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# Change-Inducing Model for the Field Units

The Organizational Transformation to Data-Based  
Fleet Management

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The earlier discoveries in this same business context led me to a notion that uncharted possibilities lie in fleet management and collaborative working ways. Data and human experience are not substitutes for each other. On the contrary, their encounter can be a source of insights and interpretation.

A possibility to submerge in this fascinating area has been a privilege that I want to thank my company for. Obtaining time from our busy schedules for such purposes is far from self-evident. Furthermore, my gratitude for the contributions and participation is directed to the all levels of the organization.

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<p>This thesis explores the management measures and models that are needed when aiming to introduce new data-based fleet management in an asset-intensive organization.</p> <p>This study is carried out according to the Action research approach because it provides the needed observations and allows the reflection on the case company's field units' operational realities. It also allows the engaging of the field employees in the creation of the new processes. The research design consists of five stages. As the proposal is built to be implemented in the field unit, the field employees were participating in all of the data collection phases. The theories of change management, organizational learning and fleet asset management are used as the foundation in the solution building.</p> <p>The outcome of this thesis is a change-inducing model that is based on a well-established change management model, essential processes of organizational learning and best practices of data-based fleet management. The proposed solution allows the management to lead the organization through a transformation process that facilitates the implementation of the data-based fleet management, and simultaneously takes into account the motivation of individuals and enhances the organizational learning. It also provides clearly perceivable steps that can be followed by the management and it also suggests simultaneous organizational measures that can be taken when leading the case company through the heat of the organizational change.</p> <p>As most of the so-called low-hanging fruits are utilized in the development of businesses, the creating of new competitiveness can require rising to a new level of complexity. Utilization of big data and capitalization of ecosystems present a complex development opportunity for such purposes. So that the applicable solutions could provide benefits, the transformation needs should go deep into the organization's operations and reach the level of the individuals' choices'. Without this adaptive change, the transformation can be limited just to the introduction of technical solutions.</p>	
Key words	Fleet management, fleet asset management, marine fleet management, organizational learning, change management

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## 1 Introduction

*“People know what they do; they frequently know why they do what they do; but what they don't know is what what they do does”*

(Foucault. Cited in: Dreyfus and Rabinow, 1983:187)

Big data and Internet-of-Things are both hyping new possibilities. The usage of big data is revolutionizing the ways the organizations are working now. When more and more data are automatically generated, collected and then analyzed, a totally new kind of decision making is facilitated. The accurate and ample data that is collected on a long time span allows a creation of such information that earlier hasn't been accessible. That information can enable previously unthinkable improvements in the cost-efficiency, robustness and sustainability of operations. This enables the development of cheaper, more robust and more optimal ways of working. Yet, in order to create a true change and to convert the collected terabytes to the euros saved, technological dreams also needs to meet the human realities.

The use of fleet data, collected from all the accessible similar physical assets, as a basis for an analysis provides a possibility to boost the data. The higher data volume allows a higher probability for an occurrence and recording of significant but infrequent incidents, such as breakdowns. This will allow new kinds of anticipation and fault avoidance with the similar incidents in the future.

Despite the information age, the existing culture and the working community might challenge the utilization of the emerging opportunities. Even though better practices are facilitated with the data-based systems, the changes in the individuals' ways of working do not automatically take place. The introduction of data systems that allow a higher control over the working process can communicate distrust and cause lowering of morale. This can challenge the adaptive change that is needed to align the everyday work and the recognized new possibilities.

In the case company of the Thesis, in the absence of effective fleet and data management, recessive ways of working have developed over a longer period of time. This development has many times been done locally and by the employees. Having the possibility to influence to the outcome, the reasons and motives behind such practices most likely vary substantially.

For the case company it means, that in the new area of digitalization and big data, a lot can be lost if the change vision and the new targets are not owned by the employees that make the relevant decisions in their daily work. A change-inducing model is needed in the case company to initialize a constructive and co-creating development work that utilizes both the user knowledge and the developed data without creating obstacles for the adaptive change of the working activities. In addition, change is not always easily welcomed. Thus, people need to be welcomed to create it themselves.

### 1.1 Business Context

The case company of this Thesis is fully state-owned and produces maritime piloting services as the only service provider in Finland. To assist the masters of the vessels' that enter to the challenging waters of Finland, the company provides ship navigation and handling services in the whole of Finland and on the 1500 Finnish fairways. The head office is based in Helsinki but the company has 20 local units, so called pilot stations, around Finland.

The field personnel of the company consists of around 140 pilots that service the ships and around 130 boat operators that as internal service providers transport the pilots. Two boat operators are needed in the transportation of pilot as another of them looks after the safety of the pilots in the risky ship embarkation processes on the deck at sea. The overall number of employees in the company is around 340.

As the company is given a legal monopoly, it is not allowed to compete in the open markets or provide other services than pilotage. Therefore the assets and the resources of the company can only be utilized in the needs of the pilotage.

The function of pilotage has a background as part of the national maritime authority. The company was separated from the authority in 2004 and it was corporatized in 2011. The organizational culture might therefore still have connections to the days of the administration.

The case company is an asset-intensive organization. The operational reliability requires the company to use efficient work boats that are custom-made with a purpose to ensure the safety of the pilots' embarkation operations. Renting of such a highly specialized fleet is not lucrative and therefore it is more sensible for the company to own

such assets. To ensure the continuity of its service production in the whole of the country, as it is set, the company owns 30 fast pilot boats and 33 ice-going pilot cutter boats. The asset value of the fleet is approximately 14 million euros whereas the new purchase value would be close to 60 million euros.

The pilot boats are used to transport the pilot in all conditions around the year at the pilot boarding grounds that are positioned to the end of the fairways and are mostly at the open sea. The company also has some units placed on the outer islands of the Finnish archipelago and there the boats are also used for transportation between the islands and the mainland.

Due to the transportation tasks, the fleet of the pilot boats uses approximately 1,9 million litres of fuel oil. The annual maintenance cost of the fleet is about 0,6 million euros. As the boats can only be used for the internal transport services, the aim is to avoid all unnecessary use. To avoid the extra usage, the company should aim to minimize the extra driving between the ports, the pilot boarding grounds and in some cases the island units. Fewer driving to the pilot boarding group can in some case be achieved by transporting many pilots out to the sea at the same time and then waiting there for the missions to take place. The transports between the units positioned on the islands and the mainland can be optimized to cover multiple transportation needs and directed based on the need of the service production. The amount of use, however, is not the only factor that is meaningful for the company's financial results.

The way that the boats are used affects the costs a lot as well. Even though fuel consumption of the fast pilot boat grows quite steadily the higher the speed still there is a possibility to save fuel by steaming on an optimal speed range. The ice-going cutter boat has power reserves that can only be reclaimed when breaking ice. In the open water the use of these reserves will radically increase the fuel consumption but has very little effect on the boats' speed. Therefore the cutter boat should normally be used with a light engine load in the open waters.

The optimal speed range and the usage of the engines and of the boats in general have connections to the fleet's aging in general and its upkeep costs. With both boat types, lighter load on the engines and the transmission presumably reduces extra wear and tear and lengthens their life cycle. The sea as a transport platform differs quite

radically from the roads. On stormy seas in the constant movement caused by the waves, the technique of the boat has constant extra stress from the hits it experiences.

Thus, the control of all the above mentioned cost factors presents currently a challenge.

## 1.2 Business Challenge, Objective and Outcome

The amount of time that boats is used and the ways they are used with are meaningful for the profitability of the pilotages. The company has for several years been seeking to master better the usage, upkeep and asset health management of its work boat fleet. This cannot take place, however, without more accurate specification of the usage and the collection of the monitoring data. Currently, both the management that observes things on a fleet level and the field personnel that have unit level views have the problem of scattered that could be used as grounds for decision making.

The boats in the case company are currently operated rather independently. The boatmen have in the boats' cockpit meters that inform them about the engines' key measures such as fuel consumption, temperature, oil pressure and many others. Based on that information and the schedule that is created based on the pilotage related transportation needs, the boatmen operate the boat as they see best. The company has only a few guidelines for the usage such as the prohibition of the bottom hits that can be avoided by adjusting the boat's speed to the size of the waves.

