møtet?
d. Om det er slik at dere får vite om en prioritering før morgen møtet, begynner dere prosessen med å klargjøre utstyr og legge inn hva dere har samt delivery ticket før morgen møtet?
e. eller må dere vente med dette til:
    I. Til dere har fått avklart på morgenmøtet hva som trengs/ godkjent det dere har?
    II. Til dere har fått bestillingsordren i SAP fra ingeniør?

Om en prioritering skjer <u>etter</u> morgen møte har blitt holdt

1. Når en prioritering oppstår etter morgenmøte og før klokken 16:00:

a. Hvem får dere vite dette av? (Eksempler: Rig, Stjørdal (Ingeniører, BFA), Statoil Operasjons Gruppe Kr.sund, eller andre.)
b. Hvordan blir det kommunisert til dere? (Tlf., Mail, SAP, Communicator, andre systemer, evt. Flere enn en metode samtidig?)
    IV. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
    V. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
    VI. <u>Om det ikke er stor variasjon</u>, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne
c. Hva slags informasjon får dere?(Fyll gjerne ut litt)

Trinn: Bestillingsordre

1. **Når ingeniøren legger inn en bestillingsordre ang. prioritert utstyret i SAP etter møtet,**

   Hvordan får dere beskjed fra ingeniør at bestillingsordren er lagt ut i SAP?

   (Mail, Tlf. SAP, Communicator evt. Flere enn en metode samtidig?)

   I. Hvor ofte hender det at kommunikasjonsmetode varierer?(daglig, ukentlig, mnd.)
   II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
   III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne

   a. Hva Inneholder bestillingsordren dere får?
   b. Hvor ofte hender det at dere ikke får en bestillings ordre etter møtet og eventuelt om det er ufullstendig informasjon? (Daglig, ukentlig, mnd. etc.)
   c. Hva kan være årsaken til dette?
      I. Hva er problemet (forklar)
      II. Nevn ulike årsaker til hvorfor problemet har oppstått
      III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

2. **Hva legger dere ut når dere svarer på denne bestillingsordren i SAP?**
   a. Hvor ofte hender det at dere ikke besvarer bestillingsordren så raskt som mulig?
   b. Hva kan være årsaken til dette?
      I. Hva er problemet (forklar)
      II. Nevn ulike årsaker til hvorfor problemet har oppstått
      III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.
   c. Hvordan vet ingeniøren at dere har besvart denne bestillingsordren?
   d. Hvor ofte hender det at ingeniøren ikke får informasjon? (Daglig, ukentlig, mnd. etc.)
   e. Hva kan være årsaken til dette?
      I. Hva er problemet (forklar)
      II. Nevn ulike årsaker til hvorfor problemet har oppstått

III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

f. Hvordan får dere beskjed fra ingeniør at utstyret dere har er godkjent? (Evt. Om det er blitt avklart på morgenmøte, trenger dere da en godkjenning fra ingeniør at det er det riktige utstyret?)

g. Hvor ofte hender det at dere evt. Ikke får beskjed fra ingeniør at utstyret dere har er godkjent? (Daglig, ukentlig, mnd. etc.)

h. Hva kan være årsaken til dette?

I. Hva er problemet (forklar)

II. Nevn ulike årsaker til hvorfor problemet har oppstått

III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

Trinn: Ekspressnummer

1. **Hvordan får dere vite ekspress nummeret fra BFA?** (Mail, Tlf., SAP, Communicator, andre systemer evt. Flere enn en metode samtidig?)

I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)

II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?

III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne

a. Når får dere ekspress nummeret fra BFA:

I. Rett etter morgenmøtet?

II. Når bestillingsordren er besvart av dere?

2. Hvor ofte hender det at dere må purre på nummer fra BFA? (Daglig, ukentlig, mnd. etc.)

a. Hva kan være årsaken til dette?

