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Writer: Jarle Østensen Aas	…… (Writer's signature)
Faculty supervisor: Kristin Engh, University of Stavanger External supervisor(s): Cecilie Eide, Statoil ASA	
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Identification of barriers for improvements within Riserless Light Well Intervention (RLWI)

"How does communication within the RLWI community in Statoil ASA and their clients affect knowledge transfer and learning within the RLWI department?"

Jarle Østensen Aas

Industrial Economics

Spring 2015

Acknowledgement

This thesis marks the end of my five-year Master's degree in Industrial Economics at the University of Stavanger.

The starting point of this thesis was an employment relationship with Statoil ASA as a well engineer within the Riserless Light Well Intervention (RLWI) department. Different challenges for improvements within the department and in collaboration with third parties, gave interest to take a deeper look into the department, hoping to identify some of the barriers that RLWI are facing.

The process of writing the thesis has been more extensive than first thought, but also enlightening on a personal and a professional level. I want to thank everyone who participated in the study with their experiences and thoughts regarding the research question. I also want to thank Cecilie Eide for being my external supervisor and for always helping when I asked for her help.

At last I would like to express my gratitude to my faculty supervisor Kristin Engh which gave me the opportunity to work with this task, for her guidance and involvement throughout the entire process. Her feedback and discussions have been very helpful.

Abstract

The aim of this thesis has been to study how the communication within the RLWI community in Statoil ASA and their clients affect knowledge transfer and learning within the department. A semi-structured interview design has been used as a basis for collecting the empirical data. The purpose of using interviews is to obtain descriptions from the interviewees with regard to interpretations of the phenomena being described.

The empirical data presented in this master's thesis, gives an indication of the different channels of communication which is used by the employees in their everyday work. In total, it was conducted six interviews with persons that are a central both during the planning and the execution part of the operation. A lot of the descriptions from the interviewees were positive in relation to communication, but I have chosen to emphasize the most challenging communication channels with greatest opportunity for improvements. The study has concluded that the RLWI department has several challenges in relation to how they communicate such as; the systems used for transferring experience/knowledge, the involvement of employees in learning situations and the vertical / diagonal communication with the head office. Hopefully this thesis can be good help to others in future studies regarding communication, knowledge transfer or learning.

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1 Introduction

1.1Background

Throughout history, mankind has always sought for development and improvements. A lot of what we take for granted in the society we live in today was a revolutionary discovery at the time it was invented. If one reflects upon things like the wheel, motors, automobiles and oil drilling. We all take them for granted as a part of our society. Therefore, I would like to use the wheel as an illustration of a development and improvement process which has been ongoing for several thousand years and how this affected the oil industry.

Before the wheel was invented, humans were extremely limited when it came to transportation of goods. They either had to carry it them self, or get help to carrying it from an animal. A man's stamina does not hold for long and the animals were restricted on how heavy loads and how far these goods could be transported. In the beginning, humans developed a method where they used logs to transport heavy loads around. This was of course not very efficient because they needed a lot of logs and manpower to move it, and therefore a cumbersome way to transport over longer distances. (Raiciu, 2009).

It was according to researchers around 3500 BC that the first wheel was invented. This was made as a solid wooden disc with a square hole in the middle of the axis. They were used for chariots and were mainly used for warfare and transportation. This became the beginning of a new era and it has revolutionized the way early human beings travelled and transported goods from one place to another ((Raiciu, 2009) & (Carfinance247, 2009)).

The biggest problem with this wooden disc wheel was the heavy weight. It took surprisingly another 1500 years before the first big improvement within the wheel evolution. The Egyptians carved out the unnecessary material and created the much lighter and faster wooden spoked wheel. This type of wheel became so popular that wheel-making became a profession. During the next 1000 years, there were only small modifications like heavier construction and protection of the rims with leather, wood or iron. It turned out that this design was so good, that it took almost 3000 years before a new design was presented. This would prove to be the beginning of the Industrial Revolution (Carfinance247, 2009).

1.2 The Industrial Revolution

Prior to the Industrial Revolution, which took place from the 18th to 19th centuries, all kinds of manufacturing was done by using hand tools and basic machines in people's homes. During the late 18th century, Britain experienced a big difference in how they were living their life. This was the beginning of a huge growth in scientific advances and industrial production. Among others the iron industry together with the development of the steam engine turned out to play an enormous role when it came to communication and transportation among people ((History, 2009) & (Eagleton & Manolopoulou, 2008)).

A British man named Abraham Darby discovered in the early 18th century a much more cost efficient way to produce cast iron and by replacing water and animal power with steam power it was now possible with mass production. The steam engine became a sort of catalyst for the development in the Industrial Revolution. As the power of the steam engine became larger and the production of cast iron became much cheaper, another British engineer named Richard Trevithick saw the opportunity to construct a locomotive. The steam locomotive required far sturdier wheels because the wooden wheels could no longer take the strain. So by using Darby's metal technology and the wooden spoke design they were now able to produce the "Steam Locomotive Wheel" ((History, 2009) & (Carfinance247, 2009)).

Automobiles had been a big topic for a long time, but people understood that neither steam engines nor the wooden spoked wheel were practical to use. They started experimenting with pneumatic tires, in the belief that this would help to improve the wheel design they already had. The problem was not only the wheel design, but also the lack of engine power for the automobiles. There were previously conducted various experiments with combustion engines, but it was slowed down because of lack of proper fuel. In 1859, the first commercial oil well was drilled and started producing in Titusville, Pennsylvania. This created new opportunities for the internal combustion engine and people began to further develop the prototypes they already had, in conviction that it would be the next big thing (National Academy of Engineering, 2015).

1.3 Development of the Oil Industry

After the oil finding in Titusville there was an oil boom in all the towns around the Titusville area. One of those who wanted to start a new carrier in this industry was the entrepreneur John D. Rockefeller. In 1859, Rockefeller and his partner sold their commission firm in Cleveland and built a small oil refinery. A few years later he bought out his partner and created the Standard Oil Company. There were several oil findings in this area which led to the establishment of numerous of smaller firms ((History , 2010) & (Hinsdale, 2004)).

Over the next twenty years there was a tremendous growth in the oil industry. The word spread about Standard Oil's oil findings and several oil companies started to drill for oil around the entire US. This led to an uneven relation between supply and demand which did not affect the oil price positively. However, after years of development and improvements with the internal combusting engine and the pneumatic tire, a new market segment opened for the oil companies (History , 2010).

In the early 1900s, the first automobiles and airplanes came to the market. This meant that the oil industry had an enormous increase in sales of gasoline. Gasoline had for many years been a useless byproduct of the distilling process, but was now representing a vast market. It turned out that this market would only become bigger after the First World War broke out in 1914. The First World War created a huge demand for gasoline, actually more than the oil companies could deliver and this led to a severe shortage of oil at the end of the war (1917-18). This meant that the oil companies had to expand both domestic and abroad to avoid the oil shortage from getting even worse. The biggest firms in US (including Standard Oil) started investing in the Middle East, Southeast Asia, and South America, while they at the same time exported their oil abroad. However, it turned out that the Americans had to go through another world war before they looked for opportunities in the Norwegian territory ((History , 2010) & (Hinsdale, 2004)).

1.4 The Oil Industry develops in Norway

In the late 1950s, almost 5 years after the Second World War, very few people thought that the Norwegian Continental Shelf (NCS) might conceal rich oil and gas deposits. Even a letter from the Norwegian Geological Survey in 1958 to the Ministry of Foreign Affairs, stated that: "*The chances of finding coal, oil or sulphur on the continental shelf off the Norwegian coast can be discounted*". However, after Esso and Shell discovered gas at Groningen in Netherland (1959), people started questioning their assumptions about the petroleum potential in the North Sea. The enthusiasm after the gas discovery in Groningen and the eagerness to find more, resulted in greater attention to the North Sea. Their focus was initially on the Dutch, German and Danish continental shelf, but in 1962 Phillips Petroleum (a US oil company) decided to apply for permission to conduct geological surveys on the Norwegian continental shelf. This attracted attention among the other international oil companies and made several of them to follow Phillips Petroleum ((Berthelsen & Nagell, 2013), (Statoil, 2009) & (Tolås, 2009)).

It was not until 1969, when Ekofisk was discovered, that the Norwegian oil adventure really began. The Norwegian Continental Shelf (NCS) was divided into blocks, but only a restricted number of them were awarded in each licensing round. Initially foreign companies controlled the exploration operations and were responsible for progress of the fields. The authorities saw it as very important that Norway had control over their offshore resources themselves, so one measure that was implemented was the establishment of Statoil in 1972 ((Berthelsen & Nagell, 2013) & (Statoil, 2009)).

1.5 Statoil ASA

Two years after Statoil ASA ("the Norwegian State Oil Company" as it was called then) was formed, they discovered the Statfjord field. During the 1980s Statoil ASA grew substantially through the development of several large fields such as; Gullfaks, Oseberg and Troll. Since then, Statoil ASA has grown larger for each year, becoming one of the most important companies in the Norwegian industry and contributed strongly to form Norway into a modern industrial country ((Statoil, 2014) & (Statoil, 2012)).

Today Statoil ASA has become an international energy company that operates in 36 countries. After 40 years of experience from oil and gas production on the Norwegian Continental Shelf, Statoil ASA contributes with a high technological standard and creation of innovative business solutions. Their headquarters are in Stavanger, Norway, with approximately 23 000 employees worldwide, and are listed on the New York and Oslo stock exchanges (Statoil, 2014).

1.6 Riserless Light Well Intervention (RLWI)

Well Intervention is one segment within the Drilling & Well (D&W) department in Statoil ASA. The main purpose of well interventions is to extend the lifetime of producing wells by improving and maintaining the conditions downhole. This would include wireline operations such as; EOR (enhanced oil recovery) stimulation, milling, repairing, fishing and plug & abandonment (P&A) (Schlumberger, 2015).

Usually an oil well will be maintained every fourth year, but it is much more complicated and costly to do interventions on a subsea well. Therefore it is a huge potential in time and cost efficiency within Riserless Light Well Interventions (RLWI). RLWI is a relatively new method within interventions and is found both time and cost effective compared to the conventional well intervention performed with a rig. The biggest difference between ordinary well intervention and RLWI is that the conventional well intervention method uses some sort of mobile drilling rig that is connected to the subsea well with a riser, while RLWI use a monohull vessel with a well control package which is installed on the subsea well (see appendix A for more detailed information) (Nugroho, 2013).

Figure 1 - Riserless Light Well Intervention (RLWI) operation (Statoil, 2014).

1.7 My objectives with this thesis

What the thesis has tried to emphasize in this introduction is the importance of improvements. Like the evolution of wheel that started as a solid disc made out of wood and became a pneumatic tire made out of steel and rubber. It is the same for the Steam engine that was replaced by a much better and improved internal combusting engine. These two improvements have together affected the entire evolution of petroleum industry as we know it. Without all these improvements the oil industry could have had a completely different role in today's society, and I had possibly chosen to study a completely different profession.

Common to all improvements is that people gain experience for each time they perform a process. Imagine that an optional process goes from A to B like this:

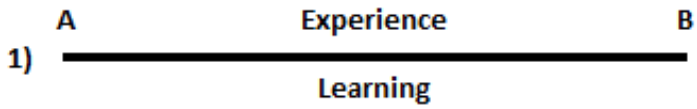

Figure 2 - Imaginary process from A to B.

Every time one has performed the process from A to B, experience and learnings are made from it. After the process is repeated (n times), one will hopefully gain enough experience and learning to add some improved changes:

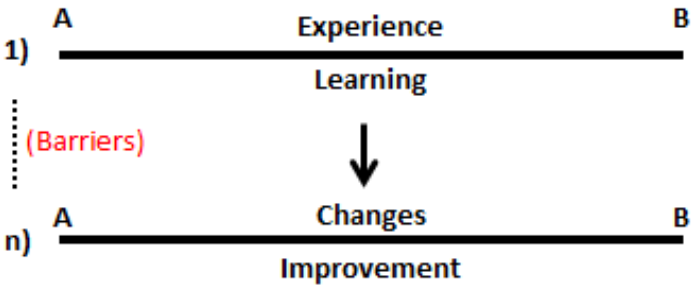

Figure 3 - Experience and learning gives changes and improvements.

This is exactly what happened with the wheel, the engine, the automobile and the oil drilling industry. It was not until the industrial revolution that people really saw the opportunity for changes and

improvements. Knowledge began to spread through communication, and improving equipment became vital for business and the society as a whole. This globalization combined with the general development of society, the need for sharing knowledge, and the efficiency demands created a huge and dynamic market that every organization has to keep up with to survive.

However, sometimes there can be barriers that makes it difficult (even impossible) to gain the development and improvement one might desire. For example when there was a shortage of gasoline prior to the first commercial oil well in 1959; it acted as a barrier for further development of the internal combustion engine. This is what I want to look into within the Riserless Light Well Intervention (RLWI) method. I am trying to identify barriers for improvements. These barriers does not have to be technical, but can just as well be factors such as; cost savings, physical / psychological working environment, reputation of Statoil ASA, HSE, efficiency, communication, lack of employee engagement, competition, laws and rules, pollution regulations, quality, management, stakeholders, logistics, organization structure, complexity, risk factors, working processes and environment. Everything that prevents improvements or act as a resistance force will be seen as a barrier throughout this thesis.

What are the driving forces behind improvements? Many people have this common idea; if something works one should not change it. Nevertheless, there are many aspects one has to consider before making improvements, example of this can be; the role of competitors, the role of technical development, the role of sharing knowledge, etc. The main purpose of improvements is to do a process safer, in less time, at a lower cost and with less effort. This is a very important aspect for Statoil ASA in today's dynamic society. Because without improvements one can easily get impaired quality, disgruntled employees/clients, less innovation, cost overruns and bottlenecks.

There are mainly two elements that affect how streamlined a process is; the skills of the people involved and the design of the process itself. So hopefully by looking into some of these aspects during this thesis, it will be beneficial to Statoil ASA in becoming even more streamlined within the RLWI operations and get a better understanding about how they can improve their work processes.

Personally, this is also a topic that interests me because of my background and interest within the oil industry. It is very interesting for me to examine what kind of barriers that could prevent the upcoming development and improvements within RLWI. With the complexity that is surrounding the planning and operational part of the RLWI procedure, I am convinced that there are great opportunities for improvements. For this thesis, it is all about examining what is preventing it from happening.

1.8 Delimitation of topic and research

Identification of barriers for improvements within Riserless Light Well Intervention is a vast subject and must therefore be limited in order to implement research in a sensible way. There are a lot of elements that can act as a barrier for improvements in an organization, but that it is to extensive to undertake an empirical study that includes several of them. I have always been interested in how the interaction between people affects the organization, and after reading how communication is vital for improving the employees' expertise in modern organizations, have I decided to look closer at this element. I believe that this delimitation of topic matches the disposable time of one semester (30 credits) in addition to that it fits well with my master program in industrial economics.

Thus I have chosen to look closer into the following research question:

"How does communication within the RLWI community in Statoil ASA and their clients affect knowledge transfer and learning within the RLWI department?"

To answer this research question one needs answer to the following sub-questions:

"How is the information flow between the internal and external parties in RLWI?"

"How is knowledge and experience communicated within RLWI?"

"Which situations provide the best learning for the employees?"

"How is the communication in relation to improvement of working processes and technology development?"

2 Theory

Based on the research question "*How does communication within the RLWI community in Statoil ASA and their clients* affect knowledge transfer and learning within the RLWI department?" This thesis will focus on theory related to communication, knowledge and learning in organizations. The theoretical foundations will then be used later in the thesis to interpret and discuss the empirical data collected during the interview process.

2.1 Organizational communication

Organizational communication is one segment within the theoretical aspect of communication. Communication in general can be defined as:

"Communication is the process by which individuals or groups send or exchange information" (Jacobsen & Thorsvik, 2007).