During several decades of the operations, the field units of the company have created their own habits of operating the boats. Probably many of these habits are based on the knowledge that the professional field personnel have about the boats and their technical setup. Therefore, it can be expected that the habits correspond in a satisfactory way to the general norms of the industry.

However, the analysis of the optimal speed ranges or factors ensuring the long-term duration of the engines' cannot currently be facilitated. Also the premises for the fleets' life cycle decision are rather weak. The reason for this is the absence of long-term data.

In addition, the humans' ability to absorb and process data is limited. It is even harder to read out from that data the effect of the different marine operating conditions and other relevant factors. In order to gain access to knowledge-based decision making, encompassing long-term data needs to be collected and analyzed in a correct way. The case company has in co-operation with an IT start-up company developed a demo version of a fleet management system that is based on the telematic monitoring of the engines CAN-data and boats' spatial AIS data.

The needed data is nowadays accessible due to the existing data streams, lowering prices of sensors and developed data transferring possibilities. By acquiring fleet tracking data, the organization can develop relevant metrics and more efficient working practices. However, the implementation of such metrics and practices might not be a trouble-free process. The boat crews and the pilot passengers might not accept the limitations and the requirements that the new practices will present. Therefore, they might resist the change.

The participation of the boats' end-users into the development work would enable more applicable practices and measures with a higher relevance. It would be likely that such a way of proceeding would make it easier for the employees to accept the outcomes of the work.

Therefore, the objective of this thesis is to *create a change-inducing model for the field units*. Firstly, the purpose of the proposed model is to allow the employees an understanding of the reason why the organization is harnessing fleet data in its operations. Secondly, the model allows the employees to participate in the defining of the measuring that is done in the boat operating. Thirdly, the model facilitates the changes that are needed in the field units so that the case company can both reach the benefits of the data-based fleet management and ensure the contribution of the field employees.

The outcome of this thesis is the change-inducing model for the field units.

### 1.3 Key Concepts

This Thesis uses the following special terms which are introduced in an order of appearance in the text and thereby are logically presented to the reader.

*Pilot Boarding Ground (PBG):* A location where the pilot either embarks or disembarks the ship that is moving during the operation. The location is defined on charts and situated at the far out end of the fairway.

*Pilot cutter:* A steel-hulled work boat that has been designed for the transportation of the pilot to the target ships in the winter and in hard seas. Such a boat, compared to its size, has a phenomenal ice breaking ability. A big majority of the case company's cutters can proceed through a 45 cm thick solid ice.

*Embarkation:* At the PBG the target ship, as it turns, creates smoother seas to its side, in other words makes lee. The pilot boat proceeds to the pilot ladders and the pilot climbs to the deck of the ship. In disembarkation the pilot climbs down from the ship to the pilot boat.

*Fleet:* In the context of fleet management, a word fleet does not refer especially to vessels, but to a population of similar physical assets. When the similarities are strong, a learning that is done based on one unit can be applied to all of the similar units.

*Industrial Internet-of-Things (IIoT):* IoT is the networking of, for instance devices, machines and other items through the internet. When items contain software and sensors, the connectivity makes it possible to collect and exchange data. The data that are produced and shared through the Industrial Internet of Thing (IIoT) is, due to its more specific purpose, more structured, correlated and set up for analytics.

*Big data (BD):* The datasets springing up contain vast and increasing amount of information. This data, when interpreted, can facilitate a new kind of decision making. However, the velocities and the forms of data vary and therefore BD is hard to handle with traditional methods.

## 2 Method and Material

This section explains how this study was carried out. Firstly, the research method that was used in this study is described. In addition, its applications to the work are explained. Secondly, the research design is introduced together with the stages of the study. Thirdly, the collection and analyzing of the data, in which the study is based on, is explained. Fourthly, the final section details the evaluation that was done on the contents of this thesis.

### 2.1 Research Approach

The main research strategies for carrying out a management study are *field work* and *desk study*. The choice between these general strategies defines whether the carrying out of the research will be done behind the researcher's desk or on the field (Blaxter et al. 2010:65). The research approaches most suited to study this type of issues are action research (AR), case studies, experiments and surveys.

AR is a family of research methodology which intends to find solutions or improvements to practical problems. Its goal is to pursue better understanding and change through action. French (2009:188) AR differs from other approaches as it is related to research that takes place in action. Other approaches are focused on researching the action that took place. According to Greenwood et al. (1998:51), AR produces practical solutions. Greenwood et al. state (1998:51) that the actions of the AR process are "aimed at transforming the situation in democratic directions". Furthermore, Hart and Bond (1995:37) point out that AR is educative and involves a change intervention. All these aspects favor the goals of developing the organizations working practices. Based on the setting, the AR is seen as the best research method for this particular study.

The AR as a research approach contains two distinguished roles, the practitioner and the researcher. The practitioner, who has an insider's perspective to the studied issues, brings into the research the knowledge of the workplace's history and culture. The aim is that the researcher is an expert of theory and research (French 2009:195). However, as Blaxter et al. (2010:48) point out, there are some disadvantages in the researching of own workplace. For instance researching of people and issues that are simultaneously managed by the developer is challenging as the setting can cause a feeling that

the developer already knows the answers. The setting requires rigorous and at the same time transparent work from the researcher.

In literature, the process of AR contains four steps that the participating group works through to complete the process (French 2009: 192). However, Grundy and Kemmis (1981:324) state that the phases are not real static steps, but rather “moments in action research spiral”. The starting point of this cyclical process is the notion of problem – something needs to be developed. (French 2009:194). Though Grundy and Kemmis (1981:323) regard a single cycle only as “a beginning of larger process”. Figure 1 below presents the cyclic process of AR.

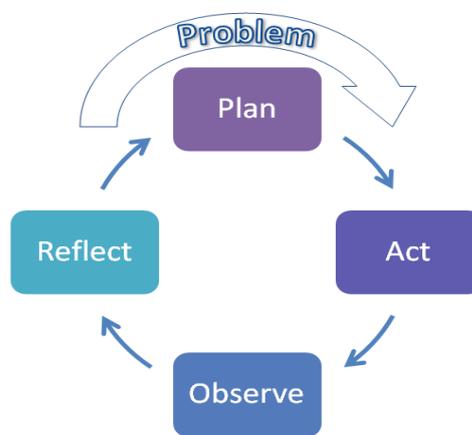


Figure 1. The cyclic process of Action research

As shown in Figure 1, as the notion of the need for a change is clear, Action research starts with *the Planning* step. The purpose of the planning is “to develop a plan of informed action to improve the current practices”, as formulated by French (2009:194). However, the plan needs to be flexible enough as its purpose is not to act as a limitation for the participatory process of knowledge generation and process definitions done by the research group.

The second step in Action research is *Action*. The group members execute the plan that has been put together. However, as the work takes place in real environment and involves real people, the process of action cannot be completely mastered and managed by the plans. Nevertheless, action phase is also used in the development of further action. (2009:194).

In the AR research process, careful *Observing* is needed for the collection of the evaluation content, the evidences. Kemmis and McTaggart (1998a:12) advice that the moment of observation needs to be planned, but at the same time it needs to be able to react on the surfacing of unexpected results.

According to Grundy and Kemmis (1981: 330), *Reflection* phases - or moments - in the AR cycle make the locus of analysis. Reflection provides the important insights, needed for progression of the research process. As the practitioner has the exclusive role of intermediary in these moments, it is essential to stay aware and refuse the invitations of self-deception.

This study strives to find practical solutions and has, in order to facilitate a future change of work in the organization, a necessity to engage the field employees in the creation of the new processes. As this study discusses areas of organizational behavior and focuses on exploring, the data available for this study are very much non-numeric. The focus is very much on the operating processes of the case company. As in depth analysis was also needed in some areas, the *qualitative research* was chosen as a strategy and as a knowledge camp of this study.