I. Hva er problemet (forklar)

II. Nevn ulike årsaker til hvorfor problemet har oppstått

III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

3. **Hva gjør dere med ekspress nummeret?(**For eksempel merket på godset for hånd eller via noen form for merkelapp (delivery ticket eller andre))
    a. Hvor ofte hender det at dere glemmer å merke godset med ekspress nummer? (Daglig, ukentlig, mnd. etc.)
    b. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

Trinn: Delivery ticket

1. **Når blir delivery ticket sendt til BFA**:
    a. Før utstyret er hentet av Bring?
        I. Evt. Hvor tidlig i de foregående trinnene kan denne bli sendt?
    b. Etter utstyret er hentet av Bring?

2. **Hvor ofte hender det at dere ikke leverer delivery ticket til BFA så raskt som mulig**?
    a. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

3. **Hvordan blir delivery ticket gitt til BFA?** (Mail, Tlf., SAP, Communicator, andre systemer evt. Flere enn en metode samtidig?)
        I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
        II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
        III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne

4. **Hvordan vet Baker at delivery ticket er mottatt av BFA?** (Via Mail, SAP, andre systemer, tlf., communicator, evt. Flere metoder samtidig.)
    - **a.** Hvor ofte hender det at dere ikke får bekreftelse / Må sjekke selv? (daglig, ukentlig, mnd etc.)
    - **b.** OM det er slik at det er vanlig å få en bekreftelse, og man ikke får det: Hva gjør man da?
    - **c.** Hva kan være årsaken til at man ikke får bekreftelse?
        - **I.** Hva er problemet (forklar)
        - **II.** Nevn ulike årsaker til hvorfor problemet har oppstått
        - **III.** Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

5. **Hvor ofte hender det at der er mangelfull informasjon på delivery ticket?** (Daglig, ukentlig, mnd.)
    a. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.
    b. Blir denne gitt til andre enn BFA? (Eksempler: Rig, Stjørdal (Ingeniører, BFA), Statoil Operasjons Gruppe Kr.sund, Vestbase Entreprisen, Bring eller andre.)

6. **Hvor ofte hender det at BFA/ og evt. andre ikke får delivery ticket?** (Daglig, ukentlig, mnd.)
    a. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen

Trinn: Bring

1. **Når blir Bring kontaktet for henting av godset?(** På hvilket tidspunkt mellom de forskjellige trinnene ovenfor)

2. **Hvor ofte hender det at Bring ikke blir kontaktet før varen står klar?** (Daglig, ukentlig, mnd.)
    a. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Om det er slik at Bring kan bli kontaktet før, redegjør om mulig for hvordan.
3. **Hvordan kontaktes Bring?(**Tlf., mail, Andre system evt. Flere enn en metode samtidig?)
        I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
        II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
        III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne

4. **Får dere en fraktseddel** (evt. Andre ting) **som en bekreftelse av at det er blitt hentet av Bring?**
    a. Hva er viktig for dere å vite fra fraktseddelen?
    b. Hvor ofte hender det at informasjon som er viktig for dere, mangler på frakt seddelen? (for eksempel track and trace nummer, sjåfør nummer eller annen viktig informasjon) (Daglig, ukentlig, mnd.)
    c. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

5. **Hvor ofte hender det at dere ikke får en fraktseddel av Bring**?(Daglig, ukentlig, mnd. etc.)
    a. Hva kan være årsaken til dette?

I. Hva er problemet (forklar)
II. Nevn ulike årsaker til hvorfor problemet har oppstått
III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

6. **Hvor ofte hender det Bring er forsinket for henting av prioritets utstyr**? (ukentlig, månedlig)
    a. Får dere beskjed om dette fra Bring?
    b. Hvor ofte hender det at dere ikke får beskjed om dette fra Bring?(Daglig, ukentlig, mnd.)
    c. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan få bedre beskjed
    d. Hvordan får dere beskjed om forsinkelser fra Bring? (Mail, Tlf., Communicator, Systemer evt. Flere enn en metode samtidig?)
    e. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
    f. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
    g. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne?