Organizational communication is about sending and receiving information among interrelated individuals within a particular environment to achieve individual or common goals. It includes not only communication between members of an organization, but also communication with external operators that have a relevance to the organization. Since the organizational communication is about transmitting information, it becomes highly contextual and culturally dependent. Individuals within the organization transmit the information in several forms such as; meetings, face-to-face conversations, letters, e-mails and other types of media channels ((Hahn, Lippert, & Payton, 2011) & (Spaho, Organizational Communication as an Important Factor of Company Success, 2011)).

Building relationships is an important aspect of organizational communication, because it is very difficult to have human relations without communication. An increasing number of employees realize that interpersonal interactions with internal organization members and external staff are very important. This is because a lot of the work activities are so complicated that it depends on good teamwork. The organization is a complex system and the organizational communication influences the environment both internally and externally. If the communication is effective, it helps inter alia to coordinate, plan and control the operations and acclimate changes through individual and organizational creativity and adaptation. Without competent communicators, it is really difficult to have a successful organization as there is more to efficient organizational communication than just know-how and knowledge. The communication involves the ability to create and exchange knowledge so that the receiver understands the meaning of it, work in teams, communicate in complex and dynamic circumstances, as well as

communicating in appropriate manners. Although building relationships is an important role in achieving effective communication, the main role of building relationships is to get better collaboration between employees and achieve the strategic objectives of the organization ((Hahn, Lippert, & Payton, 2011) & (Spaho, Organizational Communication Process, 2011)).

2.1.1 Vertical, Horizontal and Diagonal communications

Every organization must have communication in several directions to get a communication flow throughout the entire company. These directions can be divided into vertical, horizontal and diagonal communication.

Vertical communication occurs between people positioned differently hierarchically and can involve both downward and upward communication flows. Downward communication is basically the communication flow that goes from top management to employees, while upward communication is the communication flow from employees to top management. The American psychologist and social researcher Donald Pelz discovered in 1952 that increasing the power of immediate supervisors enhances both performance and satisfaction among employees, and is referred to as the Pelz-effect. He conducted a study do find out what kind of leadership styles that resulted in employee satisfaction. Surprisingly to his belief, it was more important that the supervisors had power than what style of leadership they carried out. This is because when a supervisor was seen as powerful by the employees they had greater trust, greater desire to communicate and a greater faith in the information from the supervisor. By communicating upward directly to the supervisors and asking them to provide input to discussions was one way of giving power to them. Another way was ensuring that the supervisor got certain organizational information through downward communication flow before the staff did, so that he or she could communicate the information to the staff themselves ((Baker, 2002) & (Spaho, Organizational Communication Process, 2011).

Horizontal communication occurs between employees and departments at the same organizational level. With the strong focus on teamwork, more attention has been put on horizontal communication during the last decades. This applies not only between employees in the same unit, but also between workers in different functional areas. The communication between different functional areas is important to increase the speed and production through simultaneous work processes, unlike sequential work processes. This enables collaboration between departments with different activities that do relatively independent tasks. The horizontal communication provides accurate feedback, a

unified vision, direction and possibility to implement changes effectively. By combining internal and external horizontal communication across distributed and geographically separated work groups, the organization creates a learning platform for sharing best practices, expertise, lessons learned and establishing knowledge-creating processes ((Baker, 2002) & (Spaho, Organizational Communication Process, 2011).

Diagonal communication refers to communication flow between managers and workers which are not on the same organizational level and not in direct organizational hierarchy. Neither vertical nor horizontal communication has adequate coverage of the new communications needs of modern organizations. Therefore, the term diagonal communication was introduced to capture the new challenges of network and project-based organizations, both internally and externally. This form of communication is not as widely used as vertical and horizontal communication, because it is most often used to complement these forms of communication ((Baker, 2002) & (Spaho, Organizational Communication Process, 2011)).

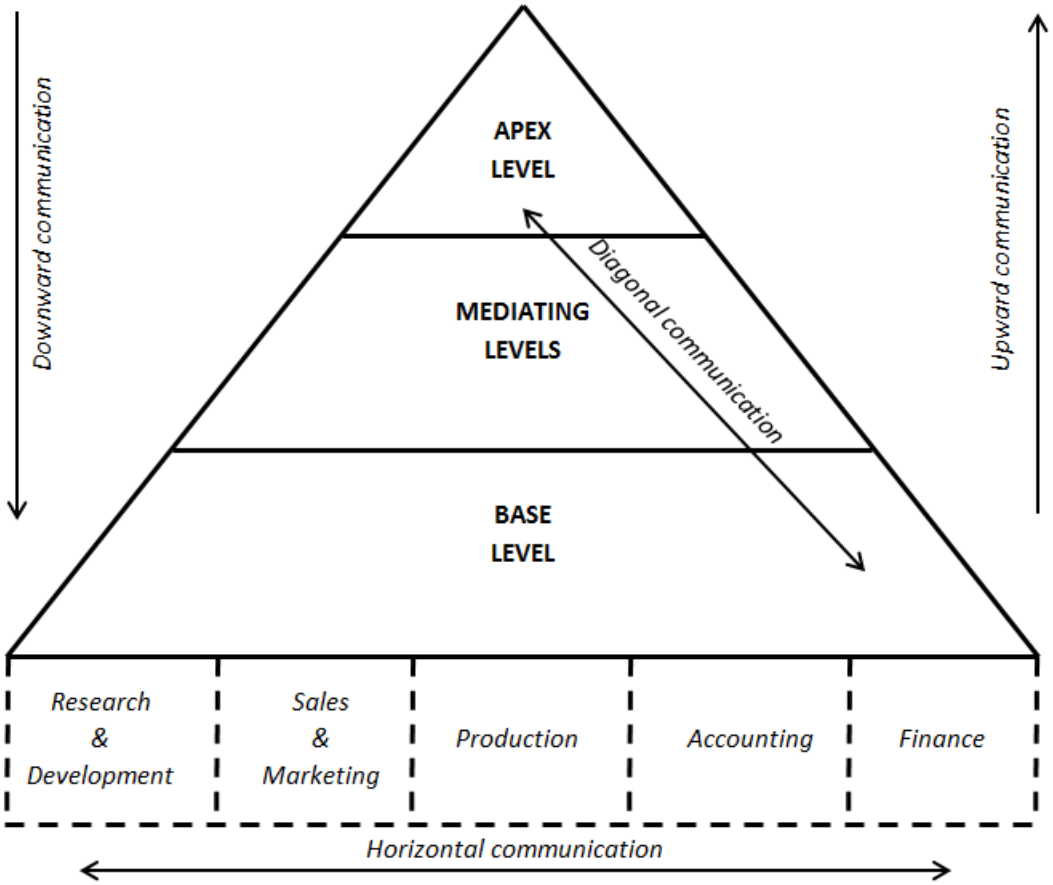

Figure 4 - Vertical, horizontal and diagonal communication.

2.2 Knowledge

A popular definition of Knowledge is given by Thomas H. Davenport and Laurence Prusak in the book; Working Knowledge; How Organizations Manage What They Know:

"*Knowledge is a fluid mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms."* (Davenport & Prusak, 1998).

When speaking of knowledge within an organization, two different types are specially focused on; tacit and explicit knowledge. Tacit knowledge uses common sense, is somehow automatic and helps organizations make decisions in little or no time of thoughts. The Hungarian philosopher Michael Polanyi described in his book "*The tacit dimension"* (1966) that tacit knowledge was about knowing how to do something without thinking about it, like riding a bicycle. This means that this type of knowledge is highly personal and inhabits the minds of people and is developed over a long period of time through trial and error. Some of this knowledge is embedded into working processes and relationships that have been developed through a continuing series of improvements. The value of tacit knowledge is therefore often underrated in organizations, because nearly two thirds of the work related information comes from face-to-face contact during casual conversations, stories, mentoring and apprenticeships. This is because people often get more spontaneous and creative communication in such open environments ((King, 2009) & (Smith, 2001)).

At the other end of the "scale" is the explicit knowledge. This is information or academic data that exist in the form of formal language like documents, organized data, manuals, best practices and other explicit forms. This type of knowledge requires a level of understanding that is gained through education. Once the knowledge is filed it is stored in databases and easily accessed by others. The database with explicit knowledge can be used as an important asset for solving similar problems or connecting people valuable knowledge. This often requires an infrastructure of the database that everyone understands, so that every person can find the information they are looking for (Smith, 2001).

2.3 Creating knowledge in organizations

Ikujiro Nonaka created a theory where he stated that continuous communication between tacit and explicit knowledge creates knowledge at an individual level. Nonaka believes that an organization is an enterprise that creates knowledge continuously and that tacit and explicit knowledge are complementary and both of them essential to knowledge creation. The knowledge is created through interactions between the tacit and explicit knowledge, because explicit knowledge often loses its meaning without tacit insight. It is important to understand that knowledge without a context is just information. Take for instant "5678 DEF street", which is just information when one have no context, but if I say that; "5678 DEF street is the address of my best friend Einar" it becomes knowledge right away. (Nonaka, Toyama, & Konno, 2000).

Since knowledge is a dynamic process created in social interactions between individuals and organizations Nonaka believes that it is created through dialectical thinking in a "spiral" that goes through two seemingly opposite concepts like; chaos and order, micro and macro, tacit and explicit, body and mind, emotion and logic, and action and cognition (Nonaka, Toyama, & Konno, 2000).

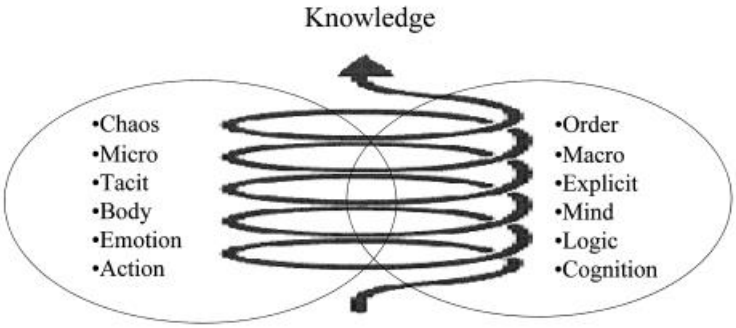

Figure 5 – Knowledge created through a spiral (Nonaka, Toyama, & Konno, 2000).

To understand the dynamic knowledge-creating process one has to look into a model containing three elements: (1) *The SECI process*, which is the social interaction between tacit and explicit knowledge, (2) *ba*, which is the shared context for knowledge creation and (3) *knowledge assets*, which are the inputs, outputs and moderator of the process. These three elements have to interact to form the knowledge spiral that creates knowledge (Nonaka, Toyama, & Konno, 2000).

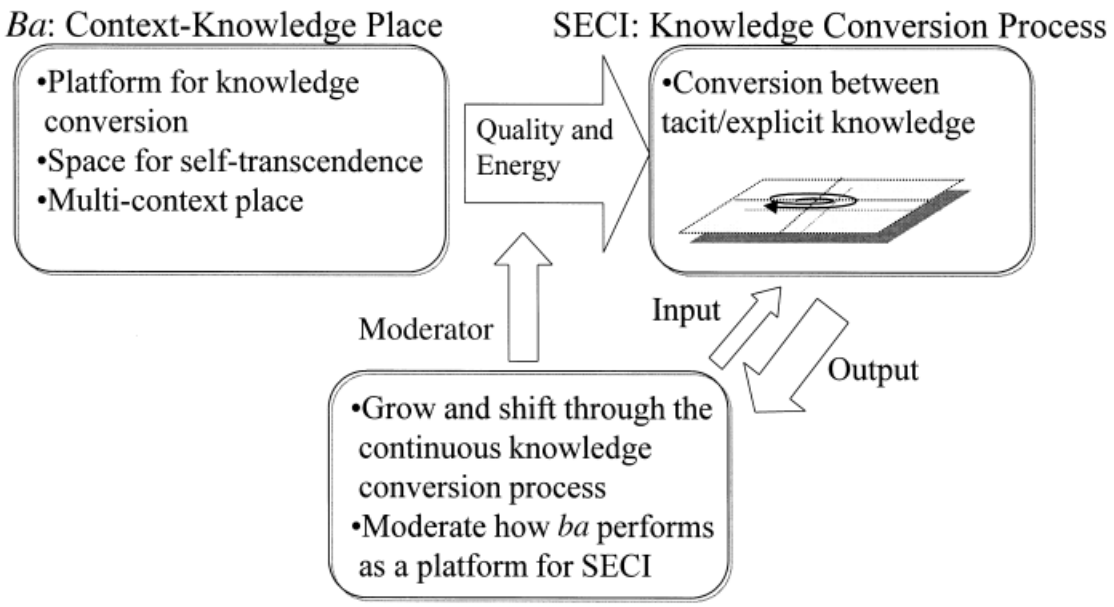

Figure 6 - The three elements of the knowledge-creating process (Nonaka, Toyama, & Konno, 2000).

2.3.1 The SECI process

The SECI process states that an organization creates knowledge through the interactions between tacit and explicit knowledge, and that this interaction is called "knowledge conversion". The conversion process consists of four modes that make the knowledge expand in both quality and quantity. They are; *socialization*, *externalization*, *combination* and *internalization* (Nonaka, Toyama, & Konno, 2000).

Socialization is the conversion process from tacit knowledge to tacit knowledge. This is the process of converting new tacit knowledge through shared experience, such as spending time together or living in the same environment. Socialization usually occurs in an apprenticeship, where the apprentice learns the tacit knowledge required for their work through hands-on experience, rather than from written manuals. The process could also occur outside the office desk, during informal meetings and even beyond organizational boundaries from the inhabited tacit knowledge in customers and suppliers (Nonaka, Toyama, & Konno, 2000).

Externalization is the conversion process from tacit knowledge to explicit knowledge. When the tacit knowledge converts to explicit it becomes "crystallized". Crystallized means that it is now possible for others to share this knowledge and it becomes the basis of new knowledge. A quality check, which allows the employees to make improvements on the manufacturing process by articulating tacit knowledge from the personnel working with this process, is an example of externalization conversion.

By accumulating this tacit knowledge and making it explicit helps everyone involved in the manufacturing process with new knowledge (Nonaka, Toyama, & Konno, 2000).

Combination is the conversion process from explicit knowledge to explicit knowledge. This is a process where explicit knowledge both internal and/or external explicit knowledge is collected and then processed, edited or combined into new explicit knowledge. One simply collects information from different sources and put them together in a new context. This could also work the other way around, by "breaking down" concepts to smaller segments too make explicit knowledge that is much easier to work with (Nonaka, Toyama, & Konno, 2000).

Internalization is the conversion process from explicit knowledge to tacit knowledge. Through internalization, the explicit knowledge that is shared throughout the organization gets converted to tacit knowledge by individuals. For example, a trainee that starts in a new job begins to read through manuals and documents to get more knowledge about the subject of interest ("learning by doing"). By reflecting upon this knowledge the trainee internalizes the explicit knowledge written in the documents to enrich his/hers tacit knowledge. Over time, more explicit knowledge becomes tacit and therefore a valuable asset for the trainee. The accumulation of tacit knowledge can then be the beginning of a new spiral of knowledge creation if it is shared through socialization (Nonaka, Toyama, & Konno, 2000).

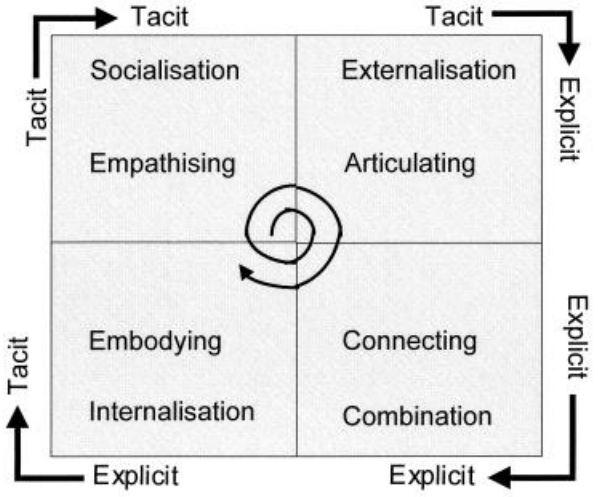

Figure 7 - The SECI process, showing that the movement through the four modes of conversion forms a "spiral" because the knowledge can go through many modes (Nonaka, Toyama, & Konno, 2000).

