

Logistics in AkerBP;

Criteria For Maximizing Flow



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Executive summary

Following the merger of Det Norske Oljeselskap and BP Norge in September 2016, the merged company AkerBP encountered a strategic choice concerning their logistics chain. The two merged companies carried each their solution to land transportation, where the fundamental difference between the two stem from contractual terms of delivery, formalized as Incoterms. The Incoterms determine responsibility for the parties of risk, cost and insurance, and where each of these responsibilities are transferred from seller to buyer. Implications on operations of choosing either Incoterms may seem obvious. However, the decision yields relevance for a wider range of aspects in the chain, and on the ability of AkerBP to successfully carry out their goal of flow efficiency in accordance with Lean-principles.

The purpose of the thesis was to provide AkerBP with relevant criteria for success in reaching their goals. The criteria should facilitate strong operational results, flow efficiency, support continuous improvement in the chain and retain cost-control. Action research was utilized to carry out the research. The approach allowed for application of multiple methods. Data was collected through interviews with internal and external stakeholders, as well as retrieved from internal resources. A mapping of the chain and a cause – and – effect analysis was subsequently conducted. The data uncovered an organizational bottleneck upon reception of goods at the offshore base, and wastes following from Lean-theory were addressed.

The analysis found four main criteria facilitating success. As a basis to reduce waste and enable flow efficiency, the analysis found Incoterms FCA should be utilized. The next critical criteria found was implementation of interfaces and integration between the planning systems used in the chain. Most critical is an interface between the planning system and the ERP-system. Consistent communication of reference/documentation requirements was found to need attention. Moreover, the analysis found a close collaboration with the freight forwarder to be of great importance. Such a collaboration enables meeting the fourth criteria. The criteria involve moving the barrier for shipping goods not compliant from the offshore base back to dispatch from the vendor. Together with the barrier, a feedback loop to enhance results should be implemented, supporting accelerated learning and reduction of time wasted later in the chain.

Together, the criteria makes possible flow *at the pull of the customer*, facilitates learning and enables continuous improvement by involved stakeholders.

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1. BACKGROUND

The logistics services supporting upstream oil & gas operations are diverse and include everything from land to sea- and airfreight. In this thesis, the final stage of land transportation between suppliers and the offshore base serves as foundation for research. For the exploration and production company AkerBP, a strategic choice has come up after a merger completed at the end of Q3 2016 between BP Norge and Det Norske. Currently, land transportation is handled according to contracts engaged in prior to the merger and with respect to whether they serve former BP Norge or Det Norske assets. The contracts hold different terms for delivery, and AkerBP is currently seeking to align contracts and practices. Essentially, the core distinctions between contracts currently held regard which party holds responsibility for transportation. Choosing either solution yields implications on a wider range of aspects in the chain. The aspects include the possibility to practice flow efficiency and the ability to build successful collaborations between stakeholders in the chain.

1.1. PURPOSE

As a measure to align and optimize operations, the company is now pursuing to hold only one solution with respect to who should provide freight forwarding services and on what Incoterms. The ultimate goals for AkerBP are strong operational results, flow-efficiency, facilitation of learning incentives to support continuous improvement, and retaining cost-control. The purpose of the research is thus to provide AkerBP with critical criteria found for enabling realization of the goals. Ultimately, the thesis should thus act as a tool of support in deciding how to set up the transportation going forward.

1.2. AKERBP E&P COMPANY

Following the strategy of growth of former Det Norske Oljeselskap, the E&P company in recent years have acquired both licenses and operating companies with assets on the Norwegian Continental Shelf. As late as in 2014, the company announced it had come to terms with operator Marathon Oil, overtaking their assets as of January 1st 2014. On June 10th of 2016, Det Norske announced it was to merge with the Norwegian branch of British Petroleum, BP Norge AS. The merged company, as announced on September 30th 2016, holds the name AkerBP.

Out of five fields operated by AkerBP, four are located in the North Sea (Alvheim, Ivar Aasen, Ula and Valhall), while the fifth, Skarv, is located in the Norwegian Sea. In their annual report

of 2016, AkerBP states their ambition for the years until 2020 is to discover 250mmboe¹ net to AkerBP. With this, the aim is to act as the leading exploration player on the Norwegian Continental Shelf(AkerBP, 2017a). Development of fields where AkerBP operates as partners, namely Gina Krog and Johan Sverdrup, is ongoing. Gina Krog is expected to commence production during Q2 of 2017, while production at the giant Johan Sverdrup is expected to start late 2019.

Carrying forward the strategy from former Det Norske, the Board of Directors´ Report for 2016 states: “The merger created a company with a diversified production base, strong balance sheet and cash flow outlook, coupled with organic and inorganic growth ambitions.”. The statement thus supports the company´s vision of becoming the leading independent offshore exploration and production company. The report also states an improvement agenda to be carried out. Four focus areas are presented under the aim of reducing costs while improving efficiency to where new stand-alone projects can carry a break-even price of 35\$/boe. The focus areas as presented are (AkerBP, 2017a):

1. Reorganization of the value chain with strategic partnerships and alliances to remove waste and increase productivity
2. Digitalization of the Exploration & Production (E&P) business model
3. Changing the management systems and culture to build on “Lean” by prioritizing flow efficiency over resource efficiency, and
4. Bring these together inside one organisation and one business model that balances volatility and flexibility to sustain growth.

1.2.1 LEAN

Upon the announcement of the merger of Det Norske and BP Norge, CEO of the company to be named AkerBP, Karl Johnny Hersvik, wasted no time in declaring the company would pursue Lean principles. In an interview with the Norwegian business web site e24, Hersvik told he spends 80-90% of his time on improvements (Lorentzen, 2016).

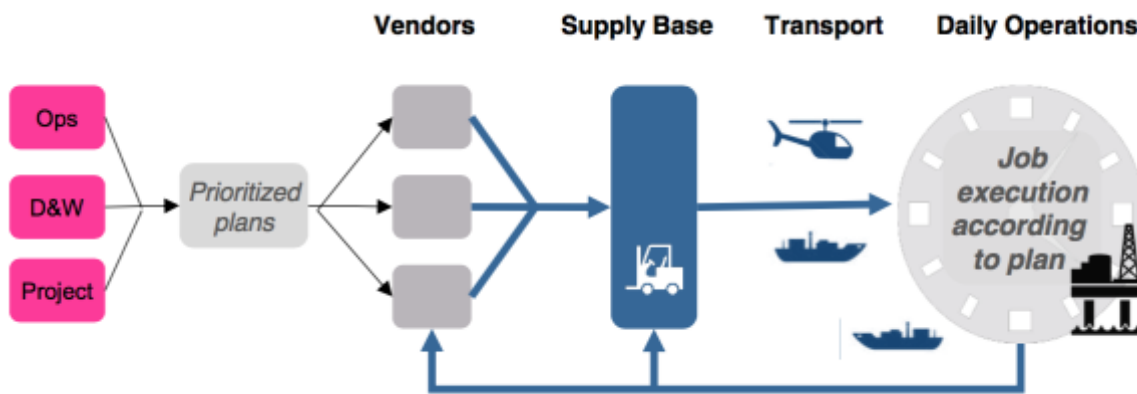
Following up the declare and as a symbolic first nudge, all AkerBP staff were given a copy of Niklas Modig´s book “This is Lean” to read, discuss and accelerate implementation. The company now increasingly works to pursue flow efficiency across all segments and business units. As an example, ongoing improvement initiatives and A3´s are open for all to see, such as on the walls of in-office meeting places. More on Lean-principles in chapter 2 on theory.

¹ Million Barrels of Oil Equivalent

1.2.2 AKERBP/REPSOL LOGISTICS CENTRE

To plan, facilitate and run the overall logistics for AkerBP operations, the company runs its own logistics center, also supporting Repsol operations. The center delivers end-to-end logistics coordination which support business units Operations and Drilling & Wells, as well as P&A operations and Well Intervention operations. Operationally, the center acts as a single-point of contact for its stakeholders. By doing so, benefits for the company is sought for through using less resources while at the same time providing increased operational flexibility and continuity on critical competence, meanwhile exploiting economies of scale (AkerBP, 2016a).

Figure 1: Reach of AkerBP/Repsol Logistics Centre's operations (AkerBP, 2016a). Displays internal information flow to the Logistics Centre and out-/inbound flow of goods to offshore installations.



The center holds 11 internal employees and also house representatives from offshore base operator Asco. As of December 2016, the logistics of 7 fields are served by the Logistics center. Additionally, the center serves 5 NUI's and 4 MODU's on the NCS, while 9 vessels and 3,9 helicopters are on contract to serve offshore needs.

1.2.3 OFFSHORE BASES

AkerBP currently feeds its operations and projects from two main offshore bases, Tananger in the south and Sandnessjøen in the north. The Tananger offshore base serves fields in the North Sea together with drilling projects carried out throughout the region. The base in Sandnessjøen serves Skarv situated in the Norwegian Sea.

Figure 2: Left and lower right: Offshore bases and operated fields – routes, distances and sailing time (AkerBP, 2017b) Colors on sailing routes indicate designated PSV and standby-vessels. Upper right: Asco Tananger base. (Asco, 2017)



Former Det Norske used base operator NorSea in Tananger up until the merger. From the merger on, former BP Norge's provider of base services, Asco, now serves all of AkerBP's offshore base needs. The base handles reception of goods, provide temporary storage, together with handling and cross-docking of goods going to offshore installations. Also, Asco handles customs clearance and maintain a customs warehouse for non-Norwegian goods. Finally, the base handles on- and offloading of PSV's going to and from installations offshore together with backload of goods from off- to onshore as well as reception of waste from production and drilling. The offshore base thus holds a key role in the logistics, supporting AkerBP's operations run according to plan.

1.2.4 SAP/WORKMATE/WELS

AkerBP currently uses two ERP-systems and a separate planning, control- and support system used in logistics, namely Wels. The two ERP-systems SAP and Workmate are maintained from the two previous companies. To build a common platform for the future, a project is currently running to build a new ERP-system with SAP. With this follows opportunities to implement new features, amongst some will be proposed in the analysis. Opportunities and challenges of the systems will be a subject both through the data collection and in the analysis presented in chapter 4.

1.3. DEMARCATIONS AND LIMITATIONS

In focusing the thesis and as a measure to ensure legitimate results for AkerBP, the research covers the part of the supply chain involved in transportation between suppliers and the offshore base at Tananger. This implicitly means limiting the scope which could also have included northbound transportation. With time, and due to already initiated projects, AkerBP will have an increasing need for transportation going north in the future. Though the research conducted in this thesis does not discuss these considerations explicitly, the proposed solution for transport should also hold scalable qualities bearing the future increased demand in mind.

Another measure taken to focus the thesis is leave out considerations regarding customs clearance and customs warehouses. The main considerations involve whether to clear goods from abroad through customs or to hold these non-Norwegian goods on Tollpasses and in customs warehouses until redelivery abroad. The merged companies have pursued different strategies and practices between them, and there are currently processes undertaken to align these according to which is found best. With regards to the main purpose of this thesis and with processes already running internally at AkerBP, the considerations are not discussed here.

With the Incoterms presented in the chapter 1.4 follows a requirement to one of the parties to hold insurance for the goods transported. An important note here is that the requirements to the insurance policy as following from Incoterms may not be sufficient for coverage of the goods transported. The requirements typically specify the policy to cover a minimum sum insured, calculated according to size and weight of the cargo. This sum insured may not always be representative of the actually cargo value. As of October 2016, AkerBP holds a Cargo Insurance Policy covering all cargo in storage or transit, worldwide, with a sum insured of up till 3,2 billion NOK (Berkley, 2016). This effectively minimizes economical risk of the transportation

with regards to explicit claims in case of accidents. Consequently, considerations regarding insurance are not discussed explicitly.

1.4. INCOTERMS

When transporting goods from supplier warehouses and facilities to supply bases, several considerations come into play. The critical contractual considerations are general for all types of trade transactions and regard risk, insurance and costs. Formalized as Incoterms, the different terms determine where the holding of risk, insurance and cost are handed from the supplier to the acquirer. The choice of Incoterms for a specific shipment thus have direct implications for both parties and their responsibilities. Further implications for parties may include potential impact on control of shipment as well as transparency on deliveries for involved stakeholders. In addition, pricing and cost-control of transportation services may be affected by the choice of Incoterms.

From the latest revision of the terms, Incoterms 2010, the first 7 terms are for any mode or modes of transportation. The last 4 terms are for sea and inland waterway transport. For the task at hand, focus will be set on the first 7 as the scope discussed will consider transport by land only. Following is a short description of each of the 7 Incoterm's, as described by the International Chamber of Commerce (Commerce, 2010).