According to Blaxter (2010:66), research that is conducted as a desk study leans on the theoretical content and therefore such work is limited behind the desk. This study involved field working practices and their development. Due to that reason this study was not conducted as desk study, but as *field work*.

The strategy was to carry out the work as qualitative research. As the questions this study handles are much related to the case company, the chosen research approach was Action research carried out as field work.

Due to the limitations that apply to this thesis, the study does not reach several rounds of planning, acting, observing and reflecting, as a more extensive AR research would. As the study proceeds from the first notion of problem to the objective definition, on to the current state analysis and in the end to the validation of the development process, the circle of *Plan-act-observe-reflect* comes to completion.

## 2.2 Research Design

The study is built in five stages and three stages of those contain data collection points. Each data collection point offers an intervention to the field working practices and provides insights and feedback, as visualized in Figure 2 below.

In the design of this study, the knowledge of the case company operations is used as an input to the phases of the research process. That ensured the generation of outcome, i.e. the change-inducing model, which will be suitable for the operating environment. The future changes in the field units' working practices rely on the intended outcomes within the study.

Figure 2 below shows the research design for this study.

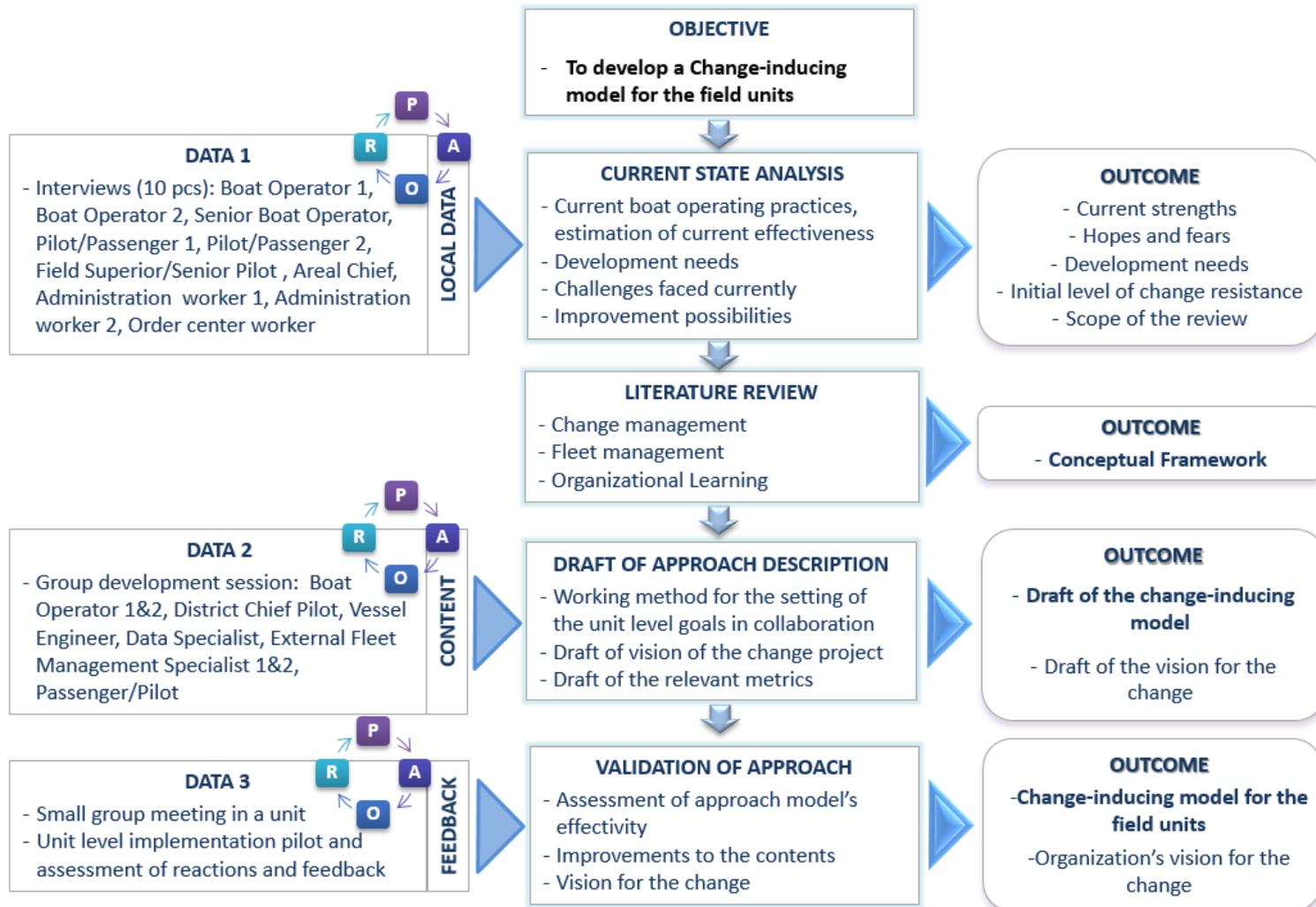


Figure 2. Research design of the study.

As presented in Figure 2, the study has five stages. In the *first stage*, the definition of the notion of problem is defined in terms of a real business challenge. The objective of the study is derived from the business challenge and the outcome from the objective.

In the *second stage*, ten interviews are conducted to collect Data 1. Due to distances, most of them are done on telephone. Field notes are taken in each interview. The purpose is to collect the material needed for the CSA, which will describe the hopes and fears, current strengths and development needs within the organization. Also a perception of the level of the current change resistance is created. Since the outcome of this thesis is a co-creation model, the employee aspects are therefore meaningful for the study.

The current state analysis introduces the areas of focus for the *third stage* - the literature review - that is situated after it. In the literature review, the study utilizes three different bodies of theory. First, the theories of change management are used when planning the approach of the development process towards the local units and employees. Second, the theories of fleet management are reviewed in order to understand how the company and the boat users could benefit from a more structured management of the company boats and the utilization of all the available data. Third, the study explores the theories of learning organizations in order to form a coherent combination of the new information and developing ways of working. The outcome of the literature view is the conceptual framework, which organizes the key ideas and theories in a form that is easily remembered.

In stage four, the proposal building, Data 2 is collected. As an outcome of the literature review, a draft of the co-operation process description exists and is processed further in a group development session. In addition to the normal notes on the feedback, also the reactions of the participating employees are observed in order to facilitate a further reflection. In this phase, the description of the co-creation process is finalized to a level that it can be piloted.

In *stage five*, the validation, the piloting to the model is done. The process is now taken to a field unit and exposed to the employee community. The descriptions of the contents that will be defined in the process are now gone through for the first time on the field. The data collected from the unit's boats is prepared for this session as well. The

insights gained in the reflection of data 1 and data 2 interventions play a key role in the avoidance of contradictions.

Again, the observations done in Data 3 collection phase plays a key role in the preparations of the final reflections. The needed adjustments are made after the last insights are encapsulated. All these stages and phases result in the final process description. Along with it, a vision for the change process is defined in order to mitigate the assimilation of the changes in the organization.

The collecting and analyzing of the data in all the collection phases plays a vital role for the rigorousness of this study.

### 2.3 Data Collection and Analysis

The data collection for this study was done in three iterations and relied on conducting interviews and discussion, participant observations, and analysis of internal documents. As this study is qualitative and involves the field work the natural way to collect data for the current state analysis was interviewing. Data collections 1-3 are described in more detail below.

In *Data collection 1*, a total of ten interviews was made. As this study aims at changing the way of working in all of the case company's field units, the sampling strategy was to get all the work functions of the field organization represented in the interviews. The target was to involve individuals that have the readiness to challenge the employer, so that the presented ideas would also receive critical evaluation. The same approach applies to Data 2 and Data 3 collection.

Details of Data 1 collection are shown in Table 1 below.