7. **Kontakter dere andre når det er forsinkelser fra Bring**?
    a. Hvem blir kontaktet da? (Eksempler: Rig, Stjørdal (Ingeniører, BFA), Statoil Operasjons Gruppe Kr.sund, Vestbase Entreprisen, Bring eller andre.)
    b. Hvordan blir disse kontaktet?(Mail, Tlf., Communicator, Systemer, evt. Flere enn en metode samtidig?)
    c. Hvor ofte hender det at dere ikke kontaktet andre om at Bring er forsinket ved henting? (Daglig, ukentlig, mnd. etc.)
    d. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen

e. Hvor ofte hender det at dere ikke kontakter andre så raskt som mulig om forsinkelse ved henting?
f. Hva kan være årsaken til dette?
    I. Hva er problemet (forklar)
    II. Nevn ulike årsaker til hvorfor problemet har oppstått
    III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

8. **Hvor ofte hender det at dere har sendt delivery ticket til BFA, før godset er hentet med Bring**?(daglig, ukentlig, månedlig)
    a. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen

9. **Hvor ofte hender det Bring blir uforutsett heftet på veien**? (ukentlig, månedlig)
    a. Får dere beskjed om dette fra Bring?
    b. Hvor ofte hender det at dere ikke får en beskjed om forsinkelser på veien fra Bring? (Daglig, ukentlig, mnd. etc.)
    c. Hva kan være årsaken til dette?
        I. Hva er problemet (forklar)
        II. Nevn ulike årsaker til hvorfor problemet har oppstått
        III. Redegjør om mulig for hvordan en kan få bedre beskjed
    d. Hvordan får dere beskjed om dette fra Bring? (Mail, Tlf., Communicator, Systemer, evt. Flere enn en metode samtidig?)
        I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
        II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
        III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne

10. Kontakter dere andre når dette skjer?

a. Hvem blir kontaktet da? (Eksempler: Rig, Stjørdal (Ingeniører, BFA), Statoil Operasjons Gruppe Kr.sund, Vestbase Entreprisen, Bring eller andre.)
b. Hvordan blir disse kontaktet?(Mail, Tlf., Communicator, Systemer evt. Flere enn en metode samtidig?)
    I. Hvor ofte hender det at kommunikasjonsmetode varierer fra de forskjellige?(daglig, ukentlig, mnd.)
    II. Hva kan være årsaken til variasjon på kommunikasjonsmetode?
    III. Om det ikke er stor variasjon, har dere noe standard prosedyrer som er med å forhindre dette, og hva inneholder i så fall denne
c. Hvor ofte hender det at dere ikke kontaktet andre om uforutsette hendelser? (Daglig, ukentlig, mnd. etc.)
d. Hva kan være årsaken til dette?
    I. Hva er problemet (forklar)
    II. Nevn ulike årsaker til hvorfor problemet har oppstått
    III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen
e. Hvor ofte hender det at dere ikke kontakter andre om uforutsette hendelser så raskt som mulig?
f. Hva kan være årsaken til dette?
    I. Hva er problemet (forklar)
    II. Nevn ulike årsaker til hvorfor problemet har oppstått
    III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

11. Får dere bekreftelse av Bring om at varen er avlevert på Vestbase? (Via Mail, SAP, andre systemer, tlf., communicator, evt. Flere metoder samtidig.)

a. Hvor ofte hender det at dere ikke får bekreftelse / Må sjekke selv? (daglig, ukentlig, mnd)
b. OM det er slik at det er vanlig å få en bekreftelse, og man ikke får det: Hva gjør man da?
c. Hva kan være årsaken til at man ikke får bekreftelse?

I. Hva er problemet (forklar)
II. Nevn ulike årsaker til hvorfor problemet har oppstått
III. Redegjør om mulig for hvordan en kan redusere sannsynligheten for at det skjer igjen.

12. Hva slags innsyn har Vestbase i det som skjer hos dere i forhold til en prioritet?

a. Hvor har de innsyn? (Muntlig, mail, Tlf., SAP, andre data systemer)

b. Hva kan de se av informasjon?

c. Har de mulighet til å få innsyn i mer om ønskelig?

I. JA: I så fall hvordan?

II. NEI: Hvorfor ikke? (nevn ulike årsaker om mulig)

Additional Interview Questions for Vestbase As

Runde med spørsmål som besvares via mail.