EXW

Utilizing Ex Works implies the seller delivers when it places the goods at the disposal for the buyer at the seller's premises or at another named place (i.e. works, factory, warehouse, etc.). The seller does not need to load the goods on any collecting vehicle, nor does it need to clear the goods for export, where such clearance is applicable.

FCA - FREE CARRIER

According to the term Free Carrier the seller delivers the goods to the carrier named by the buyer at the seller's premises or another named place. Recognized delivery is said to have found place when the goods are loaded on buyer's chosen means of transportation. Export papers should be prepared by the seller in cases where transportation is destined to cross borders.

CPT - CARRIAGE PAID TO

The terms Carriage Paid To holds that the seller delivers the goods to the carrier or another person nominated by the seller at an agreed place (if any such place is agreed between parties). Also, the seller must contract for and pay the costs of carriage necessary to bring the goods to the named place of destination.

CIP - CARRIAGE AND INSURANCE PAID TO

In addition to the conditions of CPT, using CIP means the seller also contracts for insurance cover against the buyer's risk of loss of damage to the goods during the carriage.

DAT - DELIVERED AT TERMINAL

The term Delivered at Terminal implies that the seller delivers when the goods, once unloaded from the arriving means of transport, are placed at the disposal of the buyer at the named port or place of destination. "Terminal" includes a place, whether covered or not, such as a quay, warehouse, container, yard or road, rail, or air cargo terminal. The seller bears all risks involved in bringing the goods to an unloading them at the terminal at the named port or place of destination.

DAP - DELIVERED AT PLACE

DAP state that the seller delivers when the goods are placed at the disposal of the buyer on the arriving means of transport ready for unloading at the named place of destination. The seller bears risks involved in bringing the goods to the named place.

DDP - DELIVERED DUTY PAID

According to DDP, the seller is said to deliver when the goods are placed at the disposal of the buyer, cleared for import on the arriving means of transport ready for unloading at the named place of destination. The seller bears all costs and risks involved in bringing the goods to the place of destination. The seller has an obligation to clear the goods for export as well as for import. Also, the seller pays any duty for both export and import and to carry out all customs formalities.

1.5. CURRENT TRANSPORTATION TO AKERBP OPERATIONS

As stated in the introduction to the background, the two merged companies solve transportation needs between supplier and offshore-base in each their ways. As a basis for the research, the following presents their respective solutions.

Former BP Norge use DAP/DDP as the preferred Incoterm for shipments going to base. Arguments held for using DAP/DDP are simplicity as the acquirer needs not handle risk, insurance and does not meet cost of the goods until the shipment is taken delivery of at base. A pro of using DAP can be control over import/export clearance, together with control of documentation of the customs process being retained. This as opposed to DDP, where the supplier's freight forwarder also handles customs and following documentation at delivery. Utilizing DAP/DDP thus implies less handling for the acquirer as goods are delivered at place, but cost implications are not as clear. As transport and insurance is procured by the supplier, the cost will in turn be reimbursable towards the receiving company. The receiving company thus has no leverage on what prices the supplier attains on the transportation. With DAP/DDP the receiving company also gives up control of the shipment, thus leaving operational risk in the hands of the supplier. This risk that has to be defined and controlled by contract. Asco freight management handles 3rd party transportation and freight services for former BP Norge, in cases where the incoterms FCA/Exworks is used. Also, Asco handles customs clearance for goods imported to Norway on DAP-terms and clearance of goods to/from offshore.

Former Det Norske have since August 2015 used freight forwarder Bring for handling transportation from their suppliers, holding FCA as their preferred incoterm. Also, Bring handles all customs clearance for shipments procured to former Det Norske operations. Given an adequate setup and a good collaboration, advantages of utilizing FCA with one supplier of transportation are good control of shipments, information sharing and possibilities of involving the forwarder in improvement-initiatives. Success using FCA requires a collaboration between parties and aligned incentives, together with systems and procedures to support operational success. In addition, making sure the whole company uses the main agreement when shipping goods is also addressed as an issue. Data gathered suggests parts of the former Det Norske organization still uses a competing freight forwarder for certain shipments, bearing implications discussed in chapter 4.3.

1.6. CAUSE AND EFFECT OF SET-UP

Different business units run operations with different time-span, lead-time on parts, risks, spend, and consequences of idle-time. To the author's knowledge there is currently no rich documentation highlighting these differences explicitly with regards to who are responsible for transportation, be that buyer or the seller. Through interviews with AkerBP users of freight, the research will seek to highlight effects of leaving transportation responsibility with one or the other party. By interviewing external stakeholders on the same matters, the hypothesis is to discover causes for the observed effects. Bottlenecks and sources to deviations from the standard operating procedure are especially interesting with the objective of recommending a beneficial solution to transportation and standard operating procedure.

1.7. PROBLEM STATEMENT

Fundamentally, the basis for the problem statement of this thesis builds on whether AkerBP should hold a stand-alone commercial agreement with a freight forwarder, or whether to leave the responsibility with the vendors. Also, Incoterms and the implications carried with the choice of one will need attention. The recommended solution will carry several implications for the flow of goods and information. Furthermore, the solution should support the purpose of the goals of AkerBP as presented in chapter 1.1. Through the findings in the analysis, the objective is to recommend a solution bearing these considerations in mind. Thus, the problem statement comes down to: In optimizing flow, minimizing waste and facilitating continuous improvement, what are critical criteria for AkerBP in choosing between alternative solutions on land transportation?

2. THEORY

The following will present theory and concepts within them that will be used as basis in analyzing research results. Finally, the theory will provide guidance in establishing criteria for how to set up transportation within the scope.

2.1. LEAN

Through their books *The machine that changed the world* and *Lean Thinking*, James P. Womack and Daniel T. Jones introduced the core ideas of Lean manufacturing to the western world. The ideas have long since been spread and embraced throughout the world of business,

as is now the case with AkerBP. A number of the ideas are central for the purpose of this thesis, and will be addressed in the following.

2.1.1 BANISHING WASTE (MUDA)

Identifying and banishing waste to produce more with less and with higher quality is a sound starting point for understanding the idea of Lean. Initially, 7 types of wastes were identified as critical to assess for a manufacturing firm, here as summarized by Hines, Found, Grittiths, and Harrison (2008):

1. Overproduction
Producing too much or too soon, resulting in poor flow of information or goods and excess inventory.
2. Defects
Frequent errors in paperwork, product quality problems, or poorly delivered performance.
3. Unnecessary inventory
Excessive storage and delay of information or products, resulting in excessive cost and poor customer service.
4. Inappropriate processing
Going about work processes using the wrong set of tools, procedures or systems, often when a simpler approach may be more effective.
5. Excessive transportation
Excessive movement of people, information or goods resulting in wasted time, effort, and cost.
6. Waiting
Long periods of inactivity for people information or goods, resulting in poor flow and long lead times.
7. Unnecessary motion
Poor workplace organization, resulting in poor ergonomics, e.g. excessive bending or stretching and frequently lost items.

Within the chain of land transportation between vendors and the offshore base, waste can potentially take the form of all the seven different types. In addition to involving the physical transporting of goods, the activities involve AkerBP staff, vendors' staff, freight forwarders and offshore base staff. Also, their means of communicating with each other throughout the chain is central for the stakeholders in cooperating and in documenting their work. Consequently, wastes such as defects, inappropriate processing, excessive transportation and waiting are all likely wastes. *“Fortunately, there is a powerful antidote to muda: lean thinking” (Womack & Jones, 1996)*

2.1.2 THE FIVE KEY PRINCIPLES OF LEAN

As presented by Womack & Jones (1996), *Lean Thinking* distills the essence of the Lean approach into five key principles. The book showed how the concepts can be extended beyond automotive production to any company or organization, in any sector, in any country (Hines et al., 2008).

Figure 3: Five principles of Lean (Hines et al., 2008). Visualizes the process and virtuous circle of following lean principles.

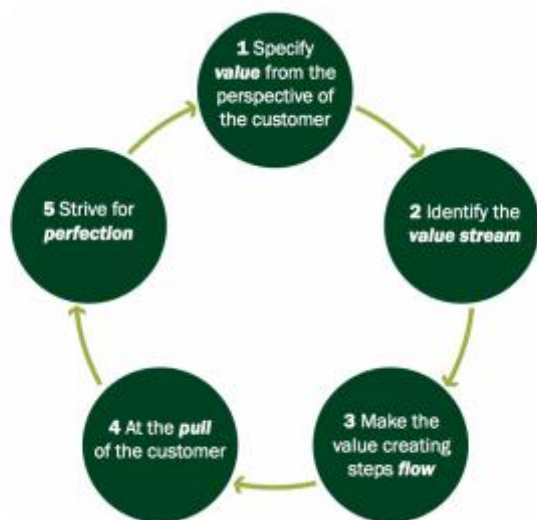


Figure 3 displays the five concepts of Lean in the form of a virtuous circle, and captures the essence of lean thinking as a never ending process to reduce waste within a business' process. The mission of the process is to deliver ever better results to the benefit of the customer as well as the extended supply chain.

These five principles are fundamental to the elimination of waste (Hines et al., 2008), and will work as a basis in the research and analysis following in chapter 4. According to the five principles, value should be specified as from the perspective of the customer. Value is essential here, as specifying what adds value to the customer is equally important as specifying what does not. Also, the customer is in focus, not individual firms, functions and departments (Hines et al., 2008). After having defined what adds value to the customer, the value stream leading up to delivery should be identified, in order to highlight non-value-adding waste. Womack and Jones (1996) hold that value stream analysis almost always will show that three types of actions are occurring along the value stream; (1) Those unambiguously adding value, (2) Those

creating no value but who are unavoidable, and finally (3) Those who create no value and are immediately avoidable.

Once the value stream is identified and the non-value-adding steps are eliminated, the next step is to make the remaining value creating steps flow. Flow describes the desired state of operations where there are no interruptions, detours, backflows, waiting or scrap (Hines et al., 2008), and where the efficiency sought for is flow efficiency rather than resource efficiency. The distinction between the two is important to understand. Resource efficiency seeks maximizing time used (of available time) by each resource in processing units, thus measuring the efficiency of each resource used in the process. Flow efficiency on the other hand, seeks maximizing the share of value-adding time used during throughput² time. Described by Modig (2015), flow efficiency enables a dramatic reduction in throughput time for each delivery meanwhile freeing capacity. For many firms, it incorporates a need to redefine the work of functions, departments and firms so they can make a positive contribution to value creation and to speak to the real needs of employees at every point along the stream so it is actually in their interest to make the value flow (Womack & Jones, 1996). Once flow efficiency is facilitated, the chain is fully ready to deliver on demand from the customer. By letting the customer pull the delivery through, a higher degree of customization and responsiveness to customer demand is possible. Allowing for this supports the initial purpose of delivering the highest possible value. This will be relevant for AkerBP's transportation chain, as requisitions from offshore installations or stock represents the pull from the customer.

Once the previous steps are incorporated, continually removing successive layers of waste as they are uncovered should be the standard of the company and its processes. Thus, continuous improvements to seek perfection is facilitated.

² Se Appendix B for definition

2.2. BOTTLENECKS

Uncovering bottlenecks to identify potential sources of waste will play an important role in the research following. In risk of taking for granted the reader's perception of a bottleneck within a particular system of interest, a definition proposed by Beer (2015) is offered to serve the purpose of a common perception:

“The bottleneck of a system is the element (node or edge) that limits the system in attaining higher throughput beyond a certain threshold. This threshold is determined by the bottleneck's physical throughput capacity, organizational rules, or operational practices.”

Beer (2015) follows up the definition by classifying different types of bottlenecks, where one way they can be categorized is by origin; organizational, physical and operational bottlenecks. Organizational bottlenecks refer to situations where the root cause of constrained throughput can be found in processes, organizational directives, or established procedures. The bottlenecks refer to “how things are planned”. Examples in a factory setting are maintenance processes that require significant downtime of a machine, large buffers, order release rules that increase WIP³, and ineffective quality assurance processes leading to delays or low yield. Physical bottlenecks refer to the physical capability of a resource, or limitations due to the general physical setup of production facilities. The bottleneck thus refers to “what can be done” given physical preconditions. Operational bottlenecks refer to how machinery, tools or other assets are handled. Examples are lack of care exercised by the operator resulting in reduced lifetime of assets or unnecessary rework, performing work deviant from procedures or damage caused on finished goods during transportation (Beer, 2015).

2.3. SUPPLY CHAIN COLLABORATION

Studies suggest companies in a supply chain can greatly benefit from collaboration. This holds for both internal collaboration across departments in the company, but likewise with up- and downstream suppliers and customers. In choosing whether to hold a commercial agreement with a freight forwarder or to leave the responsibility of transportation with the supplier, theory might yield indications for actions of AkerBP.