Table 1. Data 1 collection table

	Data type: CSA	Participants / roles	Topic, description	Date	Length	Documented as
<b>Data 1</b>						
1	Telephone interview	Boat Operator 1	Boat operator's aspects (CSA)	26-Jan-2017	71 min	Field notes
2	Telephone interview	Chief Pilot	Local superior's aspects (CSA)	26-Jan-2017	86 min	Field notes
3	Face-to-face interview	Admin 1	Administration's aspects (CSA)	26-Jan-2017	55 min	Field notes
4	Face-to face interview	Admin 2	Administration's aspects (CSA)	26-Jan-2017	83 min	Field notes
5	Telephone interview	Areal Chief Pilot	Areal Chief's aspects (CSA)	27-Jan-2017	95 min	Field notes
6	Telephone interview	Boat Operator 2	Boat Operator's aspects (CSA)	31-Jan-2017	80 min	Field notes
7	Face to face Interview	Pilot/Passenger 1	Pilot/passenger aspects (CSA)	1-Feb-2017	85 min	Field notes
8	Telephone interview	Pilot/Passenger 2	Pilot/passenger aspects (CSA)	1-Feb-2017	75 min	Field notes
9	Telephone interview	Senior Boat Operator 1	Senior Boat Operator aspects (CSA)	1-Feb-2017	78 min	Field notes
10	Face-to face interview	Order center	Pilot Order center aspects (CSA)	7-Feb-2017	40 min	Field notes

As shown in Table 1, three different groups of participants were involved in Data 1 collection: the field employees, the administration workers and external fleet management specialists. The same groups participated also in Data 2 and Data 3 collection as shown later in Table 2.

The interviews were documented with field notes during the interviews and the notes were finalized within a day of the interview. As expected, the interviews raised also some sensitive questions that the interviewees were slightly cautious to discuss. To encourage the interviewees to be more open and to increase the feeling of anonymity, no recording of the discussions were made. Instead, the field notes were taken as rich text. The identity was removed and the interviewees were named only according to their generic work titles. The filed notes are translated into English though the conversations were conducted in Finnish.

The interview questions were developed in the same process with the research design and based on the notion of the existing problems. The questions covered the description of the existing transport process, existing guidelines, current strengths and recognized development needs. Hopes, dreams and fears of the interviewee concerning the development of the transport functions and fleet monitoring were also surveyed.

The questions were written knowing that the target group might not easily understand them. The attempts to make the questions clear were not all successful as, when replying, the interviewees still understood them in a varying ways. For instance the perceptions of the concept of transport process varied. During the interview, some further definition of the questions was made by the interviewer, but the interviewees were also allowed to interpret the questions in order to facilitate findings from aspects that were previously unknown to the interviewer. Data 1 field notes can be found in the Appendices of this study.

Next, Data 2 and data 3 were collected from group sessions, as shown in Table 2 below.

Table 2. Data 2 and data 3 collection table

	Data type	Participants / role	Topic, description	Date	Length	Documented as
<b>Data 2</b>						
11	Workshop/ Group development session	Participants: - Boat Operator1 - Senior Boar Operator2 - Areal Chief Pilot - Vessel Engineer - Data Specialist - External Fleet Management Specialist 1&2 - Thesis writer (Head of Transport Department)	Proposal building workshop. The work was based on the key CSA findings and on a set of questions that was prepared based on findings and the literature review.	28.3.2017	88 min	Field notes
12	Presentation to the Department Head's and all the Field Superiors	- Head of Transport Department - Vessel Engineer - All the Areal Chief Pilots and Chief Pilots	Presenting of the outlined solution, feedback on the contents.	6.4.2917	30 min	Presentation, field notes of the feedback and observations
<b>Data 3</b>						
13	Field pilot	- Senior Boat Operator - Boat Operator1 - Boat Operator2 - External Fleet Management Specialist 1 - Thesis Writer (Head of Transport Department)	Validation of the approach model. This is done as a pilot on a field unit (co-creation of the guidelines and metric) and by monitoring the behaviors. All the available field unit staff is invited to the session	12.4.2017	90 min	Field notes of the feedback and staff's reactions

As shown in Table 2, Data 2 was collected from the proposal building workshop. The working of the group focused on the elements of the proposal and especially on the creation of metrics and guidelines. Therefore, the direct input was fed into the element of the model before the validation took place in data 3 collection phase. Field notes, containing both the feedback, comments, reactions and other observations, were written in the group session.

Data 3 allowed feedback from the direct implementation area of the model, one of the case company's field units. The reactions of employees' were highlighted in data 3 observations as the saturation of this study and the change-inducing model required a thorough reflection following a field implementation pilot.

As for the data analysis methods, this study utilizes thematic content analysis for the analysis of all its data. In the analysis of Data 1 the content of the field notes was categorized into different categories to make sense of the results from the current state analysis. The analysis of Data 2 and Data 3 was done based on the field notes and the observations. To follow the AR process, time was taken to reflect on the observations.

It needs to be noted that the research of this Thesis is a department head in the unit, so his observations plays a significant role in the Thesis. The research himself also conducted all the interviews, so that the interviewer and the interviewee always knew each other from before. This setting might have underlined the meaning of the neutrality of the questions, but special efforts were made to remain unbiased. This topic is further discussed in section 7.3, when evaluating the results of the study.

The next section discusses the results of the current state analysis is made.

### 3 Analysis of Current Way of Operating the Case Company's Boat Fleet

This section discusses the results from the current state analysis of the company's operations. It focuses on the analysis of how the pilot transportations are currently executed and the boats operated by the company.

#### 3.1 Overview of Current State Analysis

This section describes the logic behind the execution of the current state analysis. The current state analysis was conducted in seven steps. As mentioned in Section 2, the goal in all the data collection phases was to receive a critical assessment on the planned development initiatives.

First, the analysis focuses on the transportation process of the case company. To create a map for the current transportation process, ten interviews were conducted in the case company. Each interviewee was asked to describe the different phases of the pilots' transportation process in their unit. The forming of the resulting process description required combining of the data that the answers of the different interviewees contained.

Second, the analysis covered the guidelines and metrics that exist for the operating of the fleet. This allowed an understanding on the current level of instructing and measuring the operating of the boats.

Third, the analysis approached the strengths of a current way of operating. This was done in order to understand the practices and outcomes that would need to be treasured.

Fourth, the interviewees were asked about the development needs that existed in the current way of operating. The goal was to ensure that the proposal built in Section 4 would correspond with the operating seen by the employees.

Fifth, the interview questions covered the hopes, dreams and fears that the particular employees experienced in the area of developing the operating the boats. Potentially the most disturbing development initiative is recording and monitoring of the engine

data and boats' spatial data. Therefore the issue was positioned to the end of the list of questions and dealt simultaneously with the recognized needs of long-term data.

Sixth, the analysis focused on the potential limitations that existed for the development of transportations and use of boats. The purpose was to gain insight about the underlying factors that could hamper the reaching of development goals

Finally, the key findings of the CSA recognized. This was done based on the formed Data 1 that is the outcome of the interviews described above.

In order to support the collection of Data 1, the interviews were conducted in the following way. First, the questions were built based on the notion of the problem that the discussions in the case company have created. Next, the interviews were conducted so that the anxieties of discussing in-depth operational details with the company's department head would be relieved. As for the field notes, they were written from each interview and later merged to create a holistic picture of the issue.

### 3.2 The Current Process of Transportation in the Company

The case company's transportation process involves the around 260 participants. However, the case company did not earlier have description for it.

Based on the results of the interviews, it seems that the process can differ in each pilot station based on the distances, boats used and the location of the pilots. Part of the pilot stations have started to utilize the company's call center, which is handling the pilotage orders, in their transportation planning processes. In some areas the planning is done by the field workers. Despite the slight differences, a general process description, applicable to the pilot transportation on all the stations, can be outlined. The resulting process description is presented in Figure 3 below.

As shown in Figure 3, a common version of the case company's transport processes and in it, the pilot is transported to the sea, so that he can embark to the vessel at the PBG. The pilots' transportation in the company contains also the road transportation by either driving themselves and to be transported by the internal or external services. However, that part of the transportation process was, due to the limitations of time and the lower economic significance, left outside the scope of this thesis.

With the particular process description, a model was chosen that allowed the simultaneous presenting of both the transport process and the decision making process with its outcomes. As seen in in Figure 5 later in this section, the decisions (the red color boxes) concerning the transport process within the company are made by three different persons; the pilot order center's operator, the pilot and the boat operator.