Generell info om Vestbase.

1. Hva skjer på terminaldrift og hva skjer på Basedrift?
2. Hva slags arbeidsoppgaver gjør de forskjellige avdelingene?
3. Hvilke avdelinger finner vi folk under Enterprise kontakt for Statoil og hva skiller de fra andre arbeidere?
4. Hvilken avdeling ligger Teknisk Tjeneste (TT) i?
5. Hvilken avdeling kommer lasteformannen fra, og hva er arbeidsoppgavene han?
6. Ligger varehuset under terminaldrift?
7. Hvem har ansvar for seilingsruter?
8. Har dere faste tidspunkt på når båtene går fra basen? Hvor ofte hender det at båten ikke går når det skal pga. Prioriteringer?
9. Når må godset stå klart for lasting av båt? (Klokkeslett, før/ etter lastemøtet?
10. Har dere faste «due dates» på når varen skal ankomme basen (gods, matkontainere etc.?)
11. Kan vi få se en merke lapp som blir festet på godset før den blir pakket?
12. Hvilken avdeling har innsyn i SAP, LLL, RMC?
13. Hva kan de avdelingene som har innsyn i SAP se? (kan vi få en utskrift av dette?)
14. Hva er viktigst for Vestbasen å vite om varen som kommer?

Lasteliste:

1. Hvilken avdeling begynner først å lage lastelisten? Hva blir lagt inn i de forskjellige systemene?
2. Hvem andre legger inn mer informasjon videre helt til lastelisten når båt, og hva informasjon blir lagt inn av dem?
3. Hvordan blir lastelisten koordinert med manifestet?(Hvordan, hvor og i hvilket system?) → Kan vi få en utskrift av en laste liste som blir gitt til båt?
4. Når får båten lastelisten? (Tidspunkt og ift. lastemøtet: før/etter)

Lasteleieloggen (LPS/LLL):

1. Hvilken avdeling begynner først å legge inn Lasteleieloggen fra VB?
2. Hvem andre legger inn mer informasjon? Og hva informasjon blir lagt inn av dem?
3. I LLL, SAP kan dere se hva som kommer de neste dagene i god tid? (om morgningen, dagen før, en uke etc.)

Manifest:

1. Hvilken avdeling begynner først å lage manifestet på VB? Hva blir lagt inn i de forskjellige systemene?
2. Hvem andre legger inn mer informasjon? Videre helt til manifestet når båt? Og hva informasjon blir lagt inn av dem?

3. Når får båten manifestet (tidspunkt, og ift lastemøtet: før/etter)
   ➔ Kan vi få en utskrift som blir gitt til båt?

Møter:

1. Hvilke møter blir holdt på disse avdelingene? (tidspunkt, hvem er med, hvilken informasjon blir gitt (detaljert).(Morgenmøter, lastemøte etc.)
2. Hvor blir informasjonen gitt videre etter møtene i systemer (SAP, RMC, Mail, LLL, Tlf.) og avdelinger (til hvem)?

En generell beskrivelse innad i Vestbase for håndtering av <u>ikke prioritets</u> gods.

1. Kan du beskrive prosessen fra og med en vare blir tatt mottak på og til varen blir lastet på båt?
2. Hva skjer på mottak og hvem gjør det?
3. Hvilke systemer varen blir lagt inn i og av hvem (SAP, LLL, RMC)
4. Hvem flytter/sjekker/pakker varen/ går over kontainer (TT, Varemottaket etc.)
   - Hva står det på en forsegling? Hvem putter denne på kontainerne?
5. Hvem forflytter containere ned til havn? (Hvordan/når får dem beskjed og fra hvem? Hvor raskt blir containeren flyttet: kontinuerlig eller faste tidspunkt?)