³ Work In Progress

In a study on supply chain collaboration, Cao and Zhang (2010) identified seven common interconnecting dimensions between collaborations proven effective.

The seven are;

- information sharing
- goal congruence
- decision synchronization
- incentive alignment
- resource sharing
- collaborative communication
- joint knowledge creation.

Together, the study suggests, the dimensions can explain bottom-line influence on performance and that taking advantage of collaboration as a means can enable partners to “achieve synergies and create superior performance”. In a paper written by Vanpoucke, Vereecke, Pandelaere, and Solis , the findings are supported and characteristics for successful collaborations are presented. Among the findings found most interesting for this research are trust and commitment, communication behavior, the application of systems and having the right culture.

3. METHODOLOGY

As the problem statement was defined in chapter 1.7., the research design and method can be stated. The problem statement thus acts directional in regards to what persons or situations can be studied, what methods can be utilized and how the analysis is to be conducted (Thagaard, 2009). This chapter will present research design, methods and validation of the methods, before the research process and analysis follow in chapter 4.

3.1. RESEARCH DESIGN

According to (Churchill, 1995), research design is the framework or plan for a study, used as a guide to collect and analyze data. It is the blueprint that followed to complete a study. The research carried out in this study will first and foremost be based on primary data collected through interviews, and seek to build a rationale to guide AkerBP in their decision met. The research design most fitting when describing the framework for this study then is qualitative

research, described as “open, flexible, and well suited when developing new knowledge and deeper understanding is the goal” (Jacobsen, 2013).

With the aim of the study set to hold decision-making support, the research will thus hold normative qualities rather than descriptive. Normative research differs from descriptive studies because the target is not only to gather facts but also to point out in which respects the object of the study can be improved (Routio, 2007).

To be able to not merely gather relevant facts, but also develop insight to the tasks and procedures and to get familiar with the stakeholders involved, the author will be sitting with the Logistics Center at AkerBP throughout the research. This kind of approach to research differs from ethnographic case studies where the scope is limited to observation, and directs the approach towards action research. According to (Checkland, 1993), the core idea of action research is that the researcher does not remain an observer outside the subject of investigation. Instead, Checkland suggests, he/she should actively participate in the project, often a change in an organization. This way action research works as process- and problem solution approach. The approach also serves the expected nature of the findings of the research, which will not necessarily be of a sort that can be generalized without adjustments to other companies or organizations. McCutcheon and Jung define action research by stating that (Action Research is) systematic inquiry that is collective, collaborative, self-reflective, critical, and undertaken by the participants of the inquiry. The goals of such research are the understanding of practice and the articulation of a rationale or philosophy of practice in order to improve practice (Herr & Anderson, 2015). Others will define action research differently according to their field of study and expertise, and the term can be defined as a cover term for several approaches that has emerged from different traditions. (Herr & Anderson, 2015).

3.1.1 SYSTEMS THINKING

Checkland and Senge (1990) hold that Action Research is intimately connected to systems thinking, which embodies a world-view implying that the foundation for understanding lies in interpreting interrelationships within systems (Näslund, 2002). For the purpose of the research presented in this thesis, the approach facilitates the needed understanding by discovering and analyzing the interrelationships between stakeholders in the logistics chain. The methods stated in the following will further help depict the interrelations and work as a foundation for the

analysis. In this perspective of systems thinking, Action Research is a method for tackling real-world, managerial and organizational problems (Näslund, 2002)

3.2. RESEARCH METHOD

According to (Spjelkavik, 1999),

“action research is a method that can be fruitfully combined with other methods (questionnaires, interviews, observations, whatever)...”.

For the basis of the research carried out in this thesis, primary data will be collected through interviews of stakeholders within the chain. The process of data gathering is described in chapter 4.1. Data obtained will then be used and analyzed in the two processes described in the following.

To describe the as-is state of the operations within the chain, a flow mapping will be performed and presented. The mapping will make use of primary and secondary data, and includes activities, functions and processes within the chain. It further involves identifying internal and external stakeholders, and what their functions carry responsibility for. Chapter 4.2.1 will address the process, while chapter 4.3.1 will present results of each flow mapped.

Subsequently, primary data will be collated, grouped and categorized to serve as a starting point for building an Ishikawa diagram. The diagram has its name from inventor Kaoru Ishikawa, a Japanese organizational theorist. This diagram is used in process improvement methods to identify all of the contributing root causes likely to be causing a problem (Moresteam.com, 2017). For the purpose here, the diagram will be used to identify root causes to observed issues within the chain. The findings presented will subsequently serve as basis for developing theory to the measures AkerBP should incorporate. The process is described in chapter 4.2.2, while results will be presented in chapter 4.3.2.

3.3. LEGITIMACY

When developing hypothesis and theories within academic writing, validity and legitimacy of the methods and data has to be accounted for. The validation of the measuring instrument is done to evaluate if it is actually measuring what it intends to measure (Frankfort-Nachmias & Nachmias, 2008). For the case of validating the interview guides, the guide was built up through

a process of triangulation. Questions were presented and asked to be critiqued by both the supervisor at UiS as well as by staff and managers at the Logistics Center. The process helped form the interview guide to hold the desired validity.

According to McNiff and Whitehead (2011) the legitimacy rests on the degree to which the research is recognized by the community of practitioners and researchers. In the case of the research conducted through this thesis, legitimacy will be proven through what degree the thesis is perceived as valuable by AkerBP. Finally, legitimacy will be proven if it will be used as a tool of support in deciding how to set up the transportation going forward.

4. ANALYSIS

The chapter will firstly derive the work of data gathering, before chapter 4.2 presents the analysis process. Chapter 4.3 review results, before criteria found for supporting AkerBP's goals are presented.

4.1. QUALITATIVE DATA GATHERING

The data collected was first and foremost qualitative, simply defined as “data in the form of words, sentences and expressions” (Jacobsen, 2013). The approach of Action Research made contact with both internal and external stakeholders possible. To collect the primary data, interviews with key stakeholders were performed.

When making use of interviews in research, ethical and quality-related risks and considerations must be addressed and highlighted. Among these can be:

- Privacy and confidentiality issues
- Premature inferences based on limited data
- Unintentional ignorance of evidence not supportive of the conclusion

To limit these risks, individual respondents are mainly not referred to in the analysis, though in some parts identification by their role in the chain is natural. In cases where a respondent is quoted, he/she was given the opportunity to review and confirm the quote before making use of it. The analysis was conducted after all of the interviews were completed and transcribed, so to not leap into conclusions. This also enabled an objective perspective of the analysis of the data. Ideas and notes were taken throughout the process of the interviews to support and give

perspectives for the analysis to come, though without concluding prematurely. No hypothesis was established before initiating the interviews and analysis, so as to avoid connection to potentially biased research questions. Refraining from such a pre-set hypothesis also supports theoretical flexibility in the analysis.

Special attention was made to the construction of the interviews. The questions covered both broad and specific perspectives and without directing respondents' answers to hold certain opinions. All interviews were done face-to-face and should be categorized as personal. Frankfort-Nachmias and Nachmias (2008) explains this form as “..conducted on people that are or have been involved in the situation you want to study”

In preparing interviews for academic purposes such as the one here, several considerations had to be dealt with. For one, a structure had to be chosen bearing the aim of the interviews in mind. Here, grasping the full insight and opinions of the respondents were key. The structure found as most appropriate was the semi-structured interview. The structure includes that questions are usually asked in a particular order, but that the interview may also present the respondent with open-ended questions that allow for follow-up questions where natural. With this, the respondent is invited to elaborate when answering particular questions to create depth where necessary.

4.1.1 INTERVIEW GUIDE

As emphasized in chapter 4.1, care was taken in constructing the questions so as to not lead the respondents answers in support of a certain pre-determined view or solution. Rather, questions were written with the aim of grasping respondent's experience and true opinion. With these considerations in place, the questions were written to bear relevance for each of the three groups interviewed. As established in chapter 1.5, unravelling cause and effect relationships for the analysis was also an aim, and questions were therefore written specifically for each group. The following presents the interview guide for internal respondents as well as that for freight forwarders and vendors.

Interview guide – Internal respondents:

1. *What Incoterms are you most familiar working with – DAP/DDP or FCA/EXW?*
2. *Given the current transportation set-up, does the supply chain handle varying volume in a purposeful way?*
3. *How often do experience deviations on volume in deliveries?*

4. *Do these deviations cause delays on following operations (reloading, packing and unloading to PSV)?*
5. *Given the current transportation set-up, does the supply chain handle changes on delivery time/date in a purposeful way?*
6. *How often do experience deviations due to changed delivery time/date?*
7. *Do these deviations cause delays at the base/offshore installation or unnecessary storage?*
8. *In your experience, what are main challenges when it comes to labelling of shipments?*
9. *If you were to improve something with today's set-up – what would it be?*
10. *What are the main the challenges within cost-control?*
11. *Have you experienced delayed offshore shipments due to deviations on delivery to base?*
12. *In principle, do think AkerBP vendors should facilitate and hold responsibility for transportation to the base, or should AkerBP provide this service with their own transportation vendor?*
13. *What do you see as potential consequences for other stakeholders in the chain by choosing this set-up?*
14. *If you were to establish what is now currently in transit between vendor and base – would you easily be able to find this?*

Interview guide – freight forwarders:

1. *As a carrier for AkerBP as recipient, what Incoterms are you mostly working on – DAP/DDP or FCA/EXW?*
2. *From your viewpoint, do you have sufficient capacity to handle varying volume in a purposeful way?*
3. *How often do you experience deviations due delayed preparation of shipments at pick-up?*
4. *What are the main causes for deviations on your deliveries?*
5. *From your viewpoint, does the current solution handle varying delivery-times/date in a purposeful way?*
6. *How often do you experience deviations due to changes in delivery-time/date?*
7. *What are main causes to these deviations?*
8. *In your experience, what are main challenges on labelling and tracking of shipments?*
9. *What bottlenecks do you experience with the current solution?*
10. *What added value do mean your company can provide AkerBP operationally?*
11. *What information can AkerBP provide to support your work?*

Interview guide – vendors:

1. *Towards AkerBP as a customer, what incoterms are you mostly using?*
 - *DAP/DDP or EXw/FCA?*
2. *In principle, do you prefer to hold responsibility for the freight on your hand or to use a forwarder accommodated by the customer?*
3. *Why?*
4. *What measures have you implemented to tackle varying volume of goods procured by AkerBP?*
5. *What measures have you implemented to tackle varying delivery-terms on goods procured by AkerBP?*
6. *What do you see as main challenges regarding labelling when shipping to AkerBP?*
7. *What do you see as main causes to deviations on your shipments?*
8. *In your experience, does the communication between you, AkerBP and the freight forwarder support correct delivery at planned time?*
9. *If no – what could be done differently?*
10. *What measures from AkerBP and freight forwarder could support increased predictability for you?*

4.1.2 SAMPLE SELECTION AND INTERVIEWS

A screening of respondents was subsequently done, targeting users of transportation within the chain. Support and input in the process was given from employees at the Logistics Centre, the Supply Chain department and with help of suppliers Relation Managers at AkerBP.

Initially and very broadly, the population to which the relevant sample of respondents were chosen from consists of both internal and external stakeholders. Two internal business units at AkerBP were identified as carrying the bulk of the volume in the chain, namely Drilling & Wells and Operation. The two categories have the same basic needs in feeding their offshore operations with required material and equipment. Even so, they hold different responsibilities between them, as Drilling & Wells prepare and facilitate the production of oil & gas, while Operation carries out the production. Due to the differences inherent in their operations, different requirements and considerations come into play. These differences include criticality of shipments, alternative-costs and operational trade-offs. Also, differences include a distinction considering the desired characteristics of flow of goods within the chain in question. An elaboration on these distinctions follow in chapter 4.2. It was quickly established that the sample had to include respondents involved in shipments for both categories, so to reflect their

inherent differences. Following this distinction, the functions found as most critical to address within two categories were then:

- Procurement
- Logistic coordinators

Further, stakeholders within material coordination and material management were found to be important respondents. The respondents carry long operational experience and involvement within the scope together with extensive knowledge regarding the processes in question.