However, as known in the case company, there are several variations of the transport arrangement and the presented one concerns a transportation in which the pilot is taken out to the sea to meet an incoming ship. If the purpose of a transport is to collect the pilot from the outbound ship, the roles of the decision making are different. Nonetheless, the presented process does give a rather generic overview of the whole transport process.

Figure 3 below shows the current process of transportation in the case company.

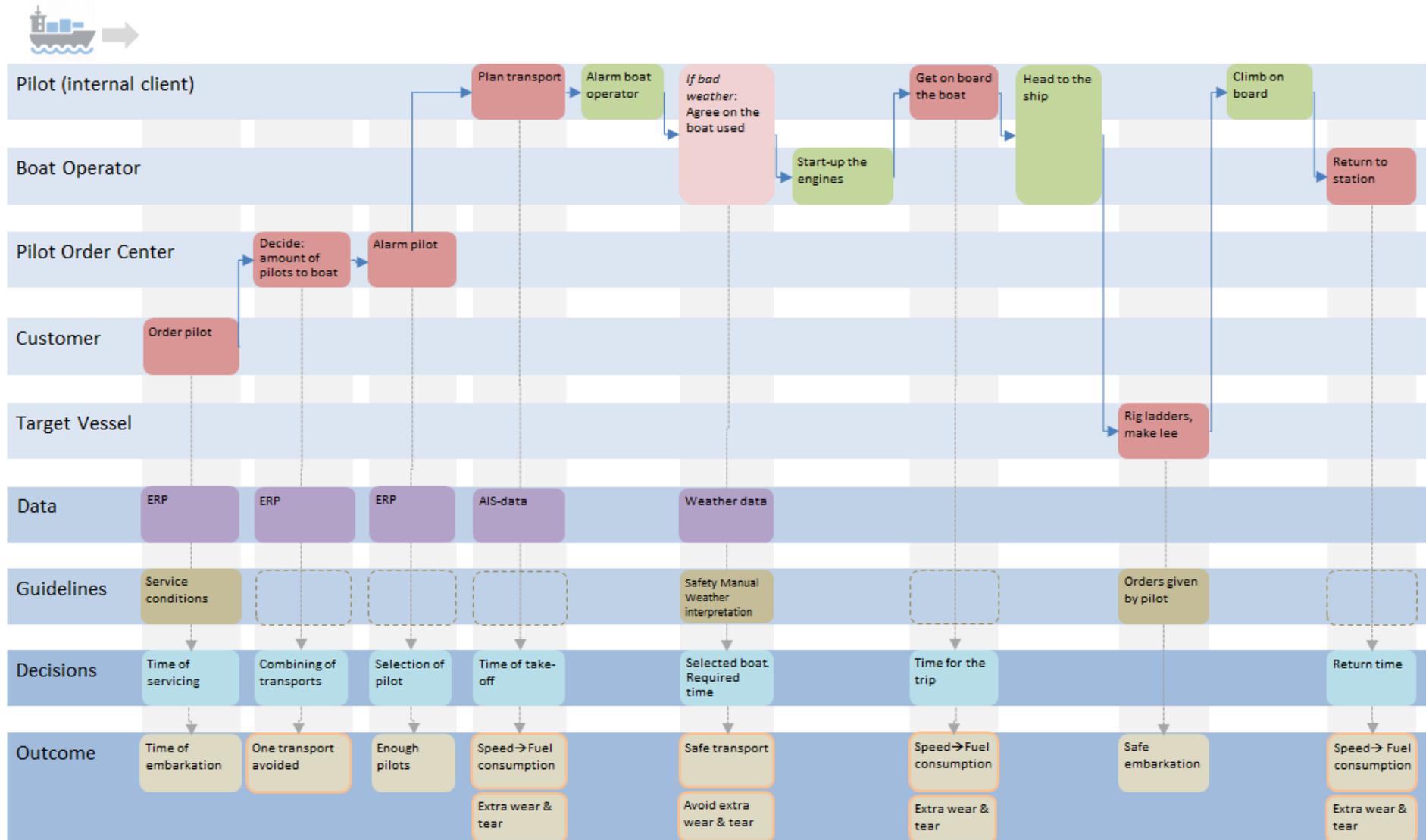


Figure 3. Description of the transport process and decisions, guidelines and outcomes within it

According to the interviewees, the transported pilot has a key role in the transport process decision making. The pilot with his scheduling defines the time when the ship is expected to be on the Pilot Boarding Ground (PBG) and the time that is reserved for the boat to proceed to the ground. The pilot role is also pronounced due the fact that, according to the interviewees, the exact departing moment of the boats is defined by the moment that the pilot arrives to the boat.

As presented in Figure 3, the decisions concerning the boats travel times have direct connection to the outcomes. The consumption of fuel and the amount of the boats and engines wear and tear grow if the boat is in a hurry and a lot of power is needed to create the speed required to reach the PBG in time. Due to the ships' limited capability to turn around of fairways and slow down speed at sea, the meaning of the timely arrival of the boat is highlighted. The pilot needs to be delivered to the ship before it reaches the point of no return.

### 3.3 Existing Guidelines and Metrics Concerning Operating of Fleet

As presented above in Figure 3, few of the decisions made within the transport process are not framed with any guidelines. The guidelines that the interviewees mentioned many times were connected with the company's definitions of the safe working practices and also with the legislation. Other than that, no actual guidelines were mentioned. However, a few interviewees referred to some kind of semi-standard boat travel times that were used in the calculation of time needed for travelling.

Also, on some boats, the boat operators themselves had printed some kind of instructions of the optimal rounds-per-minute that should be used when driving the boat. Respondent 4 pointed out the following when asked about the existence of instructions:

*There are no real instructions. This is more about the habits has been developed over the time. It is a sort of a heritage from the older operators to the younger ones. (Respondent 4)*

The only named metrics were annual report of the CO<sub>2</sub> produced and the fuel consumed in the transportation. The staff's perception of the existing guidelines and metrics within the area of transportation and boat operating is meaningful for the case company as the aim is to build new guidelines for the function. The existing guidelines - even less institutionalized ones - could be used as a starting point in the development

of more encompassing guidelines. The answers also draw an image of rather liberal field operations.

### 3.4 Strengths of the Current Way of Operating

In the interviews, the aspects of the development needs were touched rather lightly and they were not handled as failures or mistakes but rather as opportunities. The purpose of this was to support open sharing of thoughts. Based on the results from the interviews, the experienced strengths of the boat operating can be condensed to two things, the modern fleet and the highly professional field staff. In combination, these two factors were seen to ensure the safety of the operations, a central issue in the high-risk environment of the pilotage. The resulting performance allows the company a very high working reliability in all conditions.

As the boat operating is very little regulated by the management of the company, the way of operating is very flexible and the staff can decide on many questions. This was seen as strength by a couple of the interviewees.

Even the concept of best practice seemed to be a challenging one for the interviewees; it seemed to raise a bigger variety of thoughts in the mind of the interviewees. On one station, many transports were avoided by combining the transports of pilots together. Engine rounds in the engine room during a longer trip were also mentioned. It was also mentioned that, after a rethink, on one station the men had stopped proceeding with full speed from the sea to the station.

In general, one of the existing strengths seems to be connected to the planned development work. For instance, the introduction of guidelines and metrics can be seen to increase the regulation and create new limitations to the transportation operations.

### 3.5 Development Needs in the Current Way of Operating

When discussing the weaknesses and development possibilities, the scope of the answers was not limited or directed. The aim was to obtain a variety of possibilities perceived by the field employees.

This subsection contains the interviewees' opinions concerning the weaknesses of the current way of operating, the recognized development possibilities and the identified needs for long-term data.

### 3.5.1 The Level of Economy in Operations

Based on the interviews, the general understanding seems to be that the boats are operated and the transports are handled in a rather economical way. The views seem to be based on personal perceptions as no actual data are referred to. Some problems are noticed in the actions of single co-workers or in some unnecessary transport of pilots.