Spørsmål ift informasjonsflyt i en generell prosess for gods

1. Hvem får informasjon om dagens ankomst av varer til basen og når? (starten av dagen, Møte)
2. Hvor får de denne informasjonen fra? (hvem får de det av MA, Bring, Leverandører, Internt)
3. Hvilken kommunikasjonsmetode brukes for å gi denne informasjonen fra de forskjellige? (Mail, Tlf, SAP, LLL, RMC, Møte)
4. Hva slags informasjon får avdelingen fra de forskjellige partene og hva inneholder den? Detaljert.
5. Hva blir lagt inn av informasjon på et data system av informasjonen de får?
6. Hvordan vet de andre partene at informasjonen er mottatt hos dere? (bekreftelse, sjekke selv)
7. Når informasjon ankommer, blir det umiddelbart sendt videre til neste ledd internt (avdeling) (fra starten av dagen, Møte)
8. Til hvem blir denne informasjon sendt til? (Base, Båt, Varemottak etc.)
9. Hvilken kommunikasjonsmetode brukes for å gi denne informasjonen? (RMC, LLL, SAP, Mail, Tlf., Møte)
10. Hva slags informasjon får de forskjellige leddene og hva inneholder den? Detaljert

11. Hva blir lagt inn av informasjon på et data system av informasjonen de får?
12. Hvordan vet de andre partene at informasjonen er mottatt hos dere?
    (bekreftelse, sjekke selv)

Additional Interview Questions for Vestbase As

Slik vi har forstått det gjennom intervju runder med forskjellig parter, er de punktene nedenfor «kontaktpunkter» hvor dere får informasjon.

- **Spørsmålene nedenfor er fokusert rundt en prosess hvor det er <u>prioriteringer</u> som oppstår**

LLL: BFA legger ut info i laste leie log.

- Hvor ofte hender det at BFA glemmer å fylle ut det dere trenger å vite? (Delivery ticket, sertifikater etc.)
- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?

Felles mail:

- Når det har oppstått en prioritering, hvor ofte hender det at dere ikke får felles mail fra BFA(Bore og forsynings ansvarlig, Stjørdal) ang. Denne prioriteringen?

Ang. informasjonen som kommer i felles mailen:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?
-

Communicator

- Får dere av og til viktig informasjon over Communicator?

Om dere gjør det:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for dere?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?
- Hvor ofte hender det at denne informasjonen borte i forhold til at den ikke kan lagres?
-

Operasjons gruppe

Når dere blir kontaktet av OPS rom ang. prioriteter:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?/ Hvem hadde det vært mest gunstig å fått dette fra?
- Hvor ofte hender det at dere ikke blir kontaktet via av OPS rommet når det har oppstått prioriteringer?

Morgen møte
På morgen møte med OPS rom:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?
- Hvor ofte hender det at det på morgen møte med operasjons gruppe, glemmes å nevne vesentlig informasjon om at det har oppstått en prioritering (dvs. at vi regner med at dere får informasjon, men det vi lurer på er om dere får tilstrekkelig informasjon)
-

Bring daglig mail ang. levering neste dag
Fra Bring har vi fått vite at de sender ut en mail dagen før ang. Morgen dagens leveringer.

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?

Slik vi har forstått, om de får prioriteter inn etter at mailen er sendt, blir det ikke sendt noen ny mail.

- Hvor ofte hender det at Bring glemmer å sende denne mailen?
- Bruker det å være mye som ikke kommer med på denne mailen?

Om det skjer noe uforutsett på veien når Bring transporterer:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt? (og hvem er det som skal gir dere denne beskjeden og via hvilken kommunikasjons metode?)
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon? Hvem hadde det vært mest gunstig og fått dette fra?

Vi har fått vite at i teorien skal Vestbase ikke ha kontakt med Bring, både in house og ekstern fordi OPS rommet skal gi tilstrekkelig informasjon. Men slik vi har skjønt har dere god kontakt med In-house Bring siden dere er i samme bygg.
Ang. den informasjonen dere skal få fra OPS rommet:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?
- Hvor ofte hender det at dere ikke får tilstrekkelig informasjon fra OPS rom, slik at det er lettere for dere å kontakte Bring-in house/ får tilleggsinformasjon som dere får utenom det dere burde få vite?
    - Og hva gjelder dette som oftest?