Table 1- Internal Respondents

Department	Title
SCM – Operational Procurement	Senior Purchaser - Operations
SCM – Operational Procurement	Senior Purchaser – Drilling & Wells
Logistics	Logistics Coordinator – Operations/Projects
Logistics	Logistics Coordinator – Drilling & Wells
Logistics	Onshore Material Coordinator – ULA
SCM – Material Management	Supervisor
SCM – Material Management	Inventory Controller

In identifying relevant suppliers to interview, a screening of goods received at the offshore bases was initially conducted. Goods received documents from BP’s ERP-system Workmate for Q1 and Q2 2016 facilitated the screening, but in the end did not yield the overview targeted. Due to varying levels of activity throughout each year, especially within D&W, it was found that additional input was needed to determine what suppliers to approach. As a tactical decision to yield consistent feedback on the issues studied, key suppliers delivering tailored and/or critical material and tools were found as most valuable to approach. This implicitly involved a delimitation of suppliers to collect data from, suppliers who in other aspects are key for AkerBP. For example, the delimitation excludes some suppliers delivering a high number of more standardized goods to AkerBP. The deliveries are thus not considered as critical or representing high alternative costs in case of delay or deviations. In identifying those most relevant, category managers within the Supply Chain Management department for both categories D&W and Operations were consulted.

The screening resulted in the identification of 5 suppliers to target:

- Archer
- Schlumberger
- Baker Hughes
- Score AS
- Aker Solutions

Within each firm one representative was interviewed, except for the case of Aker Solutions who offered two representatives present in the same interview. The suppliers deliver a broad range of goods and services to AkerBP. This includes drilling services, well construction and intervention, maintenance and modification on- and offshore. Also, the vendors provide the tools and material required for maintaining operations. The five suppliers operate with different transportation solutions today, making their experiences valuable input for the analysis. Other suppliers were considered as equally relevant in terms of their business, but found to have very similar characteristics. Emphasis was thus held to whether each respondent added more value for the purpose of this study.

Table 2 – Suppliers interviewed

Company	Title
Archer	Purchaser and Controller – AkerBP operations
Aker Solutions	2 respondents: 1: Manager, Logistics HSEQ/Quality 2: Purchaser Lead, Alvheim and Exxon
Score A/S	Operational Planner & Supply Chain Manager
Schlumberger	Senior Logistics Specialist
Baker Hughes	Logistics & Compliance Manager – Norway

The third group of stakeholders to be interviewed were the freight forwarders. To support the purpose of this thesis and for the respondents to carry insight and experience on the current operations, two companies found as most relevant:

- Bring
- Asco Freight Management

Table 3- Freight Forwarders interviewed

Company	Title
Bring	Branch Manager – International & offshore Stavanger
Asco Freight Management	Manager Freight Department, Asco Norge

Contact with the different respondents was subsequently made. After having established the initial contact and appointments had been made for interviews, all the respondents were sent a background note. The note was written separately for each of the three groups respondent's. This to ensure all had the right information and knowledge of the research before being interviewed. See appendix C and D for background notes.

Interviews were then conducted. With the internal respondents, interviews were held at AkerBP's offices. Interviews with external respondents were held at the respective respondent's office. To achieve the form of the semi-structured interview described in chapter 4.1, all respondents were asked permission to record the interview on tape. The recording was done to not obstruct the flow of the interviews by note-taking. All but one accepted recording, supporting the intent of being able to ask informed follow-up questions. After having completed each interview, transcriptions of both prepared and follow-up questions were written.

4.2. DATA ANALYSIS

The following presents the process of analysis involved in mapping the flows and in establishing cause and effect within the chain.

4.2.1 FLOW MAPPING

As described in chapter 3.2, the mapping will present current standard operating procedures and practice within the chain. The mapping was carried out by the use of data collected from interviews, together with data gathered on field trips and from resources in AkerBP. The approach of Action Research enabled participation in internal meetings as well as meetings with external stakeholders held during the research period. Field trips to both the offshore base operator Asco and freight forwarder Bring were made to observe the operations first hand. Insight to operations and systems were given and to build knowledge of the process as a whole. Data was also collected through access to correspondence between AkerBP/external stakeholders regarding issues within the scope of the research. Reports on delivery KPI, goods received and holding-data (elaborated in chapter 4.3) further helped build understanding. This

was done to create a holistic understanding of the chain as well as to provide comprehensive insight to the establishment of causes and effects. Even so, single functions and procedures needed attention to develop the appropriate insight. This holds for both how flows of the chain are initiated as well as how they are followed through. In order to align activities, assign them relevance and enable analysis of them, the flows within the chain were characterized and seen as:

- The flow of goods
- The flow of information
- The flow of money

Due to the complex nature and diversity of operations for both business units Drilling and Wells and Operations, the mapping was limited to what distinguishes their main volume of shipments. For D&W this includes rental-equipment, while for Operations the majority of deliveries are procured goods. D&W utilize a large share of rental equipment in carrying out their operations, as the equipment is highly specialized and the work is performed by and together with contractors. Operations have a higher demand for procured goods and deliveries as these items procured are bought to support the long-term production. With this follows that the deliveries in general are not critical to the same extent as with deliveries to D&W.

From the differences presented above, the analysis uncovered a few important distinctions regarding the two departments' flow of goods. The drilling projects time-spans are varying, though normally reasonably short, with duration of months. The projects are complex and critical work within each phase has to be met with the right timing. Due to high costs and scarcity of deck space offshore, a strict pre-defined schedule for different stages of the campaign must be held. In sum, the characteristics have direct implications on the desired flow and supply of goods from on- to offshore going to D&W operations. To maintain the targeted operational progress while keeping costs down, the flow from vendors to the offshore base is best explained as targeting the principle Just-in-Time. As presented in the context of Lean-principles, JiT essentially involves feeding production with small batches of input and erasing work in progress. The relevant connection to the flow of goods to D&W operations comes from the criteria of delivery purely as customer demand appears, known as pull.

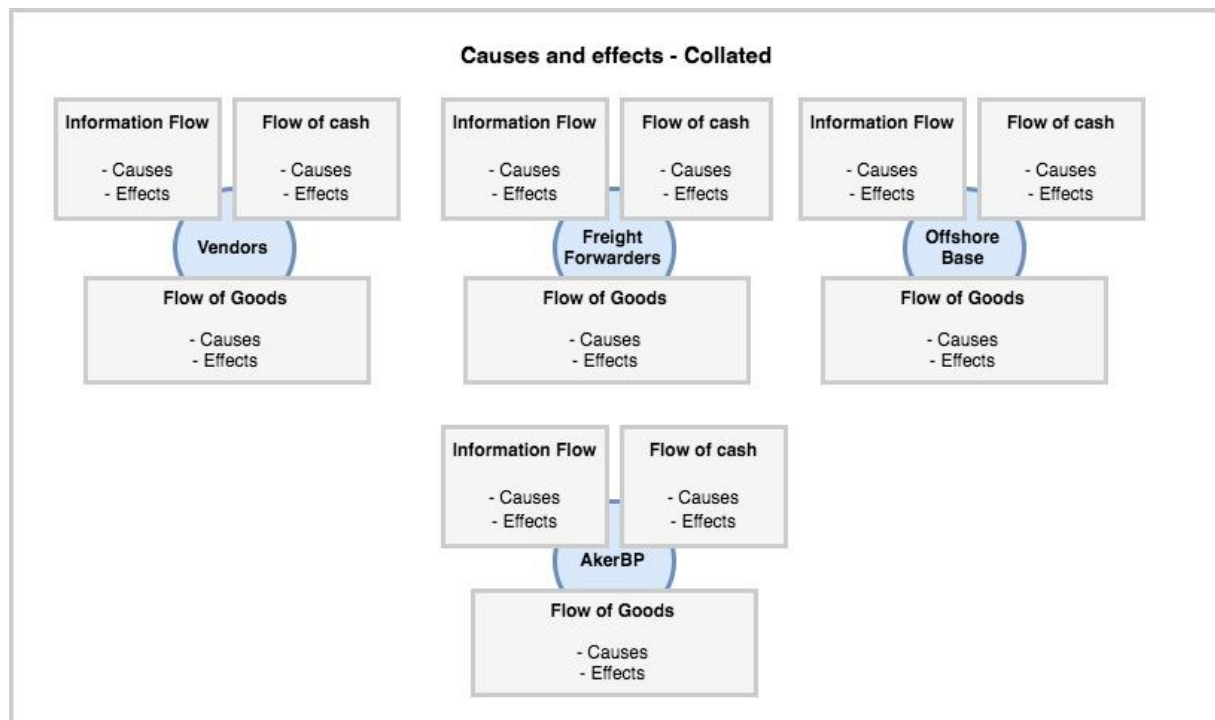
Operations, who run and control the continuous production of oil and gas, have a different set of criteria for their deliveries. Analysis found the operating procedure is set to handle all ranges

of criticality in retaining delivery of supplies. This holds for planned actions as well as maintaining buffers of required material on- and offshore. As the analysis emerged, it became evident that the distinctions between business units are strongest for the flow of goods and information. For this reason, each business unit's information flow is presented separately in chapter 4.3.1.1. and 4.3.1.2., while distinctions on goods' flow are emphasized in chapter 4.3.1.3. Distinctions of flow of cash within the chain was found to be a result of Incoterms utilized, rather than whether shipments were initiated by Operations and D&W. The distinctions will be addressed in chapter 4.3.1.4.

4.2.2 CAUSE AND EFFECT - ISHIKAWA

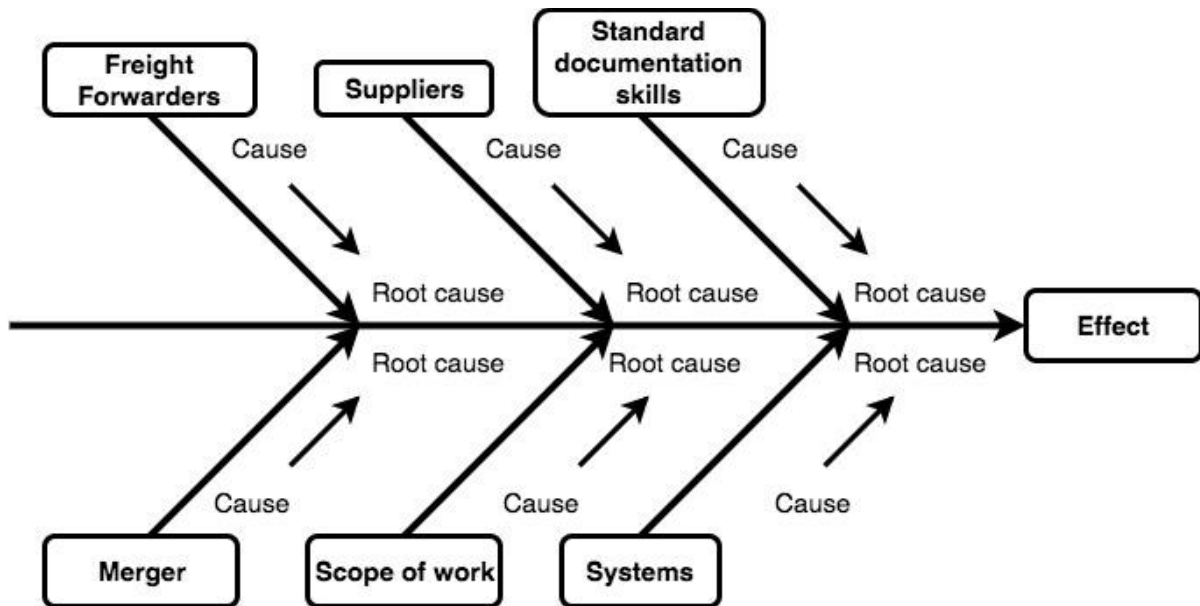
Identifying cause and effect from data collected was the next step in developing theory for what measures should be implemented by AkerBP going forward. To build understanding of challenges within the chain, data from interviews were collated in one picture reflecting the chain and its stakeholders. Initially, stakeholder responses were structured in groups. The grouping was done on the basis of whether responses addressed activities involving vendors, freight forwarders, the offshore base or AkerBP. As a next step, responses within each group were categorized according to what flow they described. This was done to sort and align responses and to enable the next step, establishing cause and effect. Within each category for each group, responses were separated, according to whether they described causes or effects. Following this method, responses could be analyzed in the correct context. Also, all responses added value for the group, category and sorting they were found to address, thus building the rationale for the bigger picture.

Figure 4: Collated image of response-grouping depicting the chain. Responses were grouped according to which stakeholder and what flow they addressed. Figure by author.



The rationale built through the collated image of response-grouping visualized in figure 4 was brought on to the Ishikawa diagram. As presented by K. Ishikawa, the diagram is one of seven basic tools used to counter issues of quality. By categorizing causes to an observed effect, the process helps visualize the issue and shows how different causes lead up to one effect. The process of building such a diagram starts by categorizing causes that all leading to an observed effect. Theory suggests several standard categories according to the field of study, while no rigorous rules apply. The chain studied here should be described as a process of service. Categories were thus chosen based on a 4S template (Edraw, 2017) used for service processes. The 4 S's are Suppliers, Systems, Surroundings, and Skills. The categories were then adapted to yield the best possible value and reflect the initial process of grouping described above. Finally, the categories utilized were: Standard documentation skills, Suppliers, Freight Forwarders, Merger, Scope of Work, and Systems.