2.3.2 Ba: Context-knowledge place

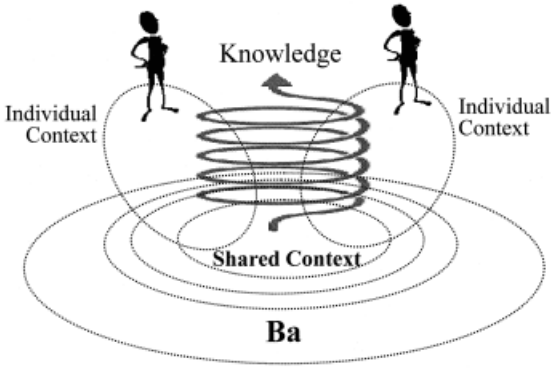

Figure 8 - Ba as shared context in motion (Nonaka, Toyama, & Konno, 2000).

Ba, which roughly means "place", is the shared context in motion. For knowledge to be created it needs a physical context and the Ba concept offers exactly this. The Ba concept that was originally proposed by Kitaro Nishida and further developed by Shimuzu was defined as "*a shared context in which knowledge is shared, created and utilized*". For the individual conversion to happen and to get into the knowledge spiral, Ba has to provide the energy, quality and place. Ba becomes the place where information becomes knowledge because it provides the basis for one to interpret information and create meanings. It is important to understand that Ba does not mean only a physical space, it unifies the physical (office space), virtual (e-mail) and the mental space (shared ideas). This is why knowledge is created through interactions between individuals and their environment, and not by an individual working alone. It means that the individuals that interact with each other (participants of the Ba context) evolve through action to create knowledge. Ba becomes the platform of knowledge creation by integrating the collected knowledge from individuals into a certain time and space. This means that a participant in Ba not only changes themselves, but also the Ba itself. Ba can be divided further into four types of subgroups; that is, *originating Ba*, *dialoguing Ba*, *systemizing Ba* and *exercising Ba*. These subgroups are again defined by two dimensions: Individually or collectively, which basically describes the type of interaction and face-to-face or virtual, which is just the media used in the interaction (Nonaka, Toyama, & Konno, 2000).

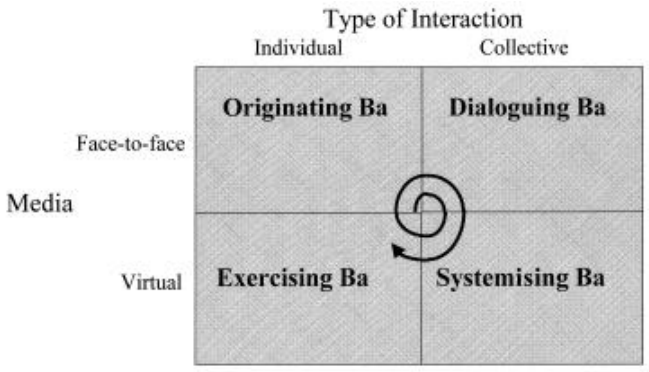

Figure 9 - the four subgroups of Ba (Nonaka, Toyama, & Konno, 2000).

The originating Ba is defined as the face-to-face interactions by individuals. This is a place where individuals share their experience, feelings and emotions. It becomes a socialization context, since the interaction captures physical and psycho-emotional reactions. The originating Ba becomes important for sharing tacit knowledge and the emergence of trust, care and commitment, which is important for knowledge conversion among individuals (Nonaka, Toyama, & Konno, 2000).

The dialoguing Ba is defined as the face-to-face interactions by collectives. This is a place where individuals share their mental models and skills, and convert them into common terms and concepts. This creates a concept for externalization where tacit knowledge gets comprehensible through dialog among the participants. The comprehensible knowledge gets further articulated through self-reflection when it is brought back into each individual. The biggest difference between dialoguing and originating Ba is that the dialoguing Ba is much more consciously constructed and therefore often easier to understand. It is really important to choose wisely the individuals with the right mix of knowledge and capabilities to manage the knowledge creation within the dialoguing Ba (Nonaka, Toyama, & Konno, 2000).

The systemizing Ba is defined as the virtual interactions by collectives. This is a place where a combination of existing explicit knowledge can be relatively simple transmitted to a large number of people in written form. The knowledge is transmitted through different collaborative environments; such as, groupware, on-line networks, reports and databanks. In today's society it has become very common for organizations to use electronic mailing lists and news groups for effectively exchange necessary knowledge among the participants (Nonaka, Toyama, & Konno, 2000).

The exercising Ba is defined as the virtual interactions by individuals. This is a place where individuals incarnate explicit knowledge through virtual media; such as, written manuals or simulation programs. Unlike dialoguing Ba that synthesis the transcendence and reflection through thoughts, the exercising Ba does it through action. This offers a context for internalization among the individuals (Nonaka, Toyama, & Konno, 2000).

2.3.3 Knowledge assets

Knowledge assets are defined as firm-specific resources that are essential to create values for the firm and acts as a base of the knowledge-creating processes. Knowledge assets are dynamic and in form of inputs, outputs and moderating factors. Even though knowledge is one of the most important assets when it comes to maintaining the competitive advantage, there is still no efficient tool for evaluating and managing knowledge assets (this applies especially to tacit knowledge). Therefore, this is a type of asset that has to develop and be used internally in order to get maximum utilization. To get a better understanding how these knowledge assets are created, acquired and exploited, knowledge assets are divided into four subgroups; that is, *experimental knowledge assets*, *conceptual knowledge assets*, *systemic knowledge assets* and *routine knowledge assets* (Nonaka, Toyama, & Konno, 2000).

Experiential Knowledge Assets Tacit knowledge shared through common experiences • Skills and know-how of individuals • Care, love, trust, and security • Energy, passion, and tension	**Conceptual Knowledge Assets** Explicit knowledge articulated through images, symbols, and language • Product concepts • Design • Brand equity
Routine Knowledge Assets Tacit knowledge routinised and embedded in actions and practices • Know-how in daily operations • Organisational routines • Organisational culture	**Systemic Knowledge Assets** Systemised and packaged explicit knowledge • Documents, specifications, manuals • Database • Patents and licenses

Figure 10 - Four subgroups of knowledge assets (Nonaka, Toyama, & Konno, 2000).

Experiential knowledge assets are shared tacit knowledge that has been acquired and accumulated by individuals in the organization through hands-on experience with other organizational members, customers, suppliers and linked enterprises. Since this is tacit knowledge, it is difficult to grasp, evaluate and trade such an asset. That is why organizations have to establish their own experiential knowledge assets through their own experience. So because it is an organization-specific asset, it is very difficult for other firms to imitate this type of resource and it then creates a sustainable competitive advantage to the organization (Nonaka, Toyama, & Konno, 2000).

Conceptual knowledge assets are explicit knowledge articulated through images, symbols and language. This type of asset is built on the concept detained by customers and members of the organization. Since the brand equity gets perceived by customers and concepts perceived by organization members, these knowledge assets are tangible and therefore much easier to grasp than experiential knowledge assets. The biggest challenge here is to grasp what customers and organization members perceive (Nonaka, Toyama, & Konno, 2000).

Systemic knowledge assets are systemized explicit knowledge such as technology specifications, product specifications, manuals, licenses, patents and document information about customers and suppliers. This is a type of knowledge asset that can be quite easily transferred to individuals who want to obtain the knowledge. That is why this is the most “visual” type of knowledge asset and it is set much focus on protecting confidential documents that should not get in the wrong hands (Nonaka, Toyama, & Konno, 2000).

Routine knowledge assets are the routinized and embedded tacit knowledge used in the actions and practices within the organization. This is some sort of “know-how” knowledge or organizational culture for how to do routine day-to-day operations. This knowledge gets embedded through continuous exercises, certain patterns of thinking and actions among organization members. This makes routine knowledge assets very practical, but one must be careful because it can lead to a very one-sided way of thinking with little room for creativity and innovation (Nonaka, Toyama, & Konno, 2000).

2.3.4 Summarized

In the previous chapters I have presented Ikujiro Nonaka's theory of the knowledge creation process in an organization. His theory includes the three elements; SECI, Ba and knowledge assets. By combining these elements with existing knowledge an organization can create new knowledge through the SECI process that takes place in a Ba. This new knowledge will then be a part of the organizational knowledge asset, which becomes the basis for a new "spiral" (knowledge creation). Nonaka means that this is a process that can in a certain extent be led by managers to actively create knowledge. He believes that both the top and middle managers have an important role in this process, but the middle managers are especially important since they are the intersection of the horizontal and vertical flow of information in the organization. Main task for the managers is to articulate the organizational knowledge vision and energizing Ba with the necessary conditions; such as, autonomy, creative chaos, redundancy, requisite variety, love, care, trust and commitment (Nonaka, Toyama, & Konno, 2000).

2.4 Knowledge communication

In the previous chapters I have described how organizational communication has a communication flow throughout the entire company, the importance of explicit and tacit knowledge, and Ikujiro Nonaka's theory about how the explicit and tacit knowledge combined with communication creates knowledge at an individual level. Further on, the thesis will introduce the importance of knowledge communication and describe why knowledge communication between experts and decision makers might fail.

Communicating professional knowledge is one of the most important activities in today's dynamic society, with high focus on teamwork and simultaneous work processes. There is always a need for sufficient knowledge transfer between experts from various domains and the decision makers. The experts share their insight, experience and know-how within their area of expertise, while the decision makers use this knowledge to take reasonable decisions. Examples of this knowledge transfer between the expert and the decision maker can be: Experts within a certain technology branch present their appraisal of a new technology to management in order to convince them to use it in the future strategy. Or, engineers who finally manage to cope with a difficult manufacturing process have to pass on their knowledge to engineers within other divisions (Eppler, 2006).

One can say that the knowledge transfer has been successful when an insight, experience or skill has been reconstructed successfully by another individual because of the communication between them. Communicating knowledge can be done in two different ways; synchronously or asynchronously. When transferring knowledge synchronously it refers to real-time interactions such as face to face conversations or video conferencing, while asynchronously refers to delayed media-based interactions such as e-mail or voice mail. If one uses synchronously and asynchronously optimally, it can help isolated individuals to work as a team and become more effective as a composite unit ((Baker, 2002) & (Eppler, 2006)).

As described above, knowledge communication is far more than conveying information or emotions, because it requires some sort of context and basic assumptions for the receiver to comprehend the communicated message. The quality of the knowledge transfer is not only based on what is communicated, but just as much on how one communicates it. This means that knowledge transfer requires a mutual interaction between experts and decision makers; because both parties only have a limited understanding of an issue and that interactions are needed to achieve full understanding.

Knowledge communication will then create a specific type of context so that information can be reconstructed into new insight, new perspectives and the acquirement of new skills (Eppler, 2006).

It is only in an ideal world that it is possible to perform perfect and efficient knowledge communication in an organization. Due to the complexity within the organization and many variable factors, there will usually form communicational problems providing knowledge communication barriers. Some of the communication barriers that can occur are:

Absorptive capacity – Due to lack of prior knowledge, the decision makers may occur difficulties with understanding the conveyed expert knowledge (Cohen & Levinthal, 1990).

Anomalous State of Knowledge (ASK) – The decision maker is not able to specify what is needed to resolve an anomaly because he or she has too little knowledge concerning the topic or situation it is regarding (Belkin, Oddy, & Brooks, 1982).

Cassandra syndrome – This happens when experts make recommendations early in a working process, but the decision maker chooses to disregard the recommendations because of several other problems that he or she faces. The decision maker does not listen to the experts' advice until the situation has become critical (Mikalachki, 1983).

Common knowledge effect – Groups tend to weight common knowledge (knowledge that all members possess) stronger than the knowledge that only one of the members possess (Gigone & Hastie, 1993).

Expert paradox – The experts fail to convey the knowledge they possess because they cannot articulate it in a way that the decision maker can fully understand what the experts are trying to tell them (Johnson, 1983).

False Consensus Effect – People assume that others think and look at situations in the same way as them without explaining their way of thinking (Ross, Greene, & House, 1977).

Groupthink – Participants in a group wants to appear collaborative, which may lead the participants to avoid conveying their knowledge, keep quiet about their doubts and follow the group leaders' suggestions in order to preserve group cohesion (Hart, 1991).

Hidden profile problem – When a superior alternative exists but is hidden from the organization because each one of the individuals have only a portion of the information that is supporting this choice (Stasser & Stewart, 1992).

Information overload – When a person is faced with more information than he or she can handle it will affect the situation because not all the relevant information is considered (O'Reilly, 1980).

In-group/Out-group behavior – Individuals tend to seek out "like-minded groups" over others, which reduce the chance of creating new radically knowledge (Blau, 1979).

Internal knowledge stickiness – Is a concept based on that knowledge do not get transferred because of an arduous relationship between the source and the recipient, recipient's lack of absorptive capacity and casual ambiguity (Szulanski, 1996).

Knowledge disavowal – When knowledge is withheld by individuals in order to protect the current status of the organization (Deshpandé & Kohli, 1989).

Not-invented-here syndrome – When a group of individuals believe they possess a monopoly of knowledge within its field and by that reject new ideas from others even though it weakens the performance of the group (Katz & Allen, 1982).

Own opinion effect – Decision makers have a tendency to prefer their own opinion rather than the experts (Yaniv & Kleinberger, 2000).

The knowing doing gap – When the knowledge about how to improve organizational performance is in place, but putting that knowledge into action is a huge challenge. How to implement what is already known (Pfeffer & Sutton, 2000).

The set-up-to-fail syndrome – When a decision maker has a philosophy about what he or she expects from an expert it may lead the expert to performing lower than what he or she would have done without hearing the expectations (Manzoni, 2007).

Wrong channel – The channel used for transmitting a message may be unsuitable for dissemination to the receiver or have limited possibility for feedback, so one do not get a proper two-way communication (Jacobsen & Thorsvik, 2007).

2.5 Kolb's experiential learning theory

David A. Kolb defines experiential learning in his book: *Experiential Learning: Experience as the source of learning and development* as:

"*The process whereby knowledge is created through the transformation of experience*" (Kolb, 1984)

Kolb's experiential theory includes a four-stage learning cycle with four adaptive learning modes; *concrete experience*, *reflective observation*, *abstract conceptualization* and *active experimentation.* The structure behind this learning process is based in the transaction between these modes and Kolb believes that a "learner" has to touch within all these modes in the learning cycle to learn (Kolb, 1984).

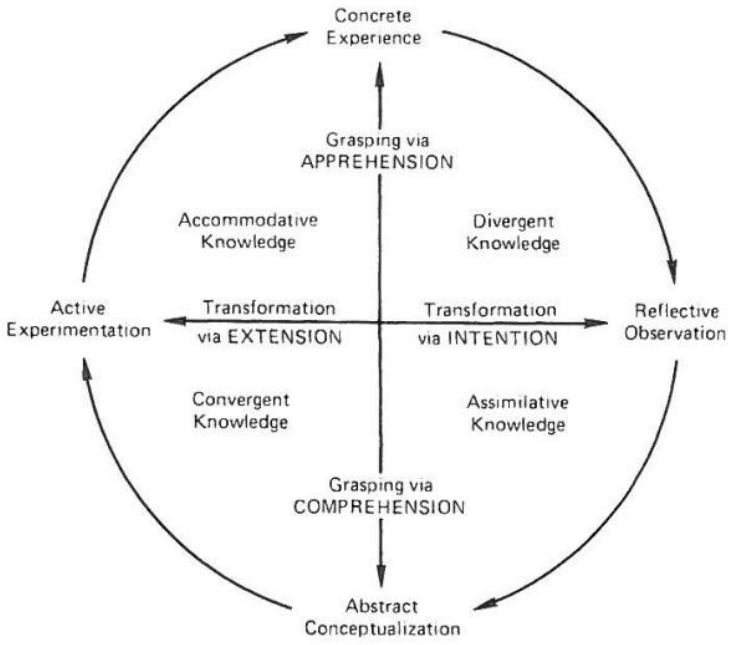

Figure 11 - The structural dimensions of Kolb's experiential theory (Kvale & Brinkmann, 2009).