The views seem to indicate that the feeling of urgency is not easily created around the development of the issues. However, it is valuable to notice that the aspect of the field workers assesses the beneficiary from a perspective of a single unit and not from the whole fleet. The necessity and the usefulness of the development can appear on a different level, if the observing is done from the perspective of the fleet.

### 3.5.2 The Decisions and Lack of Guidelines

The pilots have a pronounced role in the decision making within the transport process, but no clear guidelines seemed to exist. A strong, decisive role can be seen both as a strength and as a weakness. The positive thing is the clear ownership of the whole pilotage process. That supports the desired outcome; the particular pilot will do everything in his power to reach the target vessel. On the other hand, also the negative side of this setting was raised by the interviewees. As the pilots are free to do the scheduling themselves, the pilots might reserve too little time or come late to the station. Such phenomenon is not described to happen amongst the boat operators. Respondent 4 pointed out the following when asked about the weaknesses of the processes:

*The boatmen are annoyed about the fact that some of the pilots come so late that the boat ends up in a rush. Such pilot might arrive to the yard of the station on the last possible second. (Respondent 4)*

The problem of not taking enough time for the boat trip and coming in the last second applies, according to the interviewees, only to a part of the pilots. On the other hand, some individuals have a habit of arriving well in time. It is not likely that work related

rush would apply clearly more to another individual than the other and therefore being late seems to relate to personal habits and lack of guidelines. Respondent 8 replied the following when asked about the personal interests regarding the transportation:

*Basically, I care about the fact that we are on time. Nevertheless, sometimes I am ashamed when the ships and the VTS can see that we are not doing sensible transport arrangements. The boat goes back and forth even there would be a better arrangement available. (Respondent 8)*

The answer indicates that not all the transportation decisions are made in a way that would be optimal. As the individual used a viewing angle of an outsider, the practices didn't seem sensible anymore.

The other boat operator acts as the boat master according to the law. Despite that, the boat operators do not, according to the interviewees, feel that they could question the pilots' requests of transporting. Respondent 6 commented the following when asked about the weaknesses of the processes:

*Not all the pilots do the most sensible things. They might want a ride to the mainland even it can be seen that they will need to be transported back to the island later on. They are the clients in a way and we (boat operators) do not feel that we can deny it from them. (Respondent 6)*

The answer concerns a transportation between an island station and the mainland. In this kind of a situation, the most sensible thing could be to wait for the next vessel on the island. Instead, the pilot chooses, possibly for personal reasons, to travel to the mainland. This answer and others similar to it indicate the relation between a boat operator and a pilot. As the boat operator sees the pilot as the client, the control measures of the transportations would be hard to execute by instructing only the boat operator.

As the pilots' own motives can affect the reasoning of the transport scheme, the arrangement can lead to unwanted direction. For the development of the change-inducing model, it is important to realize that it is not sufficient just to focus on the boat operators. The pilots will need to be engaged too, as they have a key role in making the decisions that either reduce the costs and extend the life cycle of the boats, or leads to the quite opposite results.

### 3.5.3 Needs for Data

According to the interviews, currently in the company it is not possible to get access to any real boat operating or transportation related data. The only data mentioned can be seen in the cockpit of the boat, but it is not collected anywhere and therefore long-term views into it do not exist. One of the interviewees commented: “Currently we don’t have any data other than the calculations.”

Boats with their propulsions, power production systems and hulls contain much more variables than the road transportation systems. The weather changes constantly and it has a big effect on the performance of the boat. Also the friction of the hull and the conditions of the propulsion vary. All these factors together with the weakening engine performance caused by the system wear and tear challenge the boat operators’ capacity to perceive the optimal profile of use and their ability to anticipate the unwanted changes taking place in the systems. Better tools would be needed to learn more from the boats optimal usage and to predict costly system failures from the long-term changes. Respondent 3 commented the following when asked about the availability of data:

*The results are not easy to remember later on. I was later on trying to remember a certain temperature from the moment when the boat was new, but I couldn’t. (Respondent 3)*

The answer indicates that, as no statistics exist, the time span that the boats are used with and the slow changes that take place in the engines and boat system’s currently challenge the staff’s memorizing and perceiving capabilities.

The available data would be needed for learning and decisions making. Respondent 7 replied the following, when asked about the availability of the data that concerns the boats’ usage:

*A better understanding of the whole operating cost would be meaningful. It would educate the men. (Respondent 7)*

According to the answer, the bigger picture of the costs that pertain to the transport arrangements and boats’ usage is not visible to all. The interviewee sees that offering of such data could make a difference.

### 3.6 Staff's Attitudes towards Development of Operations: Hopes, Dreams and Fears

The respondents are keen to see a variety of things looked after in the operations and there are clear personal and professional areas of interests. The most common desire is to see the boats and the engine functioning well and enduring the usage of them. The anticipatory maintenance of the engines and the outcome of it, the extension of their lifecycles and trouble-free operating, also rose as an issue. Also sensible use of the boats is mentioned, as well as the continuity of the internal service production, without any acts of outsourcing.

According to the answers, a failure in the communication and implementation can cause a wave of criticism. Respondent 6 commented the following, when asked about the concerns:

*I think there can be quite a wave of criticism. On the other hand, things have developed a little already and maybe that indicates a possibility of change in general. (Respondent 6)*

The answer indicates that the changes that it is not indisputable to introduce changes to the operation of the boats. However, the earlier introductions that have been successfully implemented can also support the future changes. There are also other opinions. The company has earlier successfully developed and introduced a list of collaborative fleet management applications to a Podio work space, which is mentioned as a positive example of development in the interviews. This gives some hope that people could be receptive to new things.

There is no extensive list of the fears, even though the fleet tracking can be seen as such. Respondent 6 replied the following, when asked about the key concerns:

*The fleet tracking can be felt to come too close. People could have a feeling of the "big brother" controlling. (Respondent 6)*

Obviously, the risk is that the system is seen just as managements' means of gaining control. This needs to be understood and regarded by the management. Respondent 1 stated the following when asked about the key concerns regarding the development of the use of the boats:

*A scenario where the people cannot follow the development is a worry for me. It is important to know and remember the reasons behind the development. The vision of the change is critical; why are we doing things.*  
(Respondent 1)

The answer suggests that the employees' possibility to understand why the changes are made is a pivotal role in the forming of their opinions. Again, this is something that the management needs to be able to address.

According to the answers there are a few pitfalls in the development of the monitoring of the boats; either the reasons behind the changes might not be understood or the fleet tracking might be felt as intimidating.

The hopes of the staff do not seem so be in direct conflict with the development of the data-based fleet management. Nevertheless, the requirements for the management's communication and the elaborate introduction are undoubtedly on a high level.

### 3.7 Potential Limitations to Development of Transportations and Use of Boats

To limit the risk of management painting a too rosy picture of the development potential, the interviewees were asked to identify factors that could limit the feasibility or the economic benefits of the data-based fleet management. The angle is useful as there are things that need attention, both in the scale of expectations and in the content of the change-inducing model. Respondent 6 voiced the following when asked about the existing limitations that can hamper the development of more economical boat operations.

*No one will straight away accept it that they spend more time in the boat.*  
(Respondent 6)

The answer is connected to the employees' pay systems. The pay and the working hours in the company are such that the field employees work for a week and are off for a week. Within the work week, no overtime is known and the only limitation for the working time is the minimum daily rest (between 7-10 hours). Inversely, the employees are not compensated for the extra time that they work. Respondent 9 replied the following when asked about the existing limitations that can hamper the development of more economical boat operations:

*The pilots might not accept the time that they would need to spend on the boats if the speeds of the boats are lowered. You never hear a direct request to drive faster, but the pilots do comment that they are in a hurry. (Respondent 9)*

The answer refers to the situation where there exists no incentive for the time that is lost when cruising with economy speed instead of proceeding with full speed. This might act as a meaningful source of change resistance, exactly as many of the interviewees warn.