Figure 5: Structure of Ishikawa diagram. Displays categories of causes and how causes are the basis for uncovering root causes. Effect displayed at the right end.



The next step of building the diagram was identifying root causes to each observed cause. The process of identifying root causes under each category takes on a technique from Toyota, where staff were encouraged to explore problems first-hand until the root causes were found (Ohno, 2006). By asking “Why” five times, the idea is that root causes should be identified. By identifying these, adequate measures for improvement can be put in place. The idea also supports the concept presented under chapter 2.2 of continuous improvement. In the diagram developed here, the number of why’s ranged from 2 to 5 as root causes of some categories were more apparent than others.

4.3. ANALYSIS RESULTS

This chapter presents analysis results from both the flow mapping and from the cause and effect analysis. Lastly, a model will summarize causes, findings, criteria found for success, and how they are supported by theory.

4.3.1 FLOWS MAPPED

This subsection presents the results of flow mapping as described in chapter 4.2.1.

4.3.1.1. INFORMATION FLOW WITHIN CHAIN – D&W

To facilitate Just-in-time on outbound deliveries to base, the information flow associated with D&W within the chain is initiated differently than within Operations. Firstly, supply of the tools and equipment needed to carry out the project is pre-sourced. The pre-sourced items are listed in a Master Equipment List, MEL for short. The MEL is registered in full in WELS, which vendors delivering to D&W will also have access to. As the drilling progresses according to plan and supplies are needed offshore, the Lead Drilling Engineer or the Logistics Coordinator will place a call off order with the vendor through WELS. The order will state the needed materials, what well-number it will supply, together with delivery time and date.

Upon reception of the call off, the vendor confirms the order. The vendor then places an order with the freight forwarder, be that the vendor's freight forwarder or one designated by AkerBP. Dependent on the carrier's order-system and the criticality of the shipment, AkerBP is either notified by e-mail or can view the order through the carrier's web-booking system (or both). When transportation has been confirmed, the vendor registers an arrival notice in WELS, notifying the reception at Asco offshore base of the arrival. At this time, both AkerBP, the offshore base and the carrier are aware of the status of the shipment.

The goods are then packed in a CCU⁴ or a basket prepared for lifting on-to the car carrier before being labelled. Goods are then documented according to compliance to rules and requirements set by AkerBP, before being picked up by the carrier. Upon dispatch, the goods are checked according to the waybill issued by the carrier, and the waybill is signed by the vendor. At reception on Asco Offshore Base, the goods are checked again. Given that packing, labelling and documentation of the shipment follow compliance, Asco then signs the carrier's waybill. Subsequently, a Goods-Received notice is registered in WELS by base-personnel, notifying both AkerBP and vendor that the goods are at base. The CCU/basket is then cross-docked⁵ and ready for loading on-to the PSV, with all parties informed and with documentation of the process retained.

The information flow on backload shipments for D&W follow much of the same principles as when delivered outbound from the vendor, though reversed. For cost-reasons, rental equipment

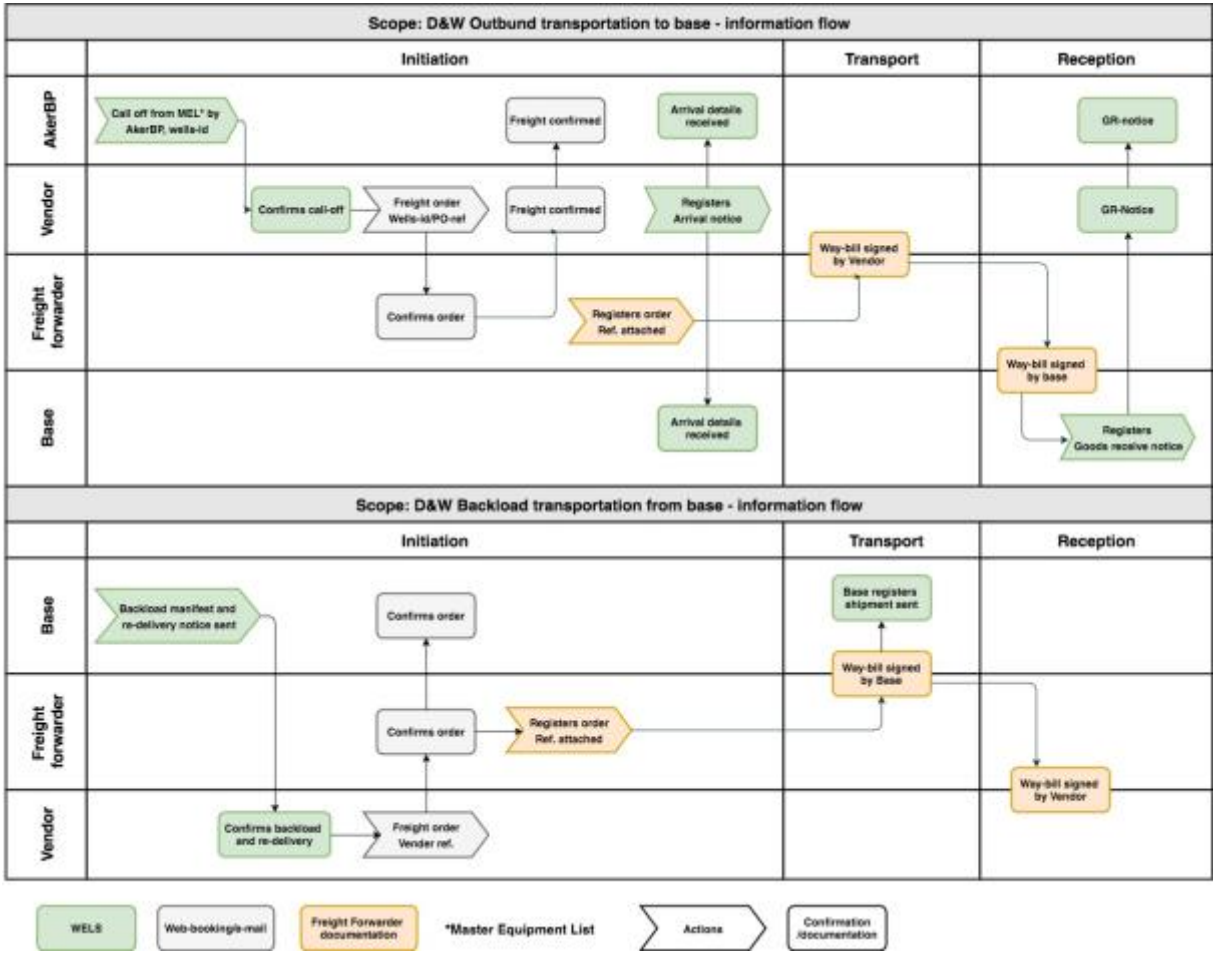
⁴ Cargo Carrying Unit

⁵ The container is unloaded from the incoming transportation vehicle and directly moved across the dock without further handling of the contents.

is essential for AkerBP to get off lease once their work is completed. From the vendors' perspective, due notice, communication and correct information is equally important.

When tools and equipment are packed and ready to go onshore, backload manifests are prepared by the offshore personnel. The manifests are then registered in Wels. At this time both Onshore AkerBP staff and the vendor are aware of the return. The manifests are then the primary source of information for Asco offshore base in handling the next step of the process, which is notifying the vendor that their equipment is ready for pick up at base. The base notifies the vendor via a re-delivery notice, stating the material that has returned and a deadline for pick up. The vendor subsequently orders transportation of the goods while also clarifying delivery details with the freight forwarder. At dispatch from base, base personnel sign the waybill brought by the carrier, while also registering the pick-up of the material in Wels. At reception and off-loading at the vendor's yard the waybill is finally signed again, by vendor personnel.

Figure 6: D&W Information within chain – made according to interviews and secondary data collected. Steps of the process are viewed horizontally, stakeholders involved vertically. Communication means are color-coded and explained at the bottom of the figure.



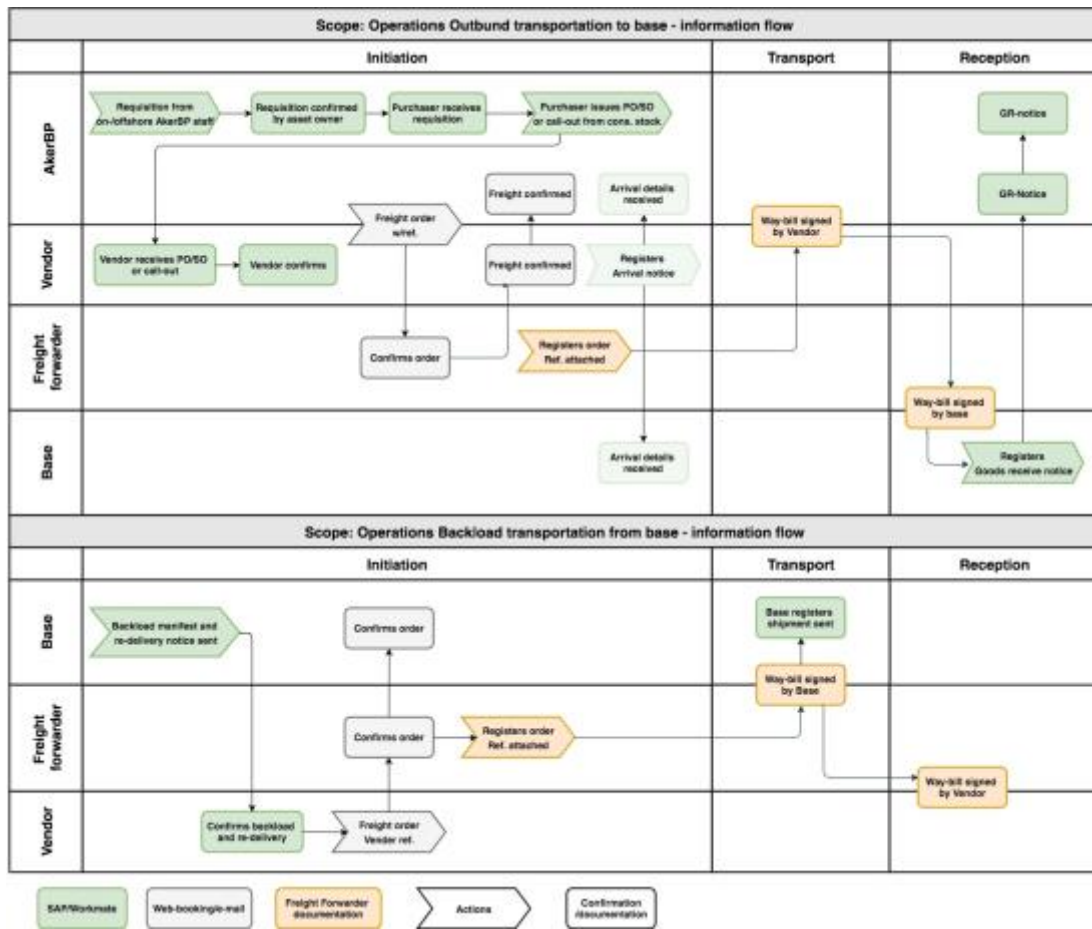
4.3.1.2. INFORMATION FLOW WITHIN SCOPE – OPERATIONS

For Operations, the vast majority of shipments sent offshore are procured goods, where tools and equipment are procured as demand occurs or stock levels indicate re-order. This holds for stock-level both on- and offshore. Critical material will be procured by AkerBP in due time and are stored either in consignment stock with the vendor, at the Asco offshore base or offshore. Also, deliveries to Operations include tools and equipment ready to go offshore after service or repair. To provide the reader with a holistic insight of the information flow involved with a single delivery to Operations, a list of the iterative steps and a flow chart is presented below.

Outbound deliveries to the offshore base:

1. A requisition is issued in SAP or Workmate by on- or offshore staff reflecting demand for an item offshore.
2. Requisition is confirmed by the asset-owner.
3. Purchaser receives the requisition.
4. Purchaser issues PO/SO to the vendor via the ERP-system or registers call-off from consignment stock.
5. Vendor confirms the PO/SO.
6. Purchaser or vendor orders freight via web-booking/e-mail (dependent on Incoterms and agreement between vendor/purchaser).
7. Freight forwarder confirms order.
8. Vendor registers arrival notice in Wels (if given access to Wels and full information on destination and sailing date).
9. In case of arrival note, base and AkerBP are informed of estimated time of arrival.
10. Vendor signs carrier's waybill at pick-up.
11. Base signs carrier's waybill at reception.
12. Base registers Goods-received note in Wels/SAP/Workmate.