The first mode in the learning cycle, *concrete experience*, refers to new experience as a result of a situation or new interpretation of an existing experience. The second mode, *reflective observation*, refers to the reflections of the existing experiences observed in the first mode. The third mode, *abstract conceptualization*, refers to the understanding and new idea creation from the reflection of the new experience. The fourth and final mode, *active experimentation*, refers to when the learner test out the new idea; too see what results it makes. Based on Kolb's theory, effective learning is not possible if the learner is not able to execute all stages in the cycle (Kolb, 1984).

According to Kolb, do all individuals have their own way of learning, this may for instance be learning in a social environment, through educational experience or through working experience. Each way of learning has Kolb divided into two dimensions; prehension and transformation. Prehension is the vertical axis in Figure 11 - The structural dimensions of Kolb's experiential theory. and is at each end divided into two different mental processes of taking hold of experience; *grasping via apprehension* and *grasping via comprehension*. The apprehension part of the axis has a correlation with the first mode *concrete experience*, because the learner understands something based on concrete experience. Since this is at the beginning of the learning cycle process, there is an element of doubt whether this experience is reliable, and further reflection is required. On the opposite side of the prehension axis is the comprehension part. The comprehension part has a correlation with the third mode *abstract conceptualization*, because the learner now has reflected and reached completely understanding, and gotten rid of the elements of doubt. The transformation dimension, which is represented as the horizontal axis in Figure 11 - The structural dimensions of Kolb's experiential theory., is at each end divided into two ways of transforming the grasped experience; *transformation via intention* and *transformation via extension*. The intention part of the axis is correlated with the second mode *reflective observation*, because it transforms the grasped experience through internal reflection. At the opposite end of the axis is the extension part, which is correlated to the fourth mode, *active experimentation*, and includes active external manipulation of the external world in terms of physical experimentation (Kolb, 1984).

The structural model of the learning process described in the previous section is very complex and thus perhaps difficult to understand. The main thing to grasp is that the learning process at any given moment in time will be controlled by one or more modes that interact simultaneously. These interactions have Kolb called learning styles and represent the combination of the preferred modes. Kolb has in its terminology called these learning styles; *divergence*, *assimilation*, *convergence* and *accommodation*. People that prefer the *diverging* learning style emphasizes concrete experience and reflective observation. It means that individuals within this category perform better in situations where they need to gather information and generate ideas in “brainstorming” sessions. These persons are supposed to be interested in people (working in groups), imaginative and emotional. People that prefer the *assimilating* learning style emphasizes abstract conceptualization and reflective observation. It means that individuals within this category prefer inductive methods and the ability to create theoretical models. They are not likely to be very interested in people and the practical value, but more

into the abstract concepts and that the theory is logic and precise. People that prefer the *converging* learning style emphasizes abstract conceptualization and active experimentation. It means that individuals within this category prefer solving problems, making decisions and finding practical application of theoretical ideas. These persons like to work with the technical aspect of the problems rather than interpersonal aspect. People that prefer the *accommodative* learning style emphasizes concrete experience and active experimentation. It means that individuals within this category prefer carrying out plans and getting involved in new experiences. Instead of using logic, accommodative learners use intuition in terms of trial and error manner, and rely on other people's analysis rather than their own analytic ability (Kolb, 1984).

3 Method

The research method involves tools and procedures that are used to achieve a particular objective. In order to get familiar with the objective, one must possess the theoretical perception of what should be examined and provide a basis for how to analyze the content of the study. This will mainly be covered by the research design, which includes planning the study's procedures and techniques (Kvale & Brinkmann, 2009). By combining the research method with the research design, one will acquire the knowledge and empirical data required for writing this thesis. Thus, this chapter becomes the foundation for an upcoming process of discussing the link between theory, sub-questions and the collected empirical data. The intention is that one should be able to answer the following research question:

"How does communication within the RLWI community in Statoil ASA and their clients affect knowledge transfer and learning within the RLWI department?"

3.1 The qualitative research interview

Throughout this study the semi-structured interview design has been used as the background for the collected data. This is because the semi-structured interview is a flexible and partly planned conversation with the purpose of obtaining descriptions from the interviews with regard to interpretations of the phenomena being described (Kvale & Brinkmann, 2009). This design makes it possible to get information about several planned subtopics, at the same time as it gives the flexibility to see if new interesting topics arise during the interview. That is why it becomes the most appropriate interview design based on the information needs for this thesis. The potential negative/positive side by using such a design is that it requires more of the interviewers' skills to get the most out of the interviews.

The purpose of the qualitative research interview is to get a better understanding of how the interviewee looks upon the world, a situation or phenomenon. This could be done by getting insight into people's experiences, opinions and knowledge. People might think that having a research interview is uncomplicated, but it is not quite that simple. They are correct by assuming that everyone can do, but mistaken when saying it is simple and uncomplicated. This is due to the fact that anyone can carry out an interview, but doing it properly is the difficult part (Kvale & Brinkmann, 2009).

A research interview requires certain conversation skills from the interviewer to obtain the information he or she wants. Depending on type of interview they all serve different purposes, such as the journalistic interview is used to report and register important events in the society, the therapeutic interviews wants to improve humans life situation and the research interview aims for producing more knowledge about a situation or phenomenon. One of the most important aspects of an interview is that there is interplay between those who know and those who do not know, between those who construct knowledge and those who collect this knowledge (Kvale & Brinkmann, 2009).

The qualitative research interview produces the knowledge through human interactions among an interviewer and the interviewee. This way of producing knowledge goes beyond a mechanical structure with strict rules and becomes more dependent on the interviewers' skills concerning personal reviews and formulation of questions. For an interviewer to have good follow-up questions and get quality data, it requires an interviewer which has great skills and knowledge about the subject of the interview. Thus, there are several factors that must take into consideration before embarking on an interview, especially considering that the researcher becomes the most important factor of them all (Kvale & Brinkmann, 2009).

3.2 Ethical challenges

An interview survey is an ethical survey, related with challenges when it comes to its purposed objective. The human interaction during an interview influences the persons involved and the created knowledge in a way that ethical issues become essential. The complex relation that is associated with exploring individuals' private life and putting it out in the public is especially an ethical situation that arises during this process. The interviewer must understand that ethical issues arise during the whole study; from the initiating planning phase until the final report is finished (Kvale & Brinkmann, 2009).

Due to ethical issues that arise during the planning and execution phase of the interview, ethical guidelines should be considered throughout the entire study. One of the first things to consider is how to get consent from the interviewees to participate in the survey. Without a proper explanation of why and how the qualitative interview will take place, it will be difficult to get their acceptance. This in turn has a link with the importance of taking care of the interviewees' confidentiality. Who has access to the interviews and how can the researcher hide the identity of the interviewees are two significant questions to be assessed by the interviewer. If one does not facilitate the process in a way the interviewee feels comfortable, one can quickly get dishonest answers or the interviewee may withhold essential information. This will weaken the credibility and question the reliability of the study (Kvale & Brinkmann, 2009).

3.3 Interviewees

Typical characteristics that make a person a good interviewee is cooperative, motivated, eloquent and knowledgeable. They adhere to the interview subject and provide honest and accurate answers without too many contradictions. Therefore, one can ask the question whether there actually exists ideal interviewees, or as Kvale and Brinkmann writes in their book; "… *different people suit different types of interview*." They believe that it is the interviewer's task to motivate the interviewee so that one gets the knowledge one need no matter who is being interviewed (Kvale & Brinkmann, 2009).

In order to get relevant information about the topic of this thesis, the interviews were conducted with people who are leaders or experts, and usually have positions of great power. Such persons are according to Kvale and Brinkmann, elite individuals. Individuals within a powerful position can for instance be harder to get information from, and they can try to take control over the interview. This creates a greater demand for the interviewer, in the way that he/she needs to have good knowledge about the topic and be conversant to what the interviewee describes. If the interviewee gets this impression, he or she will most likely give respect, which in turn will lead to a better mutual interview situation (Kvale & Brinkmann, 2009).

The intention was to interview people who had the great influence and participation in the entire operations, and try to understand how they communicated within the organization and with people outside the RLWI department. I decided to interview six persons that are a central both during the planning and the execution part of the operation. Together with my external supervisor at Statoil ASA, Cecilie Eide, we came to the conclusion that those who probably were most interesting to interview within this category were three well engineers, one lead engineer, the department leader and one well superintendent (Figure 12 - organization overview during execution of operation (source: Statoil internal)).

Well engineers function as the project manager for the operation. They are basically responsible for planning the operation in detail and in monitoring the execution phase offshore. The lead engineers have the overall responsibility for all the wells that is either in planning or execution phase. They have to prepare logistic on well sequence, allocate them to different well engineers and quality check their work. The department leader has both a technical and administrative role in the RLWI department. He is the nexus and responsible for the entire engineering department. His role is to keep up communication between the engineers and the wiss manager, as well as he contributes with technical inputs during

meetings and the development of the engineers. The well superintendent is mainly responsible for communication with the well supervisor offshore. They must be very experienced, have a continuous dialogue with the well supervisor and provide inputs during the execution offshore.

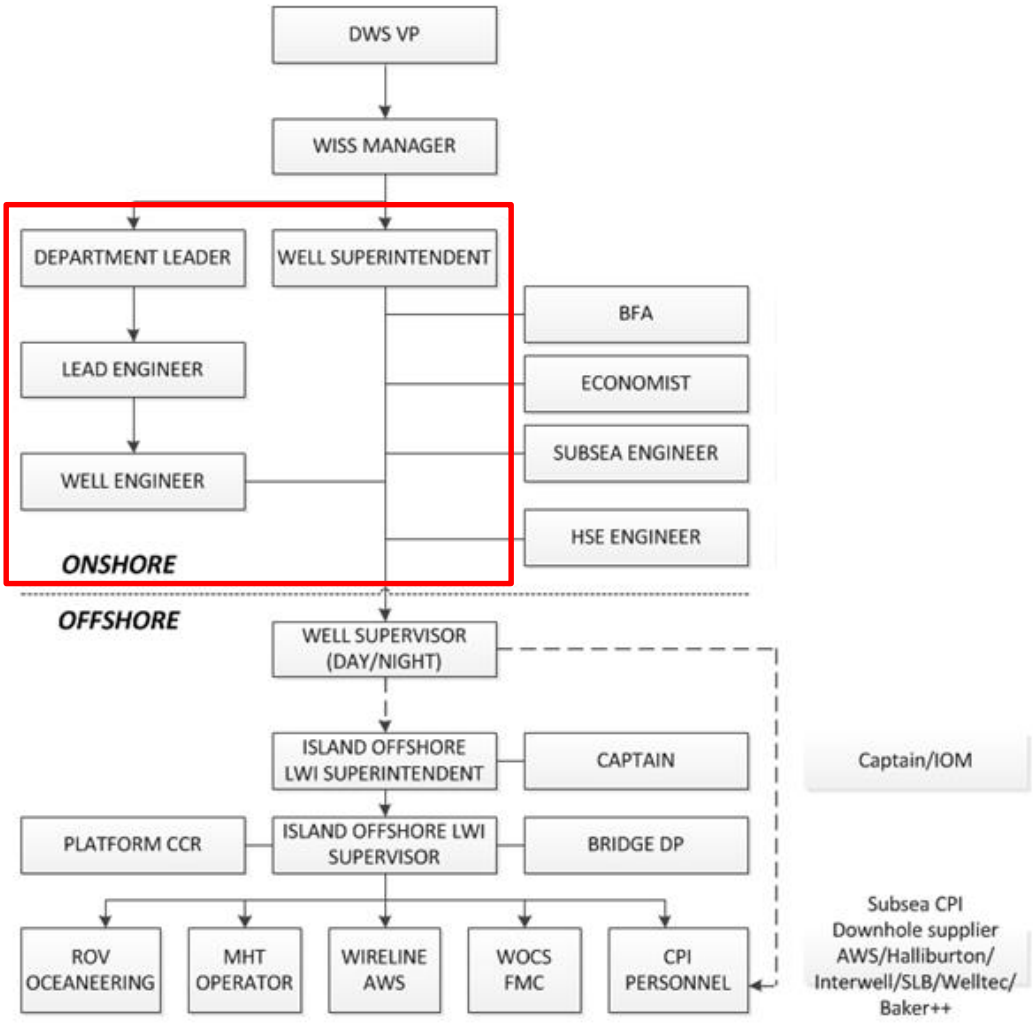

Figure 12 - organization overview during execution of operation (source: Statoil internal)

3.5 Conducting and transcribing the interviews

To obtain consent from the selected interviewees, there were sent a brief letter of information that should give some information regarding the survey. The letter contained an overview of the purpose with this study, anonymity and confidentiality, the possibility to use audio recorder, estimated time of the interview and the opportunity for the interviewee to withdraw at any time if it was desired.

The informants who participated in the survey were benevolent regarding the time of the interviews and gave free access to vacant meeting rooms to avoid interference and a better face-to-face experience. All informants were also willing to be recorded on tape, which allowed the interviewer to have greater focus on the interview and keep a good flow of conversation. This also made it possible to use quotes in the discussion part of the study. The only requirement from the informants was that their anonymity was maintained and that recordings were deleted when there was no longer a use for them.

To utilize every interview maximum, the transcribing process started right after the interview was conducted. This meant that every transcribing procedure was finished before starting on the next interview. The procedure was also a helpful tool for getting new follow-up questions that could be used during the forthcoming interviews. Kvale and Brinkmann define transcribing as the process where a conversation between two people that are physically present becomes abstracted and fixed in a written form (Kvale & Brinkmann, 2009). The six conducted interviews lasted on average 52 minutes and were as good as possible transcribed verbatim from the recordings. This provided a better overview and structure of the empirical data, which made it much easier to process and analyze later on. The recordings were kept throughout the study, because then it was possible to “go back” and clarify or elaborate parts that was misunderstood or not found in context. In addition, it was possible to contact and consult all informants in retrospect to clarify any statements about topics that were unclear on the recordings.

Of consideration for the informants' anonymity, quotations were used with great caution throughout this study. Expressions could in some cases be identifiable, and these responses were therefore converted from the oral form to a slightly more written version. Quotes that contained many pauses or fillers were also modified to highlight the message of the quote. Since the interviews were held in Norwegian, quotes had to be translated before they were use in the thesis. By changing the originally quotes, it is conceivable that the content gets a slightly different meaning or emphasis than what was

originally intended. This was a decision that had to be made, because it was considered very important to maintain the informants' anonymity.

3.6 Reliability, Validity and Generalizability

Reliability has to do with the credibility of the research results, and is often set in the context of whether the result can be reproduced by other researchers at a different time. The question of reliability not only applies to the interview itself, but also the planning, transcription and discussion process must be taken into account when talking about the reliability of the research (Kvale & Brinkmann, 2009).

In terms of the planning part, I would say that it has high degree of reliability. The main reason that I can come with such an assertion, is that I believe this method chapter adequately explains the various phases I have performed towards the actual interview process. By adhering the method chapter and the delimitations in the introductory chapter, I believe any scientist could reproduce the material that I have obtained and have the same starting point as me ahead of the interviews process.

When it comes to the actual interview process I am more critical to the reliability of the survey. In the event of a repetition of this study, with the same interviewees participated, I cannot see any reason why other answers should be given to my questions in the interview guide (Appendix B: Interview guide). This is because these questions should have little room for ambiguity, and any person should be able to read the questions and get the same answer. The only objections I can come up with are the tone of voice and body language of the researcher. However, these questions are so short and precise that I am not considering these elements as non-reliable at this early stage of the interview. The questions that follow up these answers are however very crucial to the outcome of the interview. By using a highly flexible interview guide, it gives the researcher an opportunity to explore the areas he / she consider most relevant for the study. The outcomes of these follow-up questions are highly dependent on the tone of voice, body language and emphasis on vocabulary used in the question. The use of these elements is very dependent on the type of person and their qualifications, and will therefore vary according to who is the interviewer.