Another limitation is connected to an even bigger priority as the economical use of boats, the pilotage resources. The company mostly serves a maritime freight system called tramp trade. This means that the ships have no exact schedules and they call the port as they are free from the earlier ones. The variation in the service demands is big and the resourcing has to be sensible. This means that in the busiest sequences, it is challenging for the company to service all the needs of the ships. During these times, the full speed of the boats might be needed even though that raises the costs. This reduces the savings of the economical use of the boats.

There are also some other reasons that can decrease the savings. The waves limit the speed of the boat quite often and during those times an economical speed is used anyway. There are also other factors such as vibration that precludes the use of some otherwise optimal engines' RPM (rounds per minutes) areas in the boat.

The operating environment and the systems are changing faster than earlier due to the changes in the technology, regulation and the environment. Therefore, one interesting factor is the method of learning and developing of the working practices described by the interviewees. The working community seems to have used a long time to reach the current state. One interviewee commented: "The current ways of working have been formed over a longer period of time. The development has been slow." The company has lately faced some situations where the collection of data and the generation and channeling of the created information have taken too much time. This has led, for instance to additional engine repairing costs.

### 3.8 Key Findings from the Current State Analysis (Data Collection 1)

Section 3 has introduced the findings that were made in the current state analysis. Out of those, the key development areas are itemized below in Table 3.

Table 3. Key CSA findings and their reasoning.

Key CSA findings	Reasoning
1. Lack of guidelines and metrics	Within the transport process, gaps exist in the guidelines and metrics that leave room for the pilots and boat operators to make decisions that cause extra fuel consumption and wear & tear of the boats.
2. Lack of long-term data	Currently, the employees or the management do not have access to any real boat operating or transportation related data. This does not support analyzing and building of deeper insights. Also, the data would be needed for learning, for example from the costs of the transportations.
3. Easily activated change resistance	As the individuals have not before experienced intervening of the managements in the transport operations, the introduction of company politics is likely to cause reactions in the field units. The field staff does not receive any financial compensation for the extra time spent on the boats. This existing lack of incentives supporting the economical transporting also raises the assumptions of change resistance.
4. Slow organizational learning	The development of the current ways of working has taken decades. Firstly, companies' operating environments are changing more rapidly. Secondly, the safety service business and the varying conditions that the case company operates in require efficient processing and forwarding of information. Thirdly, the efficient organizational learning can be pivotal for the development of the ways of working. Therefore, further processing of the issues is necessary.

As Table 3 above presents, the transportation process needs new guidelines and metrics.

*First, the lack of guidelines and metrics* is identified. The metrics developed in the fleet management system will include the contents of the new guidelines. This enables both the measurement of the economy of the transportation and the giving of feedback to the boat operators and to the pilots. Part of the guidelines can be refined from the par-

tially existing standard transport times. The refinement and implementation of the existing and workable standards allows a good basis for the development of the operations. Nevertheless, both the pilots, boat operators and the pilot order center staffs need to be involved in the co-creation of the guidelines and the metrics.

Second, *the lack* of long-term engine and spatial data is recognized within the company. The data would be needed for learning, educating, anticipatory actions and decision making. The only realistic way to accomplish this, due to the amount of the data and sources, is by automated data collection and analyzing. To avoid unnecessary change resistance, the company's existing policy of data that is open to all workers needs to be applied.

Third, the risk of the *easily activated change resistance* is identified. The assumption is that the staff is not paid for sitting in the boat and therefore they try to minimize that time. As the setting does not support the goals of the management, an excellent dialogue is needed in the development of the guidelines and the metrics for the economical use of the boats and transport arrangements. At some point, the beneficiary of incentives might need to be considered. However, due to the scope limitations of this thesis, the incentives are not selected for its scope. An individual's point of views based on a single boat and the management's fleet-based views might differ. This can create division with the perceptions of the benefits and impair the feeling of urgency that is essential for achieving the desired change. To create a clear direction and goal for the development work, the fleet and unit level benefits need to be composed and communicated. Through the change-inducing model, an understandable vision needs to be offered.

Fourth, *the slow organizational learning* is recognized within the company. The development of the ways of working had, based on the answers, taken several decades and no clear strategies for learning seemed to exist. To facilitate faster learning, discussion of the new models for the creation, refinement and intimidation of knowledge are needed in the company. To facilitate this discussion, a potentially applicable concept of organizational learning needs to be formed. To conclude, analysis of data 1 led to the notion that the theory of the learning organization needs to be added to the contents of the literature review.

The created change-inducing model, if proven successful, can have a big effect on the general leadership of the unit and on the co-operation between the management and the field employees. Such model might also be exploitable in the other areas of work development.

As a conclusion, introducing guidelines and metrics to a currently liberal and unregulated working environment is a challenge. Within the management's development plans, there are issues that the field employees will see relevant to their work. But even with those issues, the importance of the dialogue and co-creation is highlighted. Some contradictions will challenge the change-inducing model; the free time that the staff loses without compensation and the differing views depending on the viewing angle.

Hereafter, the focus of this thesis is on the most prominent weaknesses; the absence of the guidelines, the lack of long-term data, the easily activated incentive-related change resistance and the slow process of organizational learning. Hence, these are the themes that the literature review of the next section delves into.

## 4 Fleet Management, Change Management and Organizational Learning in Literature

This section discusses the bodies of theories that most closely relate to the areas of weaknesses that were identified in the CSA in Section 3. Firstly, fleet management is discussed to draw a framework for approaching of the currently absent guidelines and metrics. It also has, by giving an access to long-term data, connections to the effectivity of the organizational learning. Secondly, the theory of change management is used to correspond to change resistance that the future changes might arouse. Thirdly, organizational learning is discussed. That completes the entity by allowing understanding on how to enhance the organizational learning processes. At the end of this section, the conceptual framework is formed. It draws a synthesis out of all existing knowledge drawn from the theories and hence offers the foundation for the building of the solution for the business problem.

### 4.1 Fleet Management

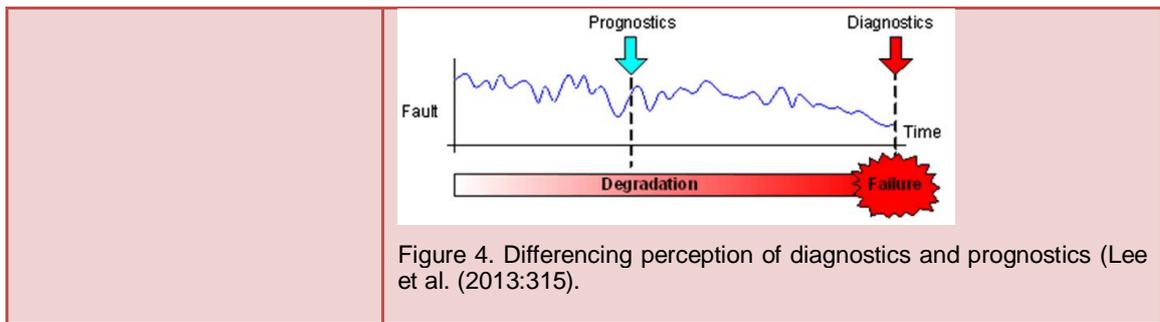
*Fleet Management* as a concept covers many different asset-intensive fields of businesses. The body of fleet management theory is somewhat internally segmented and contains several different concepts and terms that all can be seen relevant to it. Even the concepts are rather generic and applicable to the management of all sorts of physical assets, still many different concept related models and frameworks exist due to the engineering sector adaptations.

The frameworks, models and also the concepts related to fleet management are partially overlapping which makes it challenging to perceive and construe the whole of the fleet management content. To ease the process of understanding some key concepts are itemized in Table 4 below.

Table 4. An overview of fleet management related concepts.

Concept	Key content
<b>Asset management (AM)</b>	“Systematic and coordinated activities and practices that organization uses to optimally manage its assets, and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan.” (British Standards Institution. Cited in: Quertani et al. 2008: 362).