Figure 7: Operations' Information flow within the chain– made according to interviews and secondary data collected. Steps of the process are viewed horizontally, stakeholders involved vertically. Communication means are color-coded and explained at the bottom.



4.3.1.3. FLOW OF GOODS – D&W AND OPERATIONS

The physical flow of goods between vendor and the offshore base are in many aspects equal between D&W and Operations. The basics of the flow involve the vendor dispatching the shipment to the assigned freight forwarder. The shipment is then carried directly or via stops at other vendors en route to the base. The distinction between D&W and Operations flow of goods becomes most apparent after the end of the scope held in this thesis. To assign the distinction's relevance for the analysis, a description is presented below.

What separates D&W and Operations also here stem from the principle of just-in-time deliveries to D&W. To minimize handling time at reception on the base, D&W shipments are normally pre-packed and secured by the vendor before pick-up. With this follows that the containers are not usually opened and re-packed at reception, rather they are cross-docked and ready to be loaded on-to the PSV.

For the case of Operations, the majority of shipments are smaller and/or single items sourced from numerous vendors or items delivered from consignment stock at vendors' facilities. Also, tools and equipment delivered from service or repair were included as they follow much of the same procedure. As Operations do not target Just-in-Time deliveries, there are several paths a shipment may follow after reception at base, depending on criticality. It can either go into stock at base, temporary storage or to re-packing into a CCU to be prepared for shipment to installation directly. Lower criticality of deliveries together with smaller sizes and volume of the single shipments also yield implications for coordination possibilities. Given that more vendors are located within close range in the Stavanger region, chances for the freight forwarder of coordinating the pick-up are better, potentially lowering costs of transportation.

4.3.1.4. FLOW OF CASH

For the scope held within this thesis, the cash flow involved with transportation involves no distinct differences from cash flows involved with other procured services. The differences here first and foremost come from how the cost is allocated to AkerBP, which relies on what Incoterms are used.

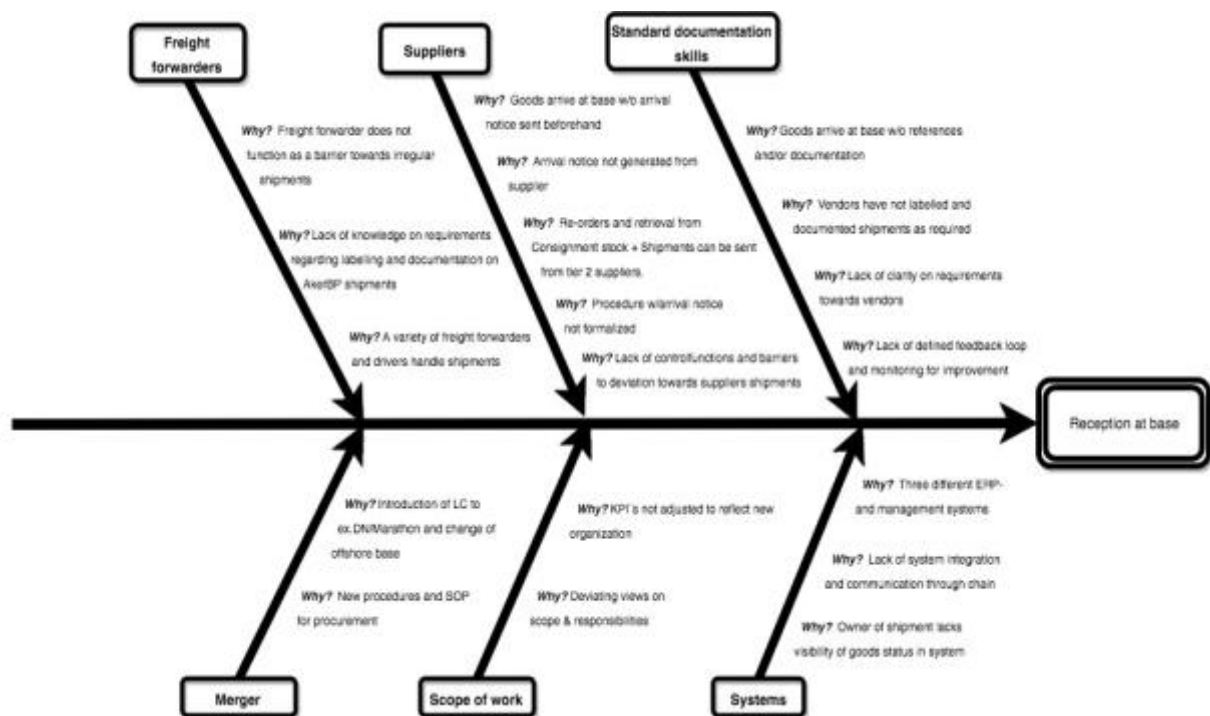
For transportation involved in ex. BP operations holding DAP/DDP as main Incoterms, the vendors cost of transportation is reimbursable by AkerBP. The vendor thus passes on the charge to AkerBP either by forwarding the freight invoice directly or through the invoice of their delivery in full. With deliveries by Bring to ex. Det Norske assets where Incoterm FCA is agreed upon, Bring invoices AkerBP monthly. Invoices are issued with one-month notice effectively giving AkerBP up till two months of credit for the service, whereby the invoices are processed by financial staff at the Logistics Centre.

Asco Freight Management (AFM) also handles transportation for AkerBP, mainly for shipments to former BP Norge where Incoterms DAP/DDP do not apply. The services include local, national as well as base to base transportation. In the same way as with Bring, AkerBP is invoiced monthly by AFM whereby finance staff at the Logistics Centre hold cost-control and processes the invoices.

4.3.2 CAUSES AND EFFECTS WITHIN SCOPE

The process of establishing cause and effect described in chapter 4.2.2 resulted in the finding of a bottleneck. The bottleneck was found to emerge at reception of goods at the offshore base, where goods going outbound to both D&W and Operations pass through. Root causes were subsequently identified by the use of the Ishikawa diagram, as described in chapter 4.2.3. The diagram and findings are presented in figure 7, where causes are found common for D&W and Operations except otherwise noted. A description of causes and effects follow before criteria to counter the bottleneck are addressed in chapter 4.3.3.

Figure 8: Ishikawa Diagram. Root causes found toward the horizontal center line, and the main effect (bottleneck) at the right end of the center line.



4.3.2.1 STANDARD DOCUMENTATION SKILLS

Labelling and documentation following shipped goods are essential when supplying goods to offshore operations. The labelling states vital information for the freight forwarder and AkerBP, while documentation of fragile or dangerous goods is required by to ensure correct handling and satisfying regulation. For that reason, all vendors delivering to AkerBP are required to follow the company's Packaging and Labelling Instructions (AkerBP, 2016b). The instructions are published publicly on www.akerbp.com and communicated to each vendor. The instructions provide comprehensive details as to how and by which means goods are to be packed, labelled and documented.

Regarding labelling, the instructions state:

All deliveries (including certificates) must have a packing slip reflecting the PO with information about:

- PO number and all items listed from the order
- Shippers address, e-mail and phone number
- Delivery address, contact name, e-mail and phone number
- Date of packing
- Other references

(AkerBP, 2016b)

Data collected through interviews and on site-visits indicate that these instructions and requirements are often not met. As an example, a respondent told during interviews that “On a bad day, wrong or missing information on goods can stop as much as 50% of shipments at reception on the base.” At reception, the labelling and documentation is what assigns the goods to the right asset/project. It is also what allows a goods-receipt notice to be registered in the ERP- and/or planning-system and what sets terms for the following actions. In addition, dangerous goods or chemicals as defined by the ADR⁶ or IMDG-code⁷ are required to carry data sheets clarifying the correct handling and shipping of the goods. The labelling and documentation thus serves several purposes including those operational, financial, legislative and of safety. Lack of compliance with the requirements can in worst case be fatal, and at best slows down the planned flow of goods.

For the vendors to be able to deliver on the requirements, it seems evident that clear instructions must be given to each vendor. One vendor reports ambiguity as to what reference is correct with different shipments, highlighting that preferred references will vary according to what business unit sends the order. The AkerBP Packaging and Labelling Instructions explicitly specifies PO to be used. For the case of D&W operating procedure, collected data suggests this is not consistently practiced. Here, the Wels-id and destination/wells-number is normally used when an item is called off from the previously described MEL in Wels. On other occasions, e.g. when parts are collected from consignment stock, the item’s resource number is used when called off through the ERP-system.

⁶ European Agreement concerning the International Carriage of Dangerous Goods by Road

⁷ International Maritime Dangerous Goods Code

Whether the instructions are communicated consistently or not, collected data suggests not all vendors are able to deliver according to them. The root-cause identified in the Ishikawa analysis suggests what is missing is consistent instructions and a feedback loop, as a majority of respondents reported the system to lack corrective measures when issues appear. Deviations are solved as they appear, but they do not initiate further measures to ensure learning from repeated issues.

4.3.2.2 SUPPLIERS

Matching information attached on goods and waybill arriving at base to the ERP-system and Wels is key to retain the desired flow of goods as they enter the Asco base. The analysis found that wrong or missing information on goods is a source to excess time used by several stakeholders. Data collected both through interviews, a site visit at the Asco base and from AkerBP staff suggests parts of the issue is rooted at earlier stages of the process.

Reference is made to figure 6 and 7, to the point where the vendor has confirmed the order for delivery to AkerBP. As transportation is booked, the vendor will notice AkerBP and the base by registering an arrival notice in the ERP-system and/or Wels. This is possible as long as the vendor has access and all required information regarding destination and sailing time. The arrival notice includes estimated time of arrival at base, reference numbers assigning the goods to the correct asset, destination and sailing date. With this, the notice sets terms for the following handling of the goods, be that cross-docking, temporary storage or storage at base. Also, if made use of, the offshore base and logistics coordinators can use the information for planning purposes. In the case of lack of an arrival notice in Wels, a routine is followed to retain the needed information. The routine is reactive and includes a service desk at the base, the relevant logistics/material coordinator and in cases the requisitioner. The parties identify the goods through the attached purchase order number, its destination and assign the goods to what sailing it is to follow. The logistics/material coordinator then manually transfers data from the ERP-system to Wels, assigning the goods to the correct line in the manifest. Staff at the base are then subsequently able to register a goods receipt notice in Wels and initiate further handling. Once the routine is completed, the ERP system and Wels show consistency between them, retaining control of the following actions for the goods and of the manifest for the upcoming shipment.

Through the data collection it became clear that missing arrival notices had several reasons. For one, a significant share of goods shipped outbound come from call off orders on previously

issued yearly purchase orders, as well as goods retrieved from consignment stock. These goods can be single items called off as demand arises, and data suggests the vendors are not instructed/required to register the notice in these cases. Some vendors also lack access to Wels/ERP-system to actually register the notice. In other cases, shipments can also be sent directly from tier 2 suppliers. Whether these suppliers are made aware of the routine held by AkerBP or not is depended on instructions from the tier 1 supplier. Data collected suggests that there is a lack of control functions and barriers when these shipments are dispatched. Such control functions or barriers could help prevent goods arriving at base without base staff being noticed.

4.3.2.3 RANGE OF FREIGHT FORWARDERS

In 2016, AkerBP purchased goods from as many as 1643⁸ different vendors. The number includes service companies and yields a reduction in number of vendors from previous years. Even so, the number highlights that a large selection of vendors deliver goods to AkerBP operations through the offshore base. Together with the fact that deliveries to ex. BP operations are normally transported by the vendor's carrier, it follows that a broad range of freight forwarding companies make deliveries to the offshore base. These carriers handle shipments on terms agreed upon with his customer, AkerBP's vendor. The vendor is obligated to pack, label and document his shipments in compliance with AkerBP and legislative requirements, though the carrier's incentives are not as clear. For the carrier, the main considerations are to meet legislative requirements and to match order references on the waybill to labelling attached to the goods. This will ensure his legitimate claim of payment for the service and show that he has fulfilled his obligation to his customer.

Each of the numerous freight forwarders cannot all have insight and competence on AkerBP requirements. This however leaves dispatch from vendors with a lack of barriers from deviations to AkerBP requirements. Collected data suggests such a barrier could have a significant impact on the flow of goods received at base. The root cause found for the lacking ability of the freight forwarders to act as a barrier was found to be the large variety of freight forwarders handling shipments.