Me, who has never performed a qualitative research interview in such a setting before, witnessed that the interviews became better every time I conducted one. During the transcribing process after each interview, I discovered elements that I constantly tried to improve for the next interview, so that the quality of the data would as good as possible. Typical aspects that I noticed on the recordings were; imprecise formulations of questions, wrong choice of words, leading questions, unnecessary

interruptions of the informant and etc. In relation to my body language, I tried during each interview to appear friendly, engaged, with a good mood and I tried to keep eye contact with the person who was interviewed. Something I also experienced, which was unexpected, was how the different personalities of the informants affected the interviews. I was not aware of the vast variety of how people were responding to an interview situation and how important my role became in the interview. These elements would probably a more experienced interviewer have less trouble with and perhaps avoid some of them. This is aspects that must be taken into consideration when it comes to the reliability of the study.

So how reproducible is this material? To be honest, I am not sure whether this material is reproducibly, but I am convinced that the credibility of the data I have gotten is very good. In preparing this thesis, I had status as a researcher, while I also had local status as upcoming employee and colleague related to the RLWI department. Although I am their upcoming colleague I do not think it affected the responses I got from the various informants. That is because this study's content are in very small extent about humiliating or criticizing how other individuals communicated or acted in different situations. When it concerns the interview answers, the informants spoke more about themselves or the entire group as a whole. It may well be that the interviewee does not tell the truth about the underlying facts, but the statements may nevertheless express the truth about the person's perception of itself. In addition, the quality of the recordings was very good, which meant that I had no trouble hearing what the various respondents had to say when I was transcribing the interviews. So all conditions considered, I would say that the reliability of this study is reasonably good.

Considering the use of qualitative research interview as a method in this study, the validity is another important aspect that must be assessed. Validity concerns the truth, relevance and strength of the survey. In other words; the extent to which the observations actually reflect the phenomena or sub-questions that this study want to know something about. It all comes down to asking the right questions and get relevant answers about what is actually being examined. Validation does not only become a confirmation, but a process for the development of more durable interpretations of observations (Kvale & Brinkmann, 2009). This makes the validation an ongoing process that already begins in the choice of topic, until the thesis is completed. By constantly asking myself about the validity of what has been done, it will act as insurance and create strength to the empirical data of the study.

One can say that reliability and validity complement each other by having both concepts dealing with various elements of data quality. Thus, I can argue that high reliability is prerequisite for high validity, but not vice versa. This is because the collected data is not valid for the research question if the data are not reliable, but on the other hand, the data can be reliable without necessarily being valid in relation to the research question. In that sense, the degree of validity in these data and conclusions is related to whether the study examine what the research question defines should examined. Thus it is important to emphasize that this is my interpretations and only I am responsible for what is written in this thesis. The material for this study consists of transcribed interviews and my impression of the informants in the interview situation. Based on the empirical data from the interviews, I would say that the validity of this study is reasonably good.

The third and final aspect of consideration by using the qualitative research interview as a method is the generalizability. If the results of the interview survey are considered reliable and valid, the questions whether the results are primarily of local interest or whether they can be transferred to other interviewees and situations have to be considered. This is a question that is constantly asked about interview studies, whether the findings can be generalized (Kvale & Brinkmann, 2009). Since I wanted to interview the people who had great influence and participation in the operations, I decided to interview six persons that are a crucial both during the planning and the execution part of the operation. Then the question becomes whether six informants is enough to generalize this study. Generalizing about a topic like communication is by itself very difficult. There is no definitive answer as to what is right or wrong, and every individual has their own way they prefer to communicate and relate to other people. Parts of the knowledge gained after the interviews are much generalizable, with respect to that almost all informants told about very similar situations and experiences. Other situations are however very individual and therefore difficult to generalize. However, by interviewing people with different positions in the hierarchy, one gets a more general representation of communication RLWI. This makes it possible to get individual experience from different viewpoints, which can help to strengthen the generalization.

4 Analysis and discussion

This chapter will analyze and discuss the collected empirical data from the interviews and take a closer look at the linkage between these data and the theory described in chapter 2. It is important that the reader of this chapter remember that this is my understanding and my interpretation of the interviews. It does not necessarily be identical to reality, but this thesis is supposed to reflect my personal assessment of the communication within the RLWI department. A lot of the descriptions from the interviewees were positive in relation to communication, but I have chosen to emphasize the most challenging channels with greatest opportunity for improvements. As a basis for the analysis and discussion I have focused on the interviews and sub-questions, which should then give a better answer to *"How does communication within the RLWI community in Statoil ASA and their clients affect knowledge transfer and learning within the RLWI department?"*

4.1 "How is the information flow between the internal and external parties within the RLWI department?"

RLWI has a special system in which the majority within the department is working on land onshore, while some work as well supervisors offshore. This requires that all of those sitting in the office onshore have a communication where they send and receive information from multiple fronts to plan and carry out operations in the best possible way. It includes not only communication between members within RLWI onshore, but also communication with people who have relevance to the operation such as; external clients, offshore personnel and other departments within Statoil ASA. The important thing is according to Spaho (2011) that all the participants in this communication process are working towards the same common goal; to achieve a successful, safe and efficient operation.

By maintaining internal and external horizontal communication across distributed and geographically separated work groups, people within the department have to use a variety of communication channels. These people are no exception to the rest of the world, in a way that every individual have their own preferred way of communicating. However, the difference in perspectives the interviewees had when they talked about what they believed was the most important channels of communication, was rather surprising. One hypothesis ahead of the interviews was that everyone was going to talk about email, telephone and various channels closely related to their job, but that was not the case. Close to half of the interviewees talked about communication channels that gave specific information related to the job they performed, such as:

> ***"I actually call a lot when there are different things ... It's quite time effectively instead of setting up a long mail. Often I send an e-mail afterwards, because then it's in their inbox, so that they remember more easily what they should do. This is typical for vendors where I ask for simulations or offers and stuff like that."***
>
> ***"It's ... like quite formal communication ... mail ... that things are communicated via mail. We have the morning meetings as well, both internally and towards those sitting offshore. So we have mail and various meetings that are used most in relation to the formal communication."***

The remaining respondents did not have their main focus on the information they received, but more focus on the interaction and having a verbal conversation with the people they communicated with. Having a face to face conversation helped building a relationship which in turn contributed to better cooperation (Hahn, Lippert, & Payton, 2011). These interviewees did not talk about the information they received, but rather that this form of communication in a way balanced the link between business related information and relationship-building fundamentals. This is very much consistent with the theory about organizational communication, where so much of the focus is about building relationships to gain better cooperation among the participants. Here are some of the transcribed quotes:

> ***"What I believe most in, is that we talk together and know each other. Then it goes either by phone or by regular gatherings or meetings. I believe in the land organization that meetings are an important communication channel, arena, to find solutions and make decisions."***
>
> ***"I think it's very important that you do not only communicate electronically, so that you have the personal relationship as well ... because it is very important."***
>
> ***"The most important is of course contact ... that is; personal contact, uh ... being able to have an open dialogue, just like now when we're sitting in an open plan offices."***

Somehow these answers seemed a little too good, and it was difficult to know if their answers could be taken at "face value". In other words; the informants gave the impression that what they said was intended to be the politically correct answer. Thus, the interview questions had to go further into the depth of these topics to answers of how they really communicated with respectively; their colleagues at the office, the external clients and with those who carried out the operation offshore.

When the informants were asked about the communication with their colleagues in the office, they were convinced that it was good. The biggest reason was given to the open plan office structure. According to themselves, it was because of the open plan office that the employees had such an open dialogue between each other. This structure made it possible for them to at any time talk to each other verbally and become better acquainted with one another.

> ***"I think the communication with the others within the department is tremendous. I really think it is thanks to the open plan office, because it's very easy to just shout out a name and ask a question out loud. And in terms of learning things from each other, the open plan office is also very good ... The fact that you hear a lot from others talking, you actually learn quite a lot."***

This informal way of communicating is very appreciated by the employees. As there usually is someone else sitting nearby that can help with a problem, it helps to create a dialoguing Ba where they can ask questions and share experience about different challenges that emerge during work. This in turn requires that those who have a situation, in fact dare to ask others for advice. There is a big difference in how far each individual is willing to go to find answers to what they are questioning. The majority of the interviewees talked about how they communicated within the RLWI department, but what happens when no one can give you an answer? There were only a few of the interviewees that actually mentioned to communicate horizontally across departments. It is hardly without a reason that the other intervention units in Stavanger are located next door to RLWI. Even though these units are not executing RLWI operation, they might have knowledge and experience of situations that could help those who sit within the RLWI department. By expanding the Ba and establishing networks outside the department, they can in compliance with Nonaka's theory get "access" to more knowledge and experience. This network of people and contacts has to be created over time and it forms a learning platform for sharing best practices, expertise, lessons learned and establishing knowledge-creating processes (Baker, 2002). However, this is highly dependent on each individual; how they are as a person and whether they seek other Bas within Statoil ASA.

Besides the informal communication, RLWI has several formal ways of communicating. One of the communication channels that several of the informants mentioned were teamsites. A teamsite is what Nonaka (2000) defines as a systemizing Ba, where all information and data from each operation gets uploaded online. This enables anyone who has access to a given teamsite to read and edit documents which are located here. At first this sounds faultless, but after using the system for some time, it

accumulates so many documents that it becomes difficult for people to find the information they are looking for.

> ***"Eventually it becomes a lot of documents, and it's up to each person how they put headlines and where they place the documents..."***

While working with an operation and its particular teamsite, they usually manage to keep track of documents. However, with no routine for what headlines to use or where the various documents shall be sited, it turns out to be problematic for others. It is possible to search for documents within a teamsite, but as long as people use different headlines on the same type of document, it is very difficult to know what to search for. Therefore, it is bizarre that a systematic knowledge asset and channel of communication which is used that much nevertheless has such a poor structure and design (Nonaka, Toyama, & Konno, 2000). There are many potential improvements, which do not necessarily require as much effort from each individual. It is all about creating a form of best practice procedure for how to structure each teamsite and naming documents. This is actually a communication tool where explicit knowledge is stored and used for sending and receiving information asynchronously both horizontally and vertically (Eppler, 2006). There are several communication channels which are used within the RLWI that is not mentioned in this section, but the previous two are the most challenging at current date. Some of the other channels which are used and that are not that challenging are: email, Lync (an instant messaging network used to direct communication between two or more users) and telephone.

In accordance with Nonakas' (2000) theory; email and telephone are two exercising Bas which is commonly used to communicate virtually by individuals, and RLWI use them regularly toward their clients. The situation of the external clients is that a number of the most widely used clients have in-house coordinators represented at the Statoil ASA building. Thus, there is a mix of channels which are used to communicate. The communication process is initiated by RLWI that has an upcoming operation with a given scope and they send enquiry based on this scope. The clients provide a suggestion based on this enquiry for how they would like to execute their part of the operation. Then it becomes the well engineers' job to assess whether it is robust, has high enough quality and if the price is in harmony with what they deliver. After the well engineer has received proposals from several vendors, he or she has to considering the proposals together with the lead engineer to figure out which offer is the best. During this period there will be a continuous communication, particularly between the well engineer responsible for the operation and the clients involved. This communication will consist of both written

and verbal channels, but this is usually dependent on the practice of each well engineer. Just as the communication flow within the RLWI department, people have different ways they prefer to contact people.

There are also major differences in how the various clients are represented. As mentioned earlier, many of the most widely used clients have in-house coordinators in the office building. Other clients have sellers who several times a week comes by the office to stay abreast of what is happening and the last type of clients do rarely show their face at the office. The well engineers, who mainly have the communication with these clients, must therefore deal differently with respect to which client they relate to. Recurring in all interviewees is how they deal with clients whom have either in-house coordinators or sellers who constantly come to visit. The usual approach is that they take advantage of that everyone is at the office building, so they take direct contact and talk to each other as often as possible. Although this works fine, there are also some challenges in relation to this concept:

> ***"I think it is a bit unfortunate that the in-house coordinators are sitting so close. I do not think we are so free anymore, because we're sitting in open plan office and from time to time we're discussing across the room... and suddenly there comes a client that really should not hear the discussion. I think we're a little too transparent in the way we're organized."***

Regularly when people are working, they are so concentrated in what they are doing that they do not notice that the clients walk around the corridors. This is actually something people working within RLWI should think about, because no matter how pleasant a client is, they have to remember that the clients are sellers and always looking for new jobs. The fact that they "sneak" around in the corridors, could give them access to information that is not favorable in terms of negotiation or the competitive situation for other clients.

If the client does not have the opportunity to come visit at the office and have meetings, it is mostly email, telephone and video calls that are being used. In particular one of the informants emphasized the importance of not only using email to communicate:

> ***"I feel it's better to call so that the message becomes more fine-tuned than if you send a mail. It is always difficult to imagine how the recipient reads the tone of an email."***

Precisely this aspect of understanding was a topic several informants stated in various parts of the interviews. The capability to create and exchange knowledge in a way which the receiver understands the meaning of it is fundamental for a successful organization (Hahn, Lippert, & Payton, 2011). Obviously, some people are better than others in building relationships with their clients, but the ability to predict poor communication is perhaps the most important attribute. How the person in the previous quote calls the receiver to fine-tune the already sent email, is all about predicting poor communication and increasing the understanding for the recipient. As of today it seems that several informants are fairly good at this, but many of them are doing it without thinking about it. Since sending and receiving information among linked individuals is highly contextual and culturally dependent, it requires that the receiver has some background knowledge regarding the subject (Spaho, Organizational Communication as an Important Factor of Company Success, 2011). Therefore, people have to be more aware of the way they speak and write messages. Many misunderstandings could be avoided in the future if people had a greater focus on their communication. This can be related to the false consensus effect which states that people assume that others think and look at situations in the same way as them without explaining their way of thinking (Ross, Greene, & House, 1977). One example is that Statoil ASA uses a three letter abbreviation system, both in written and oral messages. This system creates a lot of confusion, and especially towards outsiders who might not be so accustomed to it. Not only do they have these abbreviations, but equally abbreviations may have totally different meaning depending on the context. That was also something I experienced during the interviews: I had to ask several follow-up questions about what different abbreviations meant, and in a work situation I could only imagine that some people do not dare to ask because they are too afraid that it puts them in a bad light. Still, this applies to all parties in a communication process; the language used for communication must be as simple as possible and at the same time as the message is understood by every recipient (Hahn, Lippert, & Payton, 2011). If the receivers do not understand the message, it is their obligation to take action and ask follow-up questions to make it clearer.

As the planning phase of the operation is over, they step into the actual execution phase offshore. Those sitting in the office do not usually have much contact with clients during this phase unless something goes wrong and one has to mobilize new equipment to the vessel. Then it is mainly through regular morning meetings, in form of video calls, that information is communicated between those offshore and onshore. The morning meeting serves as the “cornerstone” of communication, but they have those topics which cannot be talked about in plenum because there are clients and others involved in the

meetings. If such topics appear during a meeting, they are discussing it afterwards by using telephone. Morning meetings are typically a synchronized systemizing Ba where everyone receives status and update from what has happened during the last day, and what the plan is for the next day. Most of the communication except from these meetings is directed towards the well supervisor offshore, and RLWI is structured in a way that makes the well superintendent responsible for this communication.

In addition to this synchronous communication, all parties involved in the operation receive a program in advance. This program is made by the responsible well engineer in the planning phase, so that everyone can prepare for the job ahead. The program explains the operation from start to finish, the history of the well, what should be done, risks involved and all technical information concerning the well. It is in other words not required any prior knowledge about the well than reading through the program to perform the operation.

The big challenge here is that the well engineer, who functions as the project manager and have been studying the well for weeks, often months, becomes forgotten by the well supervisor and the well superintendent in large parts of the communication process. Naturally, one must consider that both the well superintendent and the well supervisor has roughly 20-30 years of experience, but in reality it is the engineer who has looked most into the details of the operation. When the well superintendent and the well supervisor interact so closely, is it not always the case that the engineer becomes involved in this communication. Yaniv and Kleinberger describes this as the own opinion effect; the decision makers have a tendency to prefer their own opinion rather than the experts.