	<p>"The life cycle management of physical assets to achieve the stated outputs of the enterprise" (Asset Management Council 2014:7).</p> <p>"A strategic, integrated set of comprehensive processes (financial, management, engineering, operating and maintenance) to gain greatest lifetime effectiveness, utilization and return from physical assets (production and operating equipment and structures)" (Mitchell and Carlson 2001: 5).</p> <p>According to the Institute of Asset Management, good AM is characterized e.g. by being systematic, net value-for money focused, best compromise seeking and structured as a management system (IAM 2014: 8).</p>
<p><b>(Engineering) Asset management system</b></p>	<p>Asset management system introduces to the AM a separate management system that often is based on international standards (e.g. ISO 55000/1/2). Such system provides structure and guidance to the AM work and it contains the same basic operating principles similar to more familiar quality or environmental management systems. Organization, in order to harness such system, needs to establish, implement, maintain, measure and improve the system (ISO 2014:5).</p>
<p><b>Physical asset management</b></p>	<p>Asset management is to a large extent connected to the financial services. However, according to the Institute of Asset Management can be applied to the management of physical, enterprise, infrastructure, strategic, property and facilities assets (IAM 2014: 5). Physical asset management is used e.g. in railways, aviation, distribution and in electricity generation and supply. Hastings (2015:1)</p>
<p><b>Asset life cycle</b></p>	<p>Phases of assets' procurement (financial decision-making, planning), commissioning (installations, tests and introduction), operating/maintaining (asset health and performance) and retiring (decommissioning, disposal or resell) that follow each other (Quertani and Parlikad (2008:363). The goal of the view is the assets' maximized utilization through life-cycles.</p>
<p><b>Prognostics and health management (PHM)</b></p>	<p>Concept PHM originates to the medical industry, but has been assimilated to machine maintenance due to the need of sophisticated diagnostics. By applying the diagnostic methods the companies pursue to avoid the traditional diagnostics, where the repair is done after the failure (fill-and-fix practices). The aim is to access prognostics, which allows the repairing before the failure takes place (predict-and-prevent) (Lee et al. 2013:314), as presented in Figure 4 below.</p>



As presented in Table 4 above, the concept of asset management (AM) is pivotal for the goals that connect to the generally used fleet management term. The mere assimilation of the functions and practices inside this entity can be challenging as Brent and Schuman (2007:1) define the asset management, due to its inseparable complexity, as one of the last possibilities of a cost reduction in the companies' operations.

The conceptual model shown in Figure 5 below, (IAM 2014:16) describes the entity of AM and the relationships of the activities within it. Such more holistic view can be helpful in the perceiving of the whole of asset management.

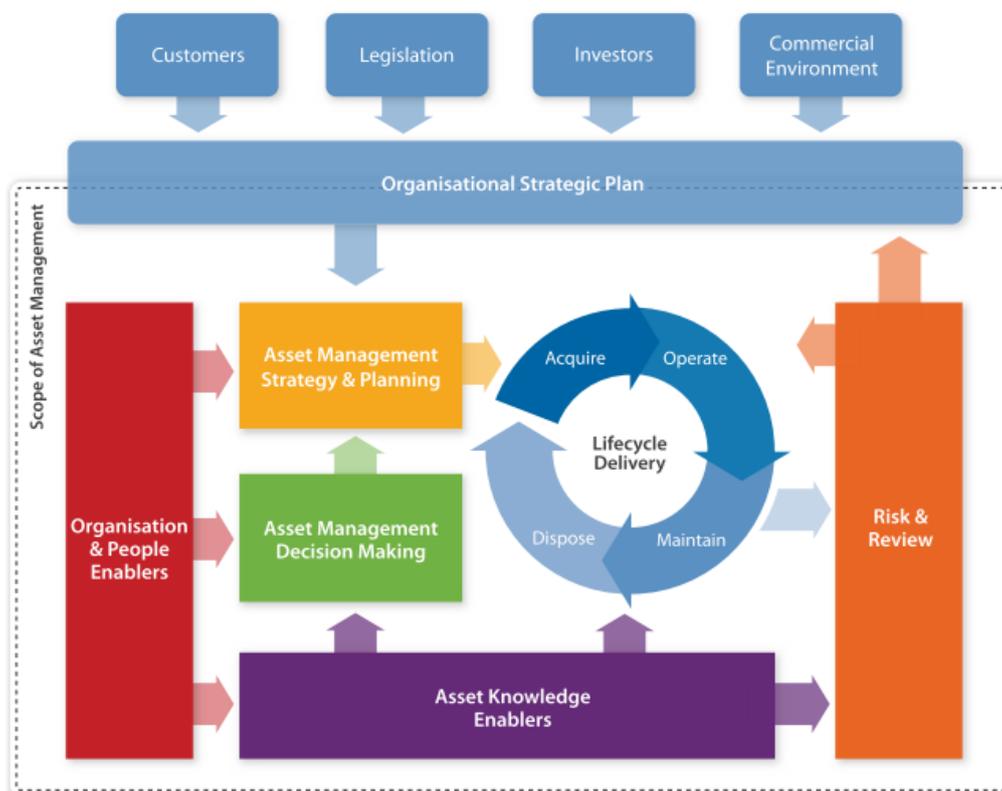


Figure 5. Conceptual model for asset management (Institute of Asset Management).

As seen from Figure 5, asset management consists of multiple different aspects. A comprehensive fleet management can be summarized as a systematic asset management that is targeted to a group of similar physical assets. A term of *fleet asset management* is used later in this study for describing describe this manifold of the management, asset, system and diagnostics related concepts existing for the management of a fleet of physical assets.

#### 4.1.1 Fleet Asset Management and Governance

According to Mardiasmo et al. (2008: 1555), some engineering systems can be viewed “as members of a population of similar entities – in other words a fleet”. Kinnunen et al. (2015: 2) define the fleet as “a population of similar physical assets”.

In the literature, there are several different systems and models for fleet management, based on the situations they are used in and on the target fleet. In wider terms, the concept of fleet management can be seen as actions of investing, strategic planning, maintenance, real-time operating, corrective actions and fault diagnostics and as the decisions that lead to those actions. (Kinnunen S-K. et al. 2015:4). These functions are positioned to the different phases of the assets’ lifecycle.

Although term fleet management is normally used in a broad context and can be seen to contain many fleet associated functions, Mardiasmo et al. (2008:3) separate it to engineering asset management and asset governance. The separation is presented from several aspects, but in general the engineering asset management is more related to the total life-cycle cost of the asset and has a technical angle of approach. The asset governance, in turn, is connected to the owners’ long term strategic goals and to the organizational and operational change. The reporting periods of the asset governance are shorter, such as annual reporting. Mardiasmo et al. (2008:3) state that asset governance - the aspect often overlooked when aiming to improve fleet management – is a key focus area when aiming to reduce the administrative part of the asset costs.

Mardiasmo et al. (2008:2) define governance as “the laws, policies and procedures that ensure organizations run in the interests of the owners...” Asset governance focuses on creating and instituting operant policies that are also transparent and accountable. The reporting of the monitored performance is done on a periodic cycle, which complements the common shortage of the asset management (Mardiasmo et al. 2008:3). The

perspectives of the asset management and governance complement each other and the linkage is the policy structure that defines the space for the implementation of the operational asset management (Tywoniak et al. 2008:1561). If the governance is absent and too much space is left, the management of the assets does not correspond to the strategic goals of the organization.

Heifetz and Linsky (2002:48) state that the managers have a tendency, when leading a change, to focus on technical solutions in situations where adaptive change would be needed in the organization. Employees that are facing a need for a change find a technical solution to the problem to be more comforting than the actual changing of their way of working. This can steer the managers to focus on a system solution and the adaptive change might not take place. Even though an issue raised by Heifetz and Linsky (2002:48) is not connected to fleet management, the warning is valuable. Therefore, when aiming to improve the operating of the fleet by implementing a technical solution, the adaptive change must not be neglected. In the field of asset operating this can be done by harnessing the asset governance alongside the asset management. This allows the company an access to the fleet benefits and administrative cost reductions.

#### 4.1.2 The Goals, Benefits and Data in Fleet Asset Management

The business practitioners in the asset-intensive organizations are challenged by the