⁸ Retrieved from AkerBP SCM

4.3.2.4 MERGER AND SCOPE OF WORK

As is inevitable upon a merger of two companies, the new organization will have to meet and adapt to changes. For the merger between Det Norske and BP Norge, changes within the chain studied here meant the introduction of the Logistics Center to former Det Norske staff. As an example, the introduction yielded changes to standard operating procedures and scope of work for purchasers from former Det Norske. Especially for the purchasers within the business unit Operations, the scope of work has tightened. Their responsibility for deliveries now ends when the transportation is confirmed by the freight forwarder. This differs from their previous scope where they held responsibility of shipments until reception at base or even until reception offshore.

The Logistics Center handles all goods moving within the chain and all the way out to the offshore installations. Its functions and staff support timely coordination of the shipments for the sustainment and execution of planned operations. For the results to hold the desired level of service, coordinating internal efforts and communication leading up to the transportation of goods is essential. The analysis found a lack of adjustment of purchasers KPI's and adaption to the new structure, scope of work and standard operating procedure partly hinders this. As an example, data showed that similar operations within the chain will be performed differently depending on who is involved. Some purchasers will follow the procedure of having the vendor order the freight. Others will make the freight order for the vendor, thus holding on to the order until delivery at base. With this follows that other stakeholders need to be aware of who holds responsibility for the shipment when they have an inquiry on shipped goods. Data thus suggests the lack of standardization and alignment of KPI's causes ambiguities and slows down adaptation to the new structure.

4.3.2.5 INFORMATION SYSTEMS

Within the transportation chain and the information flow mapped previously, several systems are utilized. The systems provide and secure consistent information flow between stakeholders. These include ERP-systems SAP and Workmate together with the planning and support system Wels, as presented in chapter 1.2.4. Also, an important source of information is each freight forwarder's system. None of these systems communicate with each other, and data collected suggests this fact leaves stakeholders with questions unanswered and extra efforts necessary to retain information.

All internal respondents were asked of their possibilities to view status of shipments in transit. Relevant information for logistics/material coordinators would include freight order statuses, estimated time of dispatch from vendor and estimated time of arrival at base. With this information, proactivity would be facilitated to allow expediting of urgent shipments and in keeping the base informed. The majority of respondents reported a lack of such information, and reported the lack of integration across systems are a daily issue.

4.3.2.6 EFFECT - BOTTLENECK AT RECEPTION

The main effect found from the presented causes is a bottleneck slowing down the flow of goods as they enter the offshore base at reception. Referring to theory of bottlenecks presented in chapter 2.2., the bottleneck found should be categorized as an organizational bottleneck. It emerges as a result of how things are planned. Data collected through interviews and retrieved from a Holding-report in Wels both point to the reception as to where the effect materializes. The following will highlight how the effect plays out and the issues it carries with it. Lastly, measures to counter the bottleneck will be presented in chapter 4.3.3.

The large range of potential freight forwarders delivering to the offshore base implies several effects. Firstly, inconsistent information to the offshore base pre-delivery leaves both the base and the logistics/material coordinators waiting for issues to occur. As an example, one respondent reports that on a day of sailing, she is merely waiting for shipments to arrive at base with deviations having to be sorted by extra communication between stakeholders. The time used holds capacity from more value-adding activities and can potentially cause idle time on the handling of more critical shipments. Second, the large range of potential freight forwarders arriving at base with each their shipments are not coordinated. On a day of sailing where greater volumes are to be received, this leaves reception at base with an uneven workload and without the possibility to secure a consistent flow on to further handling.

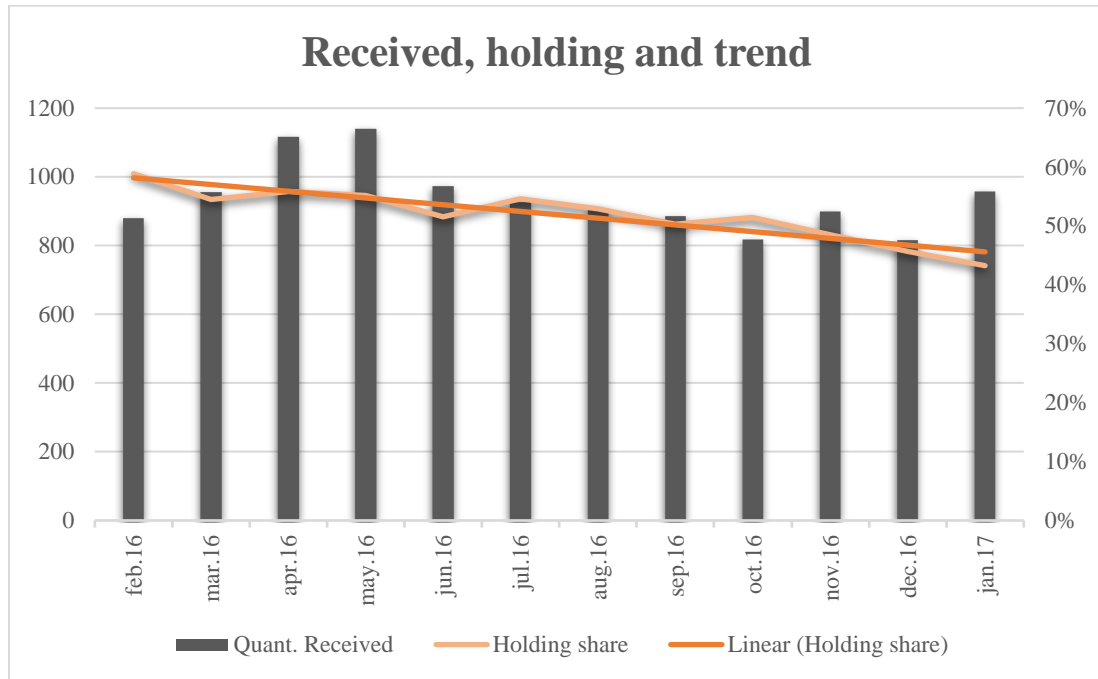
The lack of a feedback loop to address incorrect and missing labelling/documentation contributes to the effect. Together with the inconsistency on arrival notices sent in Wels this adds up to extra time spent at reception. As previously addressed, assigning outbound goods to the right asset/destination is key. Data gathered suggests more time than necessary passes while stakeholders communicate by phone and e-mail to sort out facts and correct deviations as goods are received at base.

From February 2016, former BP Norge started a campaign aimed at developing knowledge regarding deviations and issues on goods received at base. The procedure involves registering all goods received at base going to Operations' assets Ula and Vallhall. Shipments lacking information according to the SOP or who in other ways are non-conformant according to AkerBP's Packing and Labelling instructions are registered. Whenever such a good is received, the procedure explained in paragraph 4.3.2.2 is followed. The procedure makes sure the shipment is labelled, documented and that it is assigned to the right shipment manifest in Wels. Once the shipment has been cleared and the deviation sorted, the non-conformance is updated as solved by base personnel. A data summary and table is presented in table 5, with data retrieved from Wels. The summary displays the total number of shipments received at base per month, how many of these went through holding, and their %-share of the total each month.

Table 4 – Holding feb. 2016 – feb. 2017 – data retrieved from Wels.

Month	Quant. Received	Quantity Holding	Holding share
feb.16	880	518	59 %
mar.16	956	521	54 %
apr.16	1116	623	56 %
may.16	1140	629	55 %
jun.16	973	502	52 %
jul.16	926	506	55 %
aug.16	906	479	53 %
sep.16	886	446	50 %
oct.16	817	420	51 %
nov.16	899	436	48 %
dec.16	815	372	46 %
jan.17	957	414	43 %
Average	939	489	52 %
Avg. first 6 months	999	550	55 %
Avg. last 6 months	880	428	49 %

Figure 9 – Received, Holding and Trend – Data from Wels. Displays the numbers from table 4 graphically. Number of received shipments on the left axis, holding-share in percentage on the right. The blue line represents the trend of the holding-share during the period.



The holding data only includes data for shipments going to Operations’ assets Ula and Valhall, as the procedure has not been performed for shipment’s going to D&W. The same holds for shipments to former Det Norske-operated assets Alvheim and Ivar Aasen which are not included. The purpose of the data here is to give a perspective to the share of shipments included in the procedure that ends up going through holding. As the average share going through holding for the period is 52%, it is fair to say that there is a potential for improvement. Causes previously presented are all contributors according to the gathered data. An aspect that has not been discussed in this subsection is information systems, which lastly will be discussed.

Data gathered clearly show that the lack of interface between the ERP-systems and Wels is a significant source to the observed extra work and of the high share of shipments having to go through holding. Below is a data summary made from the data on shipments registered in holding. The summary gives insights to why each is found non-conformant.

Table 5: Holding categorized – Processed data from Holding-report retrieved from Wels. Jan. 2016-jan.2017

Data summary	Quantity	% Of total
Not registered in Wels	5965	87 %
Wrong/missing packing slip	170	2 %
Wrong/invalid status	123	2 %
Wrong/missing safety data sheet	175	3 %
Wrong/missing IMDG papers	151	2 %
Late for cut-off	46	1 %
Date deviating from arrival notice	49	1 %
Holding for other reasons	169	2 %
Total number of holding for the period	6848	100 %

As table 5 shows, the clear majority of shipments going through holding are those not registered in Wels with an arrival notice pre-delivery. The reasons for the lack of registration have been discussed in previous subsections. It should nevertheless be noted that according to data collected, a share of the registrations reported as non-conformant stem from call-off orders from consignment stock or other re-orders on previously issued purchase-orders. The data suggests these will normally not require a specific arrival notice in Wels. The information in the PO will normally include sufficient information for base staff to register the item to the correct container and manifest. The issue again highlights the need for an interface between systems to eliminate sources of inconsistency in operations where possible. Such an interface would further reduce re-work, risks of manual errors and support staff in retaining the desired flow.

4.3.3 WASTES AND COUNTER-MEASURES.

The following will address wastes found in the analysis and present criteria and measures for AkerBP to counter the waste. The criteria and measures aim to serve the purpose of the research presented in chapter 1.1, and to support the theoretical framework from chapter 2.

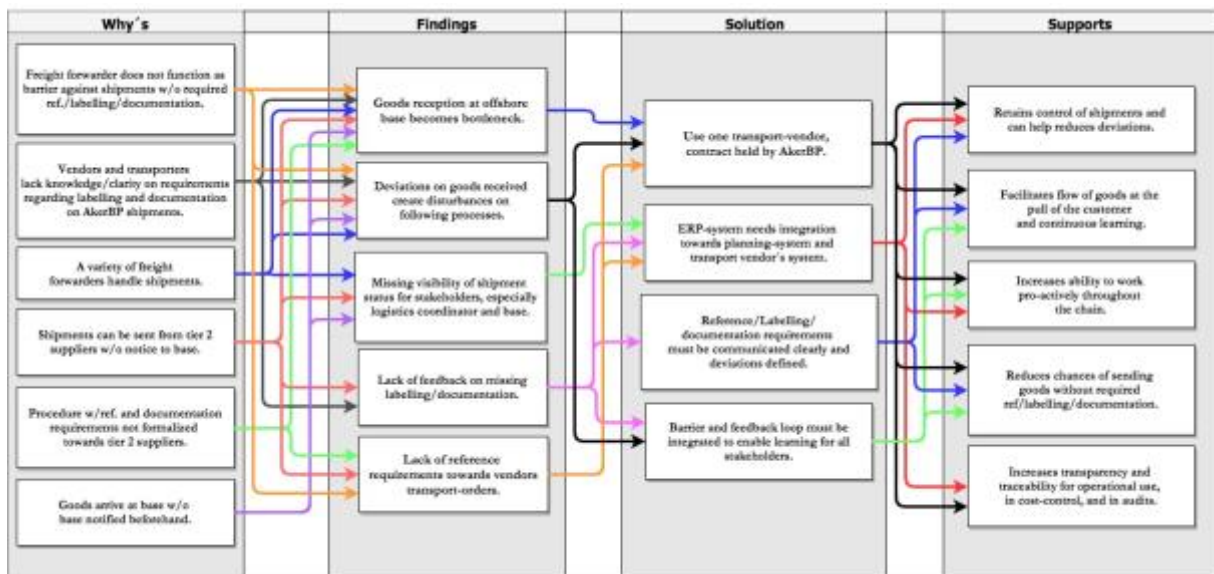
The analysis identified several sources of waste within the chain analyzed. In cases where information/documentation is incomplete, corrective efforts follow to retain compliant labelling and data sheets. This represents waste in the form of quality defects and inappropriate processing according to Lean principles presented in chapter 2.1. Time used for the corrective measures imply goods will be in idle rather than continuing their route, and extra man-hours will be spent by several stakeholders. The time and effort spent adds no value to the customer

and should be prevented if possible. The waste was found for both business units D&W and Operations. Presented numbers for the Holding-process for Operations' assets Ula and Valhall under chapter 4.3.2.6 showed how the lack of system interfaces adds to the issue. The numbers gave light to the magnitude of time wasted at reception for Operations, as 52% of received goods registered through this procedure needed extra work. Reference data for D&W do not exist, though data collected through interviews indicate the magnitude of issues is significant, as exemplified in chapter 4.3.2.1.