> ***"…because they are very experienced, so they ... they are in a way doing it as they are accustomed to, without involving us that much."***
>
> ***"I miss a little more communication or closer dialogue towards the engineer. I know it's not the engineer that has the responsibility of the operation, but the way I experience it, doesn't the engineer get updates as often as I would have liked."***

They are obviously not doing it on purpose, but when two people with that long experience speak directly and find solutions, it is not always that they recall including the well engineer who is actually the project manager for the operation. The well engineer is of course in this context a rookie, but since this person has worked with this well for so long, it may well be that he or she can contribute to discussions. In addition, a greater inclusion of engineers contributes to a new learning and experiencing Ba, which according to Nonaka will help to build competence and form a better competitive organization.

Another Ba related to offshore operations, where it appears that communication is challenging, is related to the licenses that RLWI are doing work for. This applies particularly to licenses that have a different location than Stavanger, such as Bergen and Stjørdal. As some of the interviewees said;

> ***"We do not really have this close dialogue with these environments. Like here in Stavanger, I can just go in the office community and talk to the person I want to address something with."***
>
> ***"Where you have few operations, perhaps only one operation within a year ... I think communication is a bit difficult."***

The problem is that the licenses where RLWI do not work that often are not familiar with the methodology and process for these operations. When they additionally change their personnel, it is not always easy to know whom to deal with. When most of the communication interactions are via email and telephone, one has to know who to contact. At the moment, every time RLWI have an operation on such a license, they must engage in very much teaching and send a lot of information prior to the operation. Hopefully this will change over time, as more licenses become aware of these operations. Since RLWI is relatively new in this industry, it will probably just take some time before more licenses and organizations know more about these operations.

4.2 "How is knowledge and experience communicated within RLWI?"

Knowledge originates and is applied in the minds of knowers. In organizations like RLWI, it becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms. Knowledge which in turn can be divided into tacit and explicit knowledge, are continuously communicated through many different channels of communication. It is the experiences from each individual which become the foundation of knowledge in an organization. As members of the organization are experiencing something new it becomes a form of knowledge that more people can benefit from in the future. It is according to Nonaka, the mixed communication between this tacit and explicit knowledge, which he calls conversion that creates knowledge at an individual level.

For RLWI to maintain the competitive advantage they already have, they must constantly develop their current knowledge to increase the value of these assets within the department. The only way to develop their assets is to communicate and share the experiences that each individual obtains from different Bas. The challenge is not a lack of Bas, but rather that there are so many arenas for knowledge and experience to be transferred that the employees become confused and are experiencing what O'Reilly (1980) describes as information overload.

A lot of the experiences that helps to enhance knowledge for those within RLWI originate from offshore operations. Those who work offshore have gained a large amount of experiential knowledge assets, which is important to get passed on to employees in the office. The entire drilling and well department within Statoil ASA uses a computer program called DBR, which is a daily reporting system of the offshore activities. This is a systematized Ba where everyone who has access can log in and read about what the various vessels do offshore. The well supervisor offshore is responsible to update the program every 30 minutes, 24 hours a day, making sure that everyone can keep track on what is happening. Eventually this becomes very much information and if one intends to keep up with multiple operations simultaneously it is hopeless to read through all this material. That is why the project leader (well engineer) becomes responsible of writing the experiences gained by each operation into a dedicated section within DBR. This allows those who are interested in getting more experience to read the concrete experiences instead of reading through all the text that has been written during the operation. This asynchronous way of communicating experience is what Nonaka defines as an externalization process which converts the tacit knowledge into explicit knowledge that is easily accessible for everyone interested. There are no regulations on how many or what topics one should write experiences about, but more an assessment from each project manager of what could be relevant for others:

> ***"One can write three experiences in one run or you can write none during the whole operation ... it depends a bit on what it is. If it's a bit special you usually know if it is something to include in the experiences. After a while one gets a feeling of what is standard procedure and what is nice to know for others."***

By "crystalizing" this tacit knowledge and making it explicit, helps everyone involved in the process with new knowledge. This makes DBR an excellent system for people to log in and read about various experiences. In fact, if they take the time, is a very crucial aspect for this system to function properly. Almost all the interviewees spoke well about this DBR system and how good they were to write the experience for each operation. Nevertheless, none of them even mentioned that they read through experiences from others' operations. What is then the point of spending time and resources on writing experiences in DBR, if no one actually uses it? When asking whether they actually spent time reading others' experiences, some of the answers were the following:

> ***"Put it that way; I'm better at writing my own experiences than reading someone else's."***
>
> ***"It's possible to subscribe to experiences written in DBR so that you every day receive experiences from wireline operations on your mail. In other words; all experiences in the entire Statoil ASA which is written into the subcategory wireline, is sent to me by mail… but it turns out to be quite a lot of information ..."***
>
> ***"The amount of information is so big that if you try to read the experiences that everyone else has written it takes a lot of time... "***
>
> ***"You can somehow read others' experiences, but when you don't know anything about the well it's not that interesting for you, it then ... then you don't think about it."***

Based on these answers, it seems that the whole intention of communicating experience asynchronously through DBR is just a waste of time. The only time experiences in DBR are being used is when they do a new operation in the same well or during the combination process where the project manager collects data from various systems to write the final well report for the operation. They simply collect information from different sources and put them together in a new context (Nonaka, Toyama, & Konno, 2000). It appears that the system is too big and that people do not even bother to go in and read about the various operations. When it is not even possible to narrow down the subscription further than to wireline operation, it becomes an information overload for the employees. Many of those who subscribe to these experiences only skim through the emails without really getting anything out of it.

However, as one informant told, he or she tried to forward the e-mails which were seen as interesting and relevant to the others in the department. This is a mindset that several of the staff should have, because this helps to highlight information that may be beneficial for more people to see.

Otherwise one has the problem which is emphasized in the latter quote above; about reading experience from a well you know very little about. It means that you do not get any relation to the experiences and one must read quite a lot about the operation before actually understanding the issues and hence the experiences gained. People would get better learning and experiences if they worked throughout the planning stages and took part in the execution of the operation themselves (Kolb, 1984). As a consequence, the person who has actually been involved in this process should communicate its experiences synchronously in what Nonaka defines as a dialoguing Ba. Then people have a person they can relate to and it creates a concept for externalization where tacit knowledge gets comprehensible through dialog among the participants. RLWI are supposed to go through special instances at the department meetings which are held once a month, but based on what is said in the interviews; this is rarely carried out in practice.

After each operation a one-pager is written by the project manager, which is basically a reported summary that briefly explains the operation from start to beginning. This one-pager report does only the department leaders go through, meaning that none of the well engineers are reading this briefing. There is no reason why the project manager who has written the one-page not should present it and explain the experience gained at the operation. The engineers who manage to cope with a challenging operation have to pass on their knowledge to other engineers within the division (Eppler, 2006). This would not take long time as well as this is an excellent venue to ensure that all engineers are aware of the learning and procedure in each operation. This would somehow “force” the engineers to get a routine where they listen to the experiences that others at the department has been through, instead of having to take the initiative and physically enter the DBR and read about them themselves. Such dialoguing Bas as meetings are superb locations to describe and deepen the existing experiences, as well as it enables the participants to ask follow-up questions if anything turns out to be unclear. The whole process becomes an internalization process that helps to strengthen the conceptual and routine knowledge assets that are essential with respect to creating value for the RLWI department.

It must be said that the RLWI department also have their own experience meetings four times a year where they try to gather as many as possible of those who work both onshore and offshore. Then, they highlight aspects from operations that might be beneficial for everyone. However, these meetings include several topics that actually are not relevant to sharing experience. Too many experiences during a day can be too much for people to be able to handle, but then they are not capable of covering all necessary experiences that they ought to go through each year. By going through too many experiences at once gives less value for the attendees, because eventually people start losing focus and start thinking about something completely different. Consequently, RLWI should take better advantage of their department meetings where everyone at the department is joined together and they have the opportunity to go through the operations and experiences from the previous month. This means that the amount of information does not become too big for people to process, while at the same time everyone gets updated on status quo. This will also contribute to the execution of Nonaka's knowledge-creating process involving the SECI process, the Ba and the knowledge assets required for the knowledge spiral.

Otherwise, Statoil ASA has various networks that the employees can be a member of to communicate professional knowledge. This is dialoguing and systemizing Bas where experts share their insight, experience and know-how within their area of expertise (Eppler, 2006). This is groups that are voluntarily for the employees at Statoil ASA to attend, but the possibilities are huge when it comes to getting hold of knowledge that was beforehand unknown. The challenge here is that there are so many networks where it is possible to gain access to new knowledge and experience, that it is simply impossible for an employee to take part in every one of these Bas. The intention of spreading knowledge among various departments is certainly good, but each individual must prioritize what they believe is important and provides most value for them. The entire time people have to prioritize the amount of information so that they get a balance with neither too much nor too little information. To understand the importance of the various Bas are in fact the most difficult prioritization of them all, and is thereby every individuals' assessment of what creates most value for them.

All interviewees were determined that knowledge- and experience-transfer is not good enough at this moment and that RLWI have several times tried to make various systems to streamline this retransmission process without any great success. After trying countless of variations, the department understood that the systems they used before were too big and concluded that using best practice documents were the best way to do it. Best practice is an experiential knowledge asset used to secure

good and effective routines during daily work and it is supposed to ensure a high quality and a robust system for solving tasks. It comprises tacit knowledge that has been acquired and accumulated by individuals in the organization through hands-on experience with other organizational members, customers, suppliers and linked enterprises (Nonaka, Toyama, & Konno, 2000). Every best practice document basically contains a template for a detailed operating procedure that the well engineers use when they write the program for an operation. Thus, RLWI has to make best practice documents for all operations that they perform in order to make the system work. At this date RLWI has 48 different best practices stored in a teamsite that describe everything from how the start-up meeting should be held to how to perform a perforation operation. The purpose of using such a system is according to Nonaka to make as much as possible of the experiential knowledge assets into systemic knowledge assets. In theory, this should act as an externalization process where tacit and difficult accessible knowledge is converted into explicit knowledge that can be stored in a systemizing Ba providing easy access for others. The RLWI department has chosen to place the responsibility for the practices on the different well engineers. This means that every well engineer is responsible for keeping their practices up to date at any time. It is the engineer who acts as the project leader for an operation that is accountable for passing on the experience to the person in charge of the relevant best practice. The person in charge of the relevant practice should then change the practice so that the next person who is planning a similar operation has access to the updated version.

A Best practice system is in reality a challenging system to use, because it requires a great deal from every individual for it to work. The biggest challenge is getting the employees to be critical and challenge the practices that they already have, to see if it actually is the “best practice”. One must frequently ask questions as to why things are done the way they are and not only do what is written in the document. Because the likelihood that they truly have made the best thinkable practice is relatively low. There is also a great danger of using such a system, because when one crystallizes knowledge in an explicit form it can cause people to lose their creativity and ability to create new knowledge. However, if the system is used properly and shared through what Nonaka defines as an internalization process, the accumulated tacit knowledge can be used as a beginning of a new spiral of knowledge creation.

One of the best Bas for creating a new spiral of knowledge is perhaps the open plan office. It is actually a Ba that simultaneously functions as an originating, a dialoguing, a systemizing and an exercising Ba. In this venue, it is the participants' way of communicating that decides which Ba that is exerted, but by taking advantage of how they are organized it enables them to ask questions and listen to others'

opinions and experiences. This basically makes the open plan office a Ba that is created for socialization and a place where information becomes knowledge, because it provides the basis for one to interpret information and create meanings. The newly created tacit knowledge will then be converted through an externalization process and become explicit knowledge stored in a best practices document in the teamsite.

4.3 "Which situations provide the best learning for the employees?"

David A. Kolb's experiential learning theory states that every individual have their own way of learning, and that effective learning is not possible if the learner is not able to execute all stages in his learning cycle. His experiential learning cycle corresponds with RLWIs' job procedure from the planning phase until the operation is finalized offshore. However, it was not hard to recognize what situations that the interviewees felt they got best learning from:

> ***"For me it's especially the execution of the program, but also when planning and writing the program."***
>
> ***"I would say learning by doing… Once you have written the program for a job and get to travel offshore to be part of the job, that it's optimal learning."***
>
> ***"If you are planning a well you're learning by being involved in the entire process, like understanding the well, comprehend what has been done earlier and examine how similar operation has been performed in other wells."***
>
> ***"For me it's about traveling offshore to the operations that I've planned, and being a part the operation when it's carried out. I think that's a very important part of my learning process."***

The quotes are very clear that the diverging and assimilating style of learning is the basis of learning, but that the converging and accommodative learning styles are required for the learning process to become fulfilled. Even though the execution phase offshore, which comprises the last two learning styles, takes roughly eight times less time than the two first, it was still these parts of the learning cycle that provided best learning for the informants.

At the beginning of the diverging and assimilating process when a well engineer is assigned a new job, he or she starts to grasp experience via apprehension and begins the process of determine the task objective, pre-identification of risk and immerses themselves into the operation. The engineer begins to generate ideas and the grasped experience becomes transformed through an internal reflection technique (Kolb, 1984). For the engineer to reach abstract conceptualization, he or she consults colleagues and clients to get hold on their opinions and experience of the situation. The clients explain the engineers how their blueprints and equipment works, while colleagues consult by sharing their experiences about similar tasks they have experienced before. When gathering information the engineer identifies requirements and evaluates the total risk picture for the operation. This process by

itself gives very important learning, but if one envisions the perspective of the engineer, one get a greater comprehension of the task by traveling offshore:

> ***"I believe if you imagine a two-dimensional blueprint of a system with a lot of shapes and information, it's possible that you understand the blueprint, but once you get into practice and see how it actually looks offshore ... I think that's a huge part of learning. Even if you are good to read blueprints, you will get a better comprehension when you get to see it in real life."***

However, it was not crucial for all the informants to travel offshore to get the best learning experience, but rather the execution of the program. After achieving abstract conceptualization, they get to the active experimentation part of the learning process, which includes practical applications of their theoretical ideas. Then they have to solve problems, make decisions and authorize the offshore personnel to perform the physical labor in terms of a trial and error manner. Eventually when the operation is finalized, they evaluate the results, and it becomes part of the concrete experience for a new Kolbs' experiential learning cycle.

So what is it about the actual performance that makes it stick out from the planning phase and causes most people to prefer the converging and accommodative learning styles?

> ***"The actual implementation of the program provides the best learning ... because then I can witness the operation and take notes of what's happening in relation to what was planned."***

The latter quotation gives a good indication of why the last half of Kolb's learning circle is preferred instead of the first half. Throughout the entire working process the employees work on a foundation which Statoil ASA call "The Compliance and Leadership way of working", which comprises five elements that they have to follow through the entire process; 1; understand task, 2; identify requirements, 3; manage risk, 4; execute task and 5; evaluate results. This means that the well engineers during the planning phase mainly follows governing documents that makes this part of the job relatively similar each time. When they have so many procedures and templates that describes what to do at any time, it sooner or later becomes a habit that they copy-paste information from previous programs and only change the physical characteristics which are different. This can create a false sense of security that they do not get an answer to until the implementation of the program. Indubitably, not all the planning phases are like this, but many of the well engineers do follow a step-by-step procedure during the

reflective observation and on their way towards abstract conceptualization. This gives an unfavorable learning situation, because most of the situations that provided best learning for the informants involved an unexpected or different scenario compared to normal operation procedure.

Therefore, it is actually not the execution itself that provides the best learning, but those situations where they encounter challenges that are different and unanticipated compared to what they expected. Since these situations happens a lot more frequently in the actual implementation of the program than during the planning phase. Many of the interviewees described what Kolb calls active experimentation and concrete experience as the situations with most effective learning. However, Kolbs' theory corresponds to the answers given by the informants, because they would not have taken that much benefit of the learning without taking part in the whole learning circle. Although the situations that provide best learning occur most often in the second half of the experiential learning cycle, it was highly reliant on firstly taken part in the first half. Without any background knowledge about the operation, it becomes harder for the participants to recognize situations that are different and unanticipated compared to what they expected.

4.4 "How is the communication in relation to improvement of working processes and technology development?"