Baker
Vi har fått vite at det hender at Bring står og venter da gods ikke er klart fra Baker sin side selv om delivery ticket og sertifikat er lagt inn i Laste leie loggen. Statoil har sagt at dette er godt nok bekreftelse på at varen er på vei. Men Statoil har sagt at det ikke alltid er tilfellet at godset faktisk er på vei.

- Får dere informasjon om dette, og er den tilstrekkelig for at dere skal være forberedt? (og hvem er det som skal gir dere denne beskjeden og via hvilken kommunikasjons metode?)
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon? Hvem hadde det vært mest gunstig og fått dette fra?

Når vare ankommer base

- Hvor ofte hender det at varer som ankommer basen mangler vesentlig informasjon? (PO nummer og sertifikater)

RMC

Når det bestilles ekstra tjenester i RMC:

- Den informasjonen dere vanligvis får: er den tilstrekkelig for at dere skal være forberedt?
- Evt. hva trenger dere for at det skal være tilstrekkelig informasjon?
- Hvor ofte hender det at dere ikke får tilstrekkelig informasjon om hva som treng s for å håndtere en vare (ressurser som folk, kran, ekstra ting)
- Hvor ofte hender det at ekstra tjenester ikke er bestilt før varen er ankommet basen?

Additional Interview Questions for Vestbase AS

1. **Vestbase`s drift, kjerne kompetanse og service konsept**
   - Fortell hva Vestbase drift generelt går ut på (Fortell helt fritt)
   - Hva er Vestbases kjernekompetanse?

Dere blir beskrevet som en service bedrift.

-Hvilke tanker har dere om servicen dere gir til deres kunder(hva skiller dere fra andre, hvor viktig er service for dere)

- Hva er god service fra deres synspunkt?
- Finnes det en standard dere jobber ut fra?(mht. service)
- Yter dere ekstra service?(til alle eller er det noen som er viktigere enn andre?)
  - Hvor viktig er det eventuelt å yte ekstra service for dere?
  - Hva får dere eventuelt igjen for å yte ekstra service?

2. **Generelt om Vestbase: struktur, avdelinger, arbeidsoppgaver og kommunikasjon**
   - Hvordan er organisasjonsstrukturen på Vestbase bygd opp?
   - Hvor mange avdelinger har dere på Vestbase?
   - Hvilke funksjoner har disse avdelingene? (mål og tittel)
   - Hvor mange jobber i forskjellige avdelinger på Vestbase? (få frem størrelsene sånn ca. på hver avdeling).

   - Hvilke arbeidsoppgaver har de ansatte i de forskjellige avdelingene? (Det vi mener her er hvilke arbeidstitler finnes i den enkelte avdelingen/ hvordan ser sammensetningen ut, og hva jobber de med for å fylle ut funksjonen avdelingen skal gjøre)

   - Hvordan kommuniseres det mellom avdelingene? (Mail, tlf, muntlig)
   -Hvordan kommuniseres det mellom de ansatte innad i avdelingene? (Via data system, elektronisk, tlf., muntlig)
   - Finnes det en stilling på Vestbasen som omhandler koordinasjon spesifikt (informasjon, mottak, levering, beskjeder, kontakt.)

3. **Underleverandører ved Vestbase**

- Kan dere fortelle om deres underleverandører (på Vestbase, evt. utenfor Vestbase?)

-Hva gjør de, hvor finner vi de, hva tilfører de vestbase, hvordan foregår logistikken inn mot Vestbase?

- Hvordan kommuniseres det mellom Vestbase og underleverandører?(datasystem, muntlig, tlf., elektronisk via mail, skriftlig)

- Hvem tar kontakt/ hvem sender forespørsel?(kommer bestilling rett fra kunde, fra leverandør? Etc.)

- Har dere en standard prosedyre på hvordan skaffer/ gir ut reell informasjon med leverandørene?

- Blir dette gjort mot alle leverandører?

4. **Kundelogistikk ved Vestbase(logistikken ved leveransen til kunden)**

- Kan dere fortelle litt om logistikken som skjer når varen er "ferdig" til å bli videresendt

- Hvem gjør dette på land (innleid eller ansatte?)

- Hvem frakter til slutt sted (innleid eller ansatte?)

5. **Kunder ved Vestbase**

-Hvor mange kunder samarbeider dere med(ca?)

- Hvem er de viktigste kundene deres?

- Hvorfor er disse de viktigste for dere?

- Hvilken avdeling på Vestbase har mest kontakt med kundene?

- Er det flere/ en spesifikk person som har ansvar kontakt, og hvilken arbeidstittel har den/disse?

- Hvordan kommuniserer dere(hvilken kommunikasjonsmetode bruker dere?(Via data system, elektronisk, tlf., muntlig)

- Hvor ofte har dere kontakt med kundene dere(daglig, ukentlig, månedlig, årlig?)

-Har dere en standard prosedyre på hvordan Vestbase skaffer/ gir ut reell Informasjon med kundene?

- Blir dette gjort mot alle kundene?

6. Informasjonssystem

- Hvilket informasjons stystem(er) bruker vestbase? (Fortell litt om dette)
    - Enkeltstående informasjos stystem komponenter?
    - ERP?
    - Hvordan benyttes dette systemet i praksis? (fortell fritt)
    - Fungerer systemet som er i bruk optimalt?
        - Om ikke: hvorfor?

<u>Ut ifra systemet dere benytter:</u>

- Er det kun internt, eller er kunder og underleverandører også knyttet opp mot dette?
- Hvem har tilgang eksternt?
- Er det likt for alle kunder/underleverandører, eller er det noen som har mer/mindre tilgang til dette? (Hvorfor?)
- Er dette tilgjengelig for alle avdelingene/ alle i hver avdeling på Vestbase?
- Benytter alle avdelingene ved Vestbase seg av dette systemet? (Hvis ikke, hva kan være grunnen til dette?)
- Har dere en "Tracking funksjon" på utførte handlinger/ gods? (kan for eksempel en person se om det er klart for neste trinn?)

- Er det noe vi ikke har tatt i betraktning som bidrar til informasjons flyt?

7. Hoved fokuset for arbeid med master oppgave: kartlegge en prosess

- Forklar hva denne prosessen går ut på (Forklar prosessen generelt fra begynnelse til slutt, med informasjons elementer inkludert)

<u>Dette kan tas opp om det er nok tid:</u>

Videre mer spesifikk:

- Hvor ofte gjennomføres denne prosessen?(daglig, ukentlig eller mnd.?)
- Hvilke aktører er involvert i denne prosessen?(leverandører, kunder, evt. andre)
-Hvorfor er disse kundene/leverandører viktige for denne prosessen?
- Hvilke avdelinger ved Vestbase er innblandet i denne prosessen?

- Kan det tenkes at det er noen som ikke er direkte involvert i prosessen, men som allikevel kan ha påvirkning på denne (andre prosesser som har påvirkningskraft/ krysser grensene til denne prosessen?)

- Hvorfor er informasjon viktig i denne prosessen?
- Hva bidrar denne informasjon med?
- Er informasjonen som følger denne prosessen linket til ett system?
- Hvem har eventuelt tilgang til denne informasjonen?
    - Hvem skal bruke denne informasjonen?
    - Benytter alle som skal bruke informasjonen seg av dette?
- Hvordan blir informasjon overlevert/ Mottatt fra ledd til ledd?(muntlig/skriftlig/system)
- Blir levering/mottak av informasjon dokumentert? (Slik at neste ledd vet når det er "deres tur" og kan følge prosessen?)
    - Eller må hvert ledd søke informasjonen selv?

8. Service mht. til prosessen som er i fokus

- Hva slags service tilfører dere i denne prosessen?
- Finnes det en standard/ benchmarking for service i denne prosessen/ Legendes prosesser?
- Hva er god service i denne prosessen fra deres/ kundenes synspunkt?
- Er det ønskelig å yte ekstra service i denne prosessen (evt. hvorfor)?
- Hva får dere eventuelt igjen for å yte ekstra service i denne prosessen