Reference is made to figure 10, where four criteria and measures to counter the waste is depicted. One freight forwarding agreement held by AkerBP is the first criteria, as can be seen under "Solutions". The measure enables better collaboration between AkerBP, the base and the freight forwarder, and aligns incentives between stakeholders. Instead of leaving the responsibility of transportation with the vendor, a long-term collaboration can be initiated with the freight forwarder. The solution supports using Incoterms FCA in the as used by former Det Norske, though a stronger collaboration with the freight forwarder is found to be a key to success.

By developing such a collaboration, efforts to coordinate shipments are possible to implement, thus countering issues discussed in chapter 4.3.2.3. Integration between the ERP-system, the planning system, and possibly also the transport vendor's system is the second measure found purposeful to counter waste. With the integration, waste from the current holding practice discussed in chapter 4.3.2.6 can be cut. Base staff and logistics coordinators can thus retain focus on value-adding activities such as shipment handling and coordination. Also, the measures enable both the base and logistics coordinators to proactively address critical shipments and collaborate with the forwarder in prioritizing jobs. In effect, the two measures facilitate better planning of shipments both to- and from the base. Waste should thus be reduced and flow enhanced.

Figure 10 – Causes to Solutions. Showing how underlying causes explain findings, solutions to counter findings and what the solutions support.



According to collected data, an issue on cost-control arises when AkerBP handles transportation. Due to inconsistent use of references by vendors and carriers, cost-control is left more complex than desirable. The issue arises in cases where the vendor does not use the correct PO-reference in ordering transportation. The freight forwarder currently does not have any means to detect the error. In assigning costs to the right accounts, finance at the Logistics Centre handling the invoice are left with a job of backtracking the transaction, together with other stakeholders. The issue has been lifted and discussed with vendors and freight forwarders. A consistent practice seems yet to be missing, causing waste in the form of defects, inappropriate processing and “excessive transportation” of information according to wastes presented in chapter 2.1.1. The two first measures presented above should help counter these issues, supported by the third and fourth measures. Clear, consistent communication of reference/labelling/documentation- requirements need attention. By implementing and communicating a common standard, issues discussed in chapter 4.3.2.1 will be addressed. The vendors’ ability to deliver according to requirements should thus be increased. Also, cost-control issues can be solved.

The fourth measure also supports improved results, namely a barrier at dispatch from the vendor together with a feedback loop. Implementing a barrier at dispatch supports flow in several ways. Addressing possible deviations already before the goods leave the vendor turns the routine of

straightening deviations from reactive to proactive. Also, the freight forwarder will be involved in contributing to the success of operations by taking active part of the chain (in addition to the obvious physical contribution). With this follows that the vendor can correct deviations before dispatch, while base staff and logistics coordinators can remain focused on core tasks. A feedback loop where repeated deviations from vendors are tracked and addressed will promote further reduction of waste and continuous improvements. By collaborating with the vendor to sort ambiguities, flow efficiency can be increased.

The analysis found it is currently hard to attain flow by pulling shipments through the chain. Shipments announced through Wels will be visible to base staff, while other shipments will arrive unannounced. This leaves the base and logistics coordinators unable to proactively handle and arrange the receipt. Waste appears as both base staff and logistics coordinators lack consistent information on estimated time of arrival. They are thus left with waiting until issues arise or more shipments of goods come in at the same time. By following the criteria and implementing the measures presented in this subsection, AkerBP should be able to activate a pull-system. Holding one freight agreement, collaboration between stakeholders and information transparency all facilitate the pull.

5 RELIABILITY AND VALIDITY

This chapter discusses the quality of the research presented in this thesis, as well addressing how data has been processed. Thagaard (2009) argues that reliability can be linked to the question of whether a critical review of the project will yield the impression of the research as performed in a reliable and trustworthy way. She further argues that the researcher has to present arguments for reliability by accounting for how the data has been developed during the research-process. Validity on the other hand concerns the interpretation of data. According to Thagaard (2009), the term Validity concerns the soundness of interpretations as presented by the researcher.

5.3 RELIABILITY

As presented in chapter 3, the use of Action Research had several advantages. Sitting with the company meant insight to internal processes and resources were given. Together with discussions with staff and the supervisor at UiS, this method proved valuable in developing relevant interview guides. In selecting internal respondents, care was taken to balance responses from both of the companies merged. By doing so, risk of gathering biased data was reduced.

The background note stated in appendix C and D was sent to all respondents to ensure equal knowledge and preparation for the interview across respondents.

The semi-structured interviews of respondents also proved effective. During the interviews, respondents were welcome to elaborate on topics of special concern or experience. As all respondents were given the same opportunity, the data collection supported building of a holistic insight. By tape-recording the interviews, no data was lost by note-taking during the interviews. In supporting transparency, the interview guides are included in the analysis for the reader to see, though responses are anonymized and not presented.

A critique could have been put forward on grounds of the sample size of vendors being too small. The rationale for how respondents were selected was presented in chapter 4.1.2. The process of selecting the sample involved narrowing it down to vendors delivering more critical, non-standard goods. In excluding other vendors delivering more standard goods, an argument could be made of not collecting a representative sample. By also interviewing AkerBP staff and freight forwarders, the argument is countered as these respondents produced data relevant for all deliveries.

Discussing reliability of purely quantitative research entails asking the question of whether another researcher conducting the same research would have found the same results. In essence, it is a question of replicability, based on positivistic research logic. According to alternative research logics, based on a constructivist view, the question of replicability is not relevant in qualitative research. Thagaard (2009) argues the principle of perceiving the researcher as independent of the respondent is not sufficient in research where people interact with one another. One should thus not expect each respondent to generate the exact same data had the research been conducted again. Even so, the researcher strongly believes the aggregated data would have shown the same results had the interviews been conducted again.

5.4 VALIDITY

In assessing the validity of the qualitative research, Seale (1999) suggests addressing both internal and external validity. “Internal validity concerns the extent to which causal propositions are supported in a study of a particular setting.” The analysis in chapter 4.2. found the existence of a bottleneck within the chain. Causal relationships were then elaborated in chapter 4.3, so as

to show their underpinning character of the findings. Several of the causes are interconnected, which strengthens the causality found.

External validity concerns the extent to which results are generalizable and if they hold true in other settings. As the research is conducted specifically for AkerBP, external validity has not been a goal and should not be seen as one. Each individual Exploration & Production company will have a need to assess their own processes and trade-offs within their chain of logistics to find credible evidence for how to best organize it.

6 CONCLUSION

The merger of former Det Norske and BP Norge drove the need to align terms and practices within their logistics chains, in the course of becoming one. Fundamentally, the distinctions between previous practices are clear. The essential trade-off includes whether AkerBP or the vendors should be responsible for transportation between vendors and the offshore base. The implications from Incoterms seem apparent, although choosing one or the other also imply results not so obvious.

The purpose for the research as presented in chapter 1.1 was thus to define critical criteria for AkerBP in targeting strong operational results, flow efficiency and facilitation of learning throughout the chain. With the criteria should also follow support for continuous improvement and retaining cost-control. The research and analysis of collected data provided evidence for such criteria supporting the purpose. The following summarizes the criteria and demonstrate how they address the problem statement, support the purpose of the thesis and the goals of AkerBP.

Data was collected through interviews of internal and external users of freight in the chain. By grouping, categorizing and analyzing, root causes and the effect of the data was established. An organizational bottleneck was identified, setting guidelines for suitable measures to implement. The analysis found that AkerBP will benefit from holding one freight forwarding agreement, as this sets the foundation for flow efficiency. Consequently, the analysis found, wastes of quality defects identified at several nodes in the chain can be reduced. The next critical criteria found to enable waste-reduction is implementation of interfaces and integration between the planning systems used in the chain. Most critical is an interface between the planning system and the ERP-system. Information sharing with the freight forwarder should also be prioritized.

The analysis showed that by doing so, identified wastes of waiting and inappropriate processing can be cut.

Following principles of Supply Chain Collaboration theory, collaboration with the freight forwarder was found key to carry out additional measures to support improvements. For one, a barrier from deviant packing/referencing/documentation on shipments should be set up at dispatch from the vendor. Such a barrier changes the procedure of correction from reactive to proactive. Additionally, it also assigns responsibility to the vendor before issues cause greater waste of time later in the chain. The analysis found ambiguities on reference requirements are an issue with the vendors. As a measure to remove the ambiguities, the analysis concluded that an alignment of communication from AkerBP must be put in place. Finally, a feedback loop to follow up deviations was found to be missing and should be implemented, to promote improvements and learning in the chain. By implementing these practices, goal congruence and joint knowledge creation will be facilitated. With the recommended collaboration also follows possibilities of simplified cost-control. By actively developing the freight forwarders system to provide relevant information, assigning actual transportation cost to each asset will be possible.

The criteria found for success each play an important role in answering the problem statement and in supporting the goals of this thesis. Essentially, the criteria together make possible flow *at the pull of the customer* and enable continuous improvement by involved stakeholders. Implementation of the measures will help reduce wastes as defined by Lean-theory and bring forward factors found for success in Supply Chain Collaboration. Finally, it should be relevant that the criteria address the four focus areas stated by the Board of Directors of AkerBP in their improvement agenda. In sum, the recommendations should thus be of support to AkerBP in choosing the path to follow forward.

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B. Abbreviations and definitions

E&P	Exploration & Production (company)
MMBOE	Million Barrels of Oil Equivalent
PSV	Platform Supply Vessel
NUI	Normally Unmanned Installation
MODU	Mobile Offshore Drilling Unit
SOP	Standard Operating Procedure
ERP(-system)	Enterprise Resource Planning System
SAP	ERP-system
Workmate	ERP-system
Wels	Web-based control and support system (by Wellit)
MEL	Master Equipment List
KPI	Key Performance Indicator
Throughput	The rate at which a system generates its products or services per unit of time.
PO	Purchase Order

C. Bakgrunn for Intervju – til interne

I forbindelse med sammenslåingen av Det Norske og BP Norge, og i sammenheng med selskapets uttalte mål om å ta ut effektivitets-gevinster har en problemstilling gjeldende frakt av varer mellom leverandører og base blitt løftet. Tidligere Det norske har en avtale med Bring og bruker i hovedsak Incoterms FCA, for sine innenlands sendinger til base. Tidligere BP Norge har holdt DAP/DDP som sin foretrukne Incoterms på innenlands transport til base, og da latt leverandøren ta ansvaret frem til basen. AkerBP søker å lande én løsning for selskapet slik at det kan utvikles en standard operasjons-prosedyre for transport med mål om å sikre god flyt både inn, på og ut fra base, kontrollere risiko og holde kost nede. I forlengelse av dette er det også naturlig å se på forholdet mellom transportør og base og hva som skal til for å støtte prosedyren og ta ut synergier.

Oppgavens mål er derfor å belyse årsak og virkning av valg av Incoterms, incentivene til de involverte og gjennom analyse av dette anbefale betingelser som legger til rette for en hensiktsmessig prosedyre.

Intervjuet er i denne sammenheng et viktig bidrag for å identifisere hvilke konsekvenser valget av Incoterm har, sett fra deg som bruker av frakt sitt ståsted. Intervjuer vil også bli gjennomført av aktuelle eksterne brukere av frakt samt transportørene selv, for å belyse de underliggende årsakene til konsekvensene.

For AkerBP,

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D. Background for interview – external respondents

Springing out from the merger of Det Norske and BP Norge, and with the communicated goals of carrying out efficiency-winnings, an issue regarding freight between vendors and offshore-bases has come up. Former Det Norske has operated with a contract through Bring, thus holding Exw/FCA as their preferred Incoterms. BP Norge on their end has held DAP/DDP as their preferred incoterms on domestic and base to base freight, leaving the vendor with the responsibility of transporting goods to base. AkerBP now plans to land one common solution so to develop a standard operating procedure for freight, targeting the desired flow to, at and through the base, while also preserving risk- and cost-control.

The goal of the thesis is thus to highlight cause and effect when choosing between Incoterms, stakeholders incentives and through analysis of this and additional material recommend terms supporting the developed standard operating procedure.

Interviews of key stakeholders is an important contribution to the thesis, identifying the implications of either Incoterms seen from the eyes of different users of freight. The interview thus focuses on unveiling how varying volume and time of delivery affects your deliveries and whether choice of incoterms can be seen as a reason for deviations in deliveries.

Other stakeholders that will be interviewed are internal users of freight together with the freight forwarders themselves.

On behalf of AkerBP,

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