The people who work within the RLWI department have a great deal of governing documents they have to follow during their everyday work. Several of these processes are managed and controlled by persons who are positioned higher up in the hierarchy at the head office. This requires a functioning vertical and diagonal communication flow for the messages to reach the desired recipients, but this is unfortunately not always the case.

> ***"When we get information from above, they often make a simple message so incredibly difficult and complex that the recipients who sit at the bottom of the hierarchy do not comprehend the meaning of it."***

The messages being delivered downward the hierarchy are sometimes so vague and without any form of context that the leaders within RLWI must try to understand and make sense of the message before it is forwarded to the engineers. Donald Pelz (1952) points out that this helps to strengthen the power of the immediate supervisors (Pelz-effect), but after a message has gone through several interpretations it may contain a very different meaning than what was intended. This is a good example of what Jacobsen & Thorsvik call "wrong channel": The communication becomes highly ineffective when the channel used for transmitting a message is unsuitable for dissemination to the receiver or there is limited possibility for proper two-way communication.

As of today, Statoil ASA uses a system for governing documents called ARIS. This is a management system tool which defines how employees should work and describes how they perform their activities. The objective by using a management system is to contribute to safe, reliable and efficient operations and enable people to comply with external and internal requirements. The management system that is designed and maintained by the Statoil headquarters, aims to build on others' experiences and gives the opportunity to ensure continues learning across Statoil ASA.

The opportunities for improvement of the working processes in ARIS are principally designed in the same manner as improvements of best practices documents. The main difference is that instead of communicating the improvements horizontally within the department, one must now communicate vertically or diagonally to people who are positioned differently in the hierarchy. In an organization as huge as Statoil ASA, it is not always that easy to understand how this up- and downward flow of communication works. However, in relation to changes of working processes in ARIS, the

communication is relatively good. If someone discovers a potential improvement within the ARIS system, they can add suggestions through an official communication channel. When this proposal is passed on, it will be considered to be included in the system during the next revision.

> ***"We have simplified extremely much in RLWI, because we had a tremendous amount of complex working processes before compared to what we have today."***

In fact, simplification is perchance one of the greatest potentials for improvements throughout the entire Statoil ASA. By having complex systems and procedures, one only achieve less understanding and sense of the work that is being done. It is okay to follow a process or a requirement, but it is much harder to understand the intentions of all these written documents. If one actually understands the purpose of each requirement, one is able to work much more efficiently according to the compliance and leadership principle. This is a big communication problem in RLWI, because the person(s) who has made the requirements does not have to be smarter than those who use them. However, many employees believe that the communicated requirements are a form of pat answer, when in reality it is just the explicit knowledge of what some people consider the best. This is an uncertain way of operating such a system, because when all these requirements must be followed during hundreds of operations, it may well be that they do not suit every purpose. A dozen of those operations might just as well suffer from increasing costs or greater risk due to these requirements. Thus, by simplifying the work processes and attach an appendix describing the meaning of each requirement, the communication becomes more contextual and people have greater opportunities to challenge and make their own choices about what is needed for their activity. This imposes a greater responsibility to the employees and forces them to gradually acquire more knowledge about the work they perform. Over time, this will cause the engineers to accumulate tacit knowledge through an internalization process, which can be transferred among the staff in order to make a more flexible and efficient system (Nonaka, Toyama, & Konno, 2000).

The contracts that the RLWI staff uses in their everyday work are correspondingly put together by the head office.

> ***"I think that the contract department in Statoil don't understand us well enough and we don't understand contract in Statoil good enough either."***

When Statoil negotiated contracts, the strategy was that these should function across the entire company. RLWI, which is a unique concept within Statoil ASA, have their separate mechanisms and

special needs they want in the contract. If these elements had been included, it would have given an even more streamlined operation. At this day, these needs are in a little degree taken care of and it causes RLWI to take greater costs than desirable.

> ***"If we had gained approval for our ideas and models in relation to the way we operate, and received an optimal contract based on these terms... I'm sure we would have been more cost-effective than what we are today."***

The way this communication has been practiced up to now has been miserable. The problem is not necessarily that the information does not reach the receiver at the head office, but rather that the engineers within the department feel too "small" to take a position on such things. One of the responsible contracting persons from the head office spoke regarding these contracts in a joint meeting with the various intervention departments. This person was convinced that the people within each department had to take much more responsibility and look for opportunities that could challenge and modify their contracts. This was something most of the people within the RLWI department were unaware of. The person also stated that everyone should just speak directly to him if something was wrong with the contracts, but this contradicts with the hierarchy in Statoil ASA. By not communicating vertically through the formal channels, which should be through the immediate supervisor, it will according to the Pelz-effect reduce the employees' trust, their desire to communicate and their faith in the information from these supervisors.

There are also communication problems in relation to improvement of technology development within RLWI. There is no one in the department who is responsible for technology development, but rather a shared responsibility among everyone. Formally Statoil ASA has an enrollment system in terms of a technology portal for new technology that goes towards head office. This is a communication channel that actually not all the employees are aware of and those that know about it have very little faith in the system.

> ***"To be honest, I do not know how it works at this moment. I really feel that everything has fallen through and that the system was much better before."***
>
> ***"We shall basically send the suggestion further on, but what we experiences is that nothing happens…"***

> ***Now I'm too far down in the system to gain acceptance of new technologies. I mean that the research and development environment should communicate more often with us users. They live in their own little world absent at the head office, where they exclusively deals with large projects that benefit other areas than RLWI.***

The RLWI department should mainly have focus on the operations and not on new technology, but with the communication channels that exist today, the distance towards the head office becomes way to big than what is reasonable. It is almost comical that a research and development environment which is nearly isolated from the users, should determine which technology to be concentrated on. The RLWI department has understood the issue and has therefore chosen to bypass the head office regarding development of new technology.

> ***"Our suggestions have not gone through the system because it's too big. We have tried to submit proposals, but they're not prioritized. In principle, we only informed the office and took matters into our own hands."***

The solution has been that RLWI arrange separate meetings with suppliers without involving the head office, where they communicate what elements which can be improved. Additionally, the suppliers are in a selling position, which implies that they contact RLWI if they have something that they believe RLWI may benefit from. However, the problem of evading the head office is that they do not get the funding needed to develop the technology. This means that they must communicate diagonally to the various licenses that RLWI operates to see if they may be interested in sponsoring their technology project. The licenses will certainly have incentives for developing the technology on the vessels, but RLWI do operate on so many licenses that it is difficult to find a certain license willing to finance their project. Instead of a technology system that works, RLWI now uses unnecessary time on communicating between multiple joints to get approval on their technology improvements. Pfeffer and Sutton (2000) consider this as the knowing doing gap: When the knowledge about how to improve organizational performance is in place, but putting that knowledge into action is a huge challenge. How to implement what is already known. This shows once again that the vertical and diagonal communication in Statoil ASA has great potential for improvement.

5 Conclusion

The RLWI department works in a way that forces them to deal with different people in various settings. It means that the employees must use multiple forms of communication to disseminate information to all those involved. In such a large and complex company as Statoil ASA, it is unmanageable to avoid challenges related to communication which affects knowledge transfer and learning.

The main findings after writing the analysis and discussion chapter are that all informants have to some degree understood the importance of building relationships. People have a different approach to how they build relationships, but all of them recognize the importance of this aspect related to communication. With a big focus on teamwork during the last years, the RLWI department has come a long way in how they communicate horizontally within the department. However, communication with other departments is an aspect that many should rethink and develop to a greater extent. As of today, only a small number of people take advantage of the knowledge and experiences that the other intervention departments possess. Exploring other environments gives access to valuable information that can be helpful in RLWI's everyday work. Another aspect is how good they are in predicting poor communication. By having a consistent focus on foreseeing poor communication, especially towards clients and others outside the department; it will contribute to better understanding for the recipients.

At an organizational level they have communication through teamsites that works as a knowledge asset, but still have such a poor structure and design. Having a database with so many documents and without any procedures of what documents should be named or located; the communication through these sites becomes difficult. They usually manages to keep track of documents while working with a certain teamsite, but it turns out to be problematic for people to find the information they are looking for in other sites.

The involvement of the well engineers during the execution phase is also a communication issue that affects the knowledge transfer and learning. When most of the experiences that contribute to enhance the knowledge assets originate from offshore operations, it is crucial that not only the responsible well engineer gets involved, but the entire department gets hold on what is happening. RLWI uses a lot of electronic Bas to transfer knowledge, but without any familiarity to the operation or too large amount of information, these arenas become little convenient for that purpose. They do also use a best practice system which is a very good way of transferring knowledge if it is used properly. The problem is that this is a demanding system to use and it often fails to grasp all the experience that is useful for the

employees. Originating and dialoguing Bas, such as the open plan office and meetings, are better for addressing experiences and creating new knowledge. This is Bas where experts share their insight, experience and know-how within their area of expertise. The open plan office is excellent for informal communication through face to face conversations, but there is still a lack of routinely knowledge transfer among the employees. The experience meetings that they arrange four times a year are not able to cover all the required experiences and RLWI should therefore take better advantage of their monthly department meetings. Everyone within the RLWI department is then gathered and they have the opportunity to go through the experiences from the previous month.

In relation to learning for the employees, the thesis highlight the importance of more people partake in the communication process between the well superintendent onshore and the well supervisor offshore. The situations which provided most learning for the employees were circumstances where they encountered challenges that were different and unanticipated compared to what they expected. That usually happened when the learner tested out their planned work to see what result it gave. However, this way of learning is not adequately if the learner has not been involved in the planning stages. Without any background knowledge about the operation, it becomes hard for the employees to recognize situations that are unanticipated compared to what they expected.

The vertical up- and downward communication do also have issues which affect knowledge transfer and learning within RLWI. When the head office communicate messages downward the hierarchy, they are sometimes so vague and without context that the receiver have problems understanding the meaning of it. Even some of the governing documents which is controlled and monitored by the head office, are often written in such a difficult language that the users struggle to understand the intension of them. This is especially related to requirements and contracts that can contribute to increase both costs and risk if they are followed slavishly. By simplifying these processes and attaching appendixes describing the intention of each requirement, the communication becomes more contextual and people have opportunities to make their own choices about what is needed for their activity. This helps to challenge their processes by creating new knowledge and ideas about how the operations can be carried out most effectively.

There is not only challenges related to communication downward, but also in the way RLWI communicates upward toward the head office. Several of the employees do not know how to communicate improvements regarding contracts or technology. Those who actually know what

communication channels to use, does not believe the message reaches its destination. The distance towards the head office has become so large that the communication channels do not constitute the purpose they were created for. As a result, RLWI now communicate through other than the official channels to gain approval for their ideas. Instead of a communication system that works, RLWI now uses unnecessary time on communicating diagonally between multiple joints to get approval for their improvements.

This study has shown different aspects concerning communication which affects the knowledge transfer and learning within the RLWI department, and that effective communication is crucial for improving the employees' knowledge. Since the study revealed so many aspects regarding communication, it can be considered as the first step in a further research. Therefore, it can be interesting in a future study to choose one of those aspects and analyze how the communication functions in practice. The aspects that I believe have the greatest potential for improvement and a further study is:

- The employees' awareness regarding predicting poor communication.
- Communication with other departments.
- Their best practice system.
- The structure and design of teamsites.
- The involvement of well engineers in the execution phase offshore.
- Communication with different licenses.
- The vertical / diagonal communication towards the head office regarding working procedures, contracts and technology development.

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Appendix A: Well Intervention

A.1 Subsea Well Intervention

During the lifetime of a subsea well the production rate alters constantly and different errors may occur. This means that occasionally oil companies have to do maintenance and different technical operations to get greater utilization for each well. Because of the increasing number of subsea wells, the demand for well interventions is greater than ever (Zijderveld, Tiebout, Hendriks, & Poldervaart, 2012).

To date there are three different categories within well intervention:

1. Category A: Light Well Intervention
2. Category B: Medium Well Intervention
3. Category C: Heavy Well Intervention

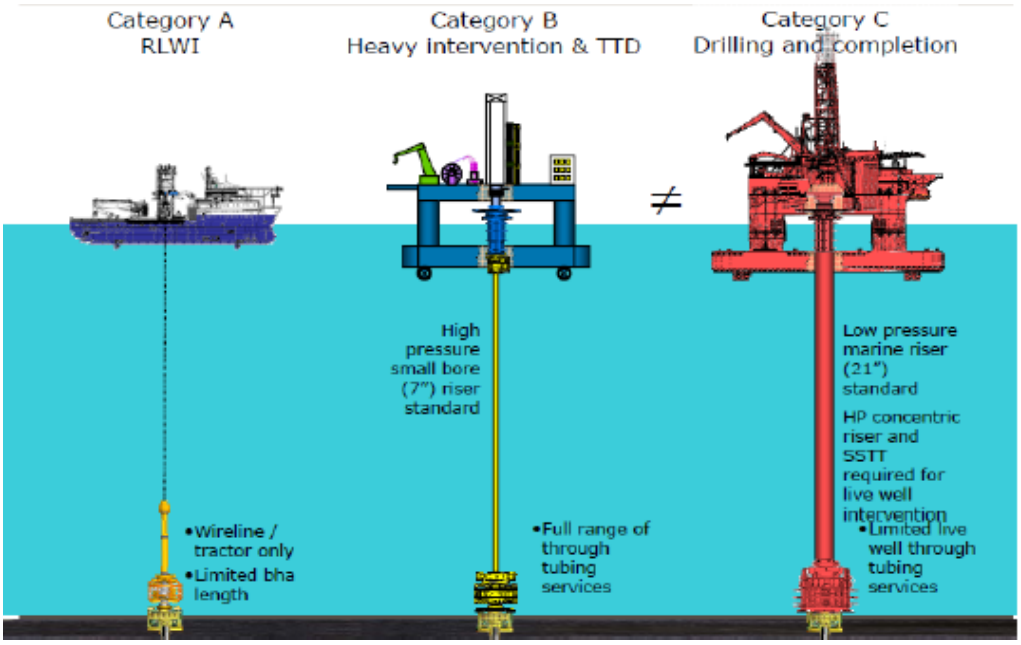

Figure 13 - Well intervention category A, B and C (Nugroho, 2013)

Light well intervention is a type of service that uses a variety of different equipment that can be handled by a numerous types of vessels/rigs (Zijderveld, Tiebout, Hendriks, & Poldervaart, 2012).

Typical Light Well Intervention operations:

- Borehole logging.
- SCSSV failure/repair.
- Pulling/installing VXT
- Fluid displacement.
- Gas lift valve repair.
- Perforating and re-perforating.
- Sand Washing.
- Setting and pulling plugs.
- Stimulation work.
- Zonal isolation.

Medium Well Intervention is a type of service that needs in general more specialized requirements than the Light Well Intervention. Some of these requirements refer to safety and production issues during operation (Zijderveld, Tiebout, Hendriks, & Poldervaart, 2012).

Typical Medium Well Intervention operations:

- Casing leak repairs.
- Fishing.
- Paraffin, asphaltenes and hydrates.
- P&A (plugging and abandoned well).
- Remedial cementing.
- Sand control/gravel packing.
- SCSSV failure (Surface-Controlled Subsurface Safety Valve).
- Water shut-offs.

Heavy Well Intervention is associated with the use of drilling rigs because of high complexity operations that only drilling rigs can perform (Zijderveld, Tiebout, Hendriks, & Poldervaart, 2012).

Typical Heavy Well Intervention operations:

- Tubing packer failure.
- ESP replacement.
- Horizontal well sand control.
- Well completion change out.
- Re-drilling side tracks.
- Subsea X-tree change out.

A.2 Riserless Light Well Intervention (RLWI)

As described in chapter "1.6 Riserless Light Well Intervention (RLWI)" Riserless Light Well Intervention means that there is no use of any type of riser during operations. This is a method that lets Statoil ASA perform live well intervention operations regularly and cost efficient compared to the conventional method. By using monohull vessels equipped with dynamic positioning, RLWI has capabilities to execute a variety of wireline well intervention operations instead of riser based operations that require platforms ((Nugroho, 2013) & (Juárez, 2012)).

Different type of Wirelines

There are mainly three different types of wireline. These come in different dimensions and characteristics, depending on the conditions in the borehole. The three different types are: Slickline, Braided line and Electric line.

The slickline is simply a piece of metallic cable (Figure 14 – Slickline). Its simplicity is an advantage because it reduces the friction and it is not easily affected by the pressure in the well. However, it is also a disadvantage. The design makes the wireline tolerate less pull up weight and it is easy to break. The slickline is preferred as long as the wire can handle the load. The main operations that it is used for is; setting or removing plugs, deploying and removing retrievable valves, fishing and gauge cutting (Juárez, 2012).

Figure 14 – Slickline (Juárez, 2012)

A braided line is in a few words a bunch of slim slicklines braided together forming one cable (Figure 15 - Braided line). This is mainly used for operations that require heavy pull up weight. When using braided line one has to use grease to make sure that the Pressure Control Package (PCH) can seal around the braided contours of the wire.

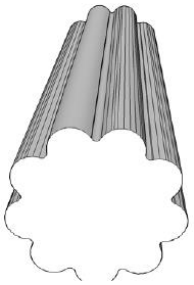

Figure 15 - Braided line (Juárez, 2012)

The electric line is just a variation of the braided line. This is simply an isolated electric cable within the braided line. It has the same strength capacity as the braided line in addition to the electric conductivity. This cable is mainly used for operations which electrical signal is required. This could be milling, tractor, logging, perforation and PLT operations.

Operations capable for RLWI

The different types of operations that can be performed from a RLWI vessel are:

- **Milling:** A process for removing scale inside the production tubing.
- **Bailing:** A process for removing sand and other types of debris from the bottom of the well.
- **Straddle:** A process for isolating parts of the perforated sections to stop water from getting in to the well.
- **PLT (production logging):** A process which helps to understand and quantify multiphase flow in a well.
- **Caliper logging:** A process that monitors the inner diameter of the pipe wall**.**
- **Perforations:** A process for re-perforation of reservoirs to improve the production or injection properties of the well.
- **Installation or extraction of plugs:** A process with the objective of either zonal isolation, well integrity, temporary P&A or preparation for permanent P&A.
- **Installing Gas lift Valves (GLV):** A process that makes it able to inject gas into the production tubing.
- **Change DHSV:** A process for changing and installing a new DHSV (Down Hole Safety Valve).
- **Punching tubing:** A process for making holes in the tubing (but not the casing) to get communication from inside the tubing and the annulus.
- **Cutting tubing:** A process for cutting the tubing, making it possible to retrieve the tubing at a later occasion.

- **Pull/install VXT (Vertical Christmas Tree):** A process for retrieving the VXT from the seafloor. Only VXT can be recovered without major risks/problems because the TH (tubing hanger) is not installed inside the tree structure but in the wellhead.
- **Temporary P&A (plug & abandonment):** Any kind of P&A that does not require pumping of cementing.
- **Acid treatment:** A process for stimulating and getting better properties in the well.
- **Fishing:** A process for removing lost equipment downhole.
- **Leak detection:** A process of detecting various leaks in the well.

Pros & Cons with Riserless Light Well Intervention

Pros

- Most cost effective LWI setup.
- Most time effective LWI setup; It is faster to mobilize, deploy and move between different wells.
- The RLWI method can be used by three different vessels.
- The vessels can be used for different operations than RLWI as well.
- An increasing demand for operations (add the graph?)
- There is a huge potential for doing a greater variety of operations with new technology.
- The operation is safer while using RLWI, because with a well control package installed on the seafloor it makes it much easier to handle blowouts.
- The vessels leaves a much smaller carbon and physical footprint because of a more smaller vessel, less people involved, simpler logistics and a lower chance for environmental contamination.

Cons

- Limited to wireline operations.
- Cannot pump large volumes of fluid.
- Cannot run Coiled Tubing (CT) (in a testing phase).
- Cannot execute the whole P&A sequence (looking at the possibility of cementing).
- Cannot do top hole drilling (exploring this possibility).
- Limited capacity of storage on the vessel.
- Depth limitations (stack is tested to 500m).
- More vulnerable to bad weather than a rig.
- BHA (Bottom Hole Assembly) cannot be longer than the Lubrication Tubular (LT) which is 22 m.
- Limited top side space. In case of a critical situation one might need a semisubmersible vessel because of a need for circulation system (well killing).
- The vessel is not able to perform heavy fishing operations because of limited pulling capacity.

Vessels

Statoil currently has two vessels that they use for RLWI operations, Island Wellserver and Island Frontier. Island Wellserver is slightly bigger and newer than Island Frontier, but both of these vessels are designed to do Light Well Intervention services and associated work. There are a few differences between them, so I am going to use Island Wellserver and its stack as an illustration throughout this thesis (Figure 16 - Island Wellserver, delivered in 2008).

Figure 16 - Island Wellserver, delivered in 2008 (Nugroho, 2013)

Stack

The stack made by FMC Technologies comprises the WCP (Well Control Package) connected to the X-tree, the LS (Lubricator Section) and the PCH (Pressure Control Head). This RLWI stack can be run from an intervention vessel such as Island Wellserver without the use of a riser. Because the system uses a X-tree adapter, the stack is very adaptable to use for any existing subsea system on the market. The design makes it possible to insert tools into the wellbore under full pressure without getting any sort of hydrocarbon release subsea/into the ocean. The well control system functions as a barrier between the well and the environment throughout the whole intervention operation. This is providing safe access to live subsea wells and helps to reduce intervention costs considerably. All the components put together can be seen in Figure 17 - The RLWI stack put together ((FMC Technologies, 2011) & (Nugroho, 2013)).

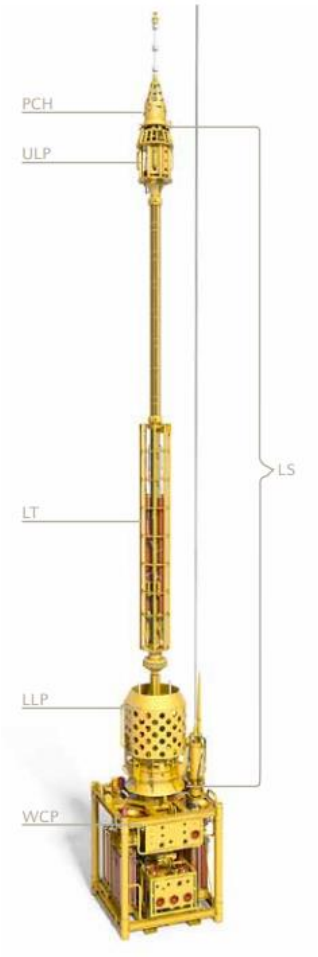

Figure 17 - The RLWI stack put together (FMC Technologies, 2011)

To get a perspective of how big this stack is and its limitations, FMC has some key system data (FMC Technologies, 2011):

- Operating water depth 1000 meter (due to umbilical length).
- Design pressure 690 bar.
- Bore diameter 7-$^{1/16}$" (179,4mm).
- Total weight in air 69 ton.
- Total height 33 meter.
- Maximum tool string length 22 meter.
- Compatible with all types of X-tree.
- Capable of all types of wireline operations.

Well Control Package (WCP)

The WCP, which is connected to the X-mas tree, is the equivalent to a BOP (Blowout Preventer) used in regular drilling and completion operations. It is functioning as the main mechanical barrier against the reservoir. In case of an uncontrolled well situation, the shear ram inside the WCP is qualified for cutting, wireline, coiled tubing, drill pipe and even some tools. By using an adapter it is possible to install the WCP to both HXT and VXT (Juárez, 2012).

Lower Lubricator Package (LLP)

The LLP, which is connected to the WCP, is the safety joint in the RLWI Stack. In an emergency situation where there are excessive forces applied to the stack, the LLP is designed to bend so that the permanent equipment gets protected (FMC Technologies, 2011).

Lubricator Tubular (LT)

The LT, which is connected to the LLP, is the place where the wireline tool string stops while pressurizing the system before opening the well or depressurizing the system after the well is closed in. It is limited to house a maximum 22 meters long tool string. When the tool string is inside the LT, the valves that are isolating the tool string and the LT from the well are opened, and the tool string can enter the well (Juárez, 2012).

Upper Lubricator Package (ULP)

The ULP is connected to the LT and comprises the lubricator reservoir and tubular. It also contains a Cutting Ball Valve (CBV) which is capable of cutting all sorts of wireline and sealing the well. Even though it cannot cut tools, it can be considered as a mechanical barrier (Juárez, 2012).

Pressure Control Package (PCH)

The PCH, which is connected to the ULP, function as a lid sealing of the wireline from the open water above, and the wellbore pressure below. The seal is achieved by pumping viscous grease between the wireline and the narrow tube of the PCH. This allows the wireline to move up and down at the same time as the wellbore is sealed off ((FMC Technologies, 2011) & (Juárez, 2012)).

A.3 The Riserless Light Well Intervention operation procedure

Riserless Light Well Intervention operations are performed from the moon pool, which is approximately 60m^2 wide square hole in the middle of the vessel. With assistant of a ROV (Remote Operated Vehicle) subsea, the first run is lowering the WCP (Well Control Package) on top of the subsea tree. Next run the LS (Lower Stack), including the LLP (Lower Lubricator Package), LT (Lubricator Tubular) and ULP (Upper Lubricator Package), is connected on top of the WCP (see Figure 18). In addition, there is a sort of guide wire system that support the equipment's when it is lowered into the sea. Compensator system in the tower compensates for the sea current that acts as a force on the wireline and tool string. It is important to constantly monitor the lowering of equipment to avoid twisting of the wireline. Fortunately, the deeper the equipment gets, the lower the sea current is (Juárez, 2012).

Before the wireline is attached to the tool string and lowered into the sea, it has to be threaded through the PCH (Pressure Control Head). This is because the tool string diameter is larger than the narrow tube in the PCH and the PCH is the final interface between the subsea installation and the seawater column. So when the tool string enters the top of the lubricator assembly (with guiding help from ROV and guide cones), the PCH is connected and locked in place on top of the LS. This makes it possible to replace the seawater out of the stack by flushing in inhibitor fluids to avoid hydrate formation. Then the stack is pressurized (equalizing the well pressure) before opening the well and running the tool string into it. The only force that makes the tool string go into the well is the gravity, so if the well is deviated to approximately 70 degrees, the friction gets too high, and a well tractor has to be used. The well tractor is usually attached to the back of the tool string and enables the wireline to go through high deviated sections by using a powered motor. Then the operation is carried out and more or less the same procedure is reversed before going on to the next well ((Juárez, 2012) & (Nugroho, 2013)).

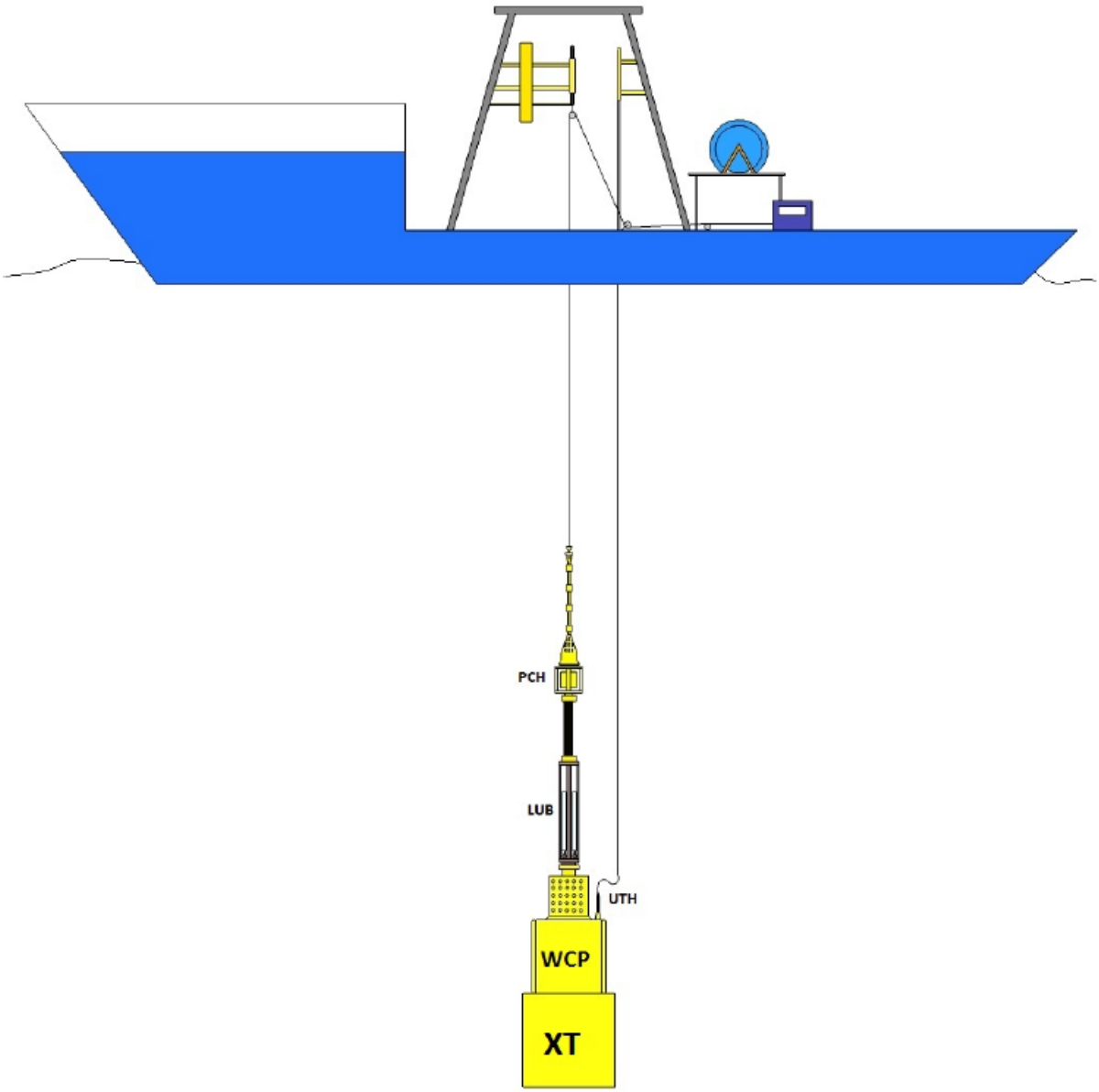

Figure 18 - 2D schematic of the connected subsea equipment (Juárez, 2012).

A.4 The alliance

The alliance is basically a joint venture where different companies deliver a service within their area of expertise. Statoil ASA is the client that pays for the services that the companies deliver. The alliance consists of Island Offshore (IOSS), FMC Technologies, Altus Intervention and Oceaneering. Oceaneering is responsible for operating and maintaining the ROV's, and have more of an assistant role in the RLWI operation. Altus Intervention delivers different wireline equipment and personnel for its operations and maintaining. FMC Technologies operates and maintains the stack and the related items. Island Offshore (IOSS) has the most important role in the alliance, because they own the vessels and have a coordinating role during the operations. IOSS delivers the maritime crew, maintenance, housekeeping, food and controls the general project management. This makes IOSS responsible for the interface between the companies within this joint venture and is therefore taking a substantial risk of subcontractors not performing. So the whole intention for Statoil ASA with this alliance is to avoid a complex and costly procurement process with many different parties. Now IOSS function as a single point of contact instead of having to deal with each operator separately and ensuring that the interfaces between the companies work steadily (Welde, 2009).

Appendix B: Interview guide

The interview guide used during the interviews were supposed to cover the sub topics of the research question and consisted of the following nine questions:

1. What are the most important channels of communication at work?

2. Have you experienced undesirable events where communication conditions were the reason?

3. What would you say are the greatest challenges of communication at your work?

4. How do you perceive the communication between you and those who work offshore / onshore / external clients?

5. Are there procedures on how to disseminate information to the parties involved in a RLWI operation?

6. We are talking about learning opportunities at work. What gives most effective learning for you?

7. How do you make sure that learning and experience is shared after each operation?

8. What systems and procedures do you have within RLWI, providing access to new information about technology developments in the industry?

9. How are opportunities for improvement in a work process followed up in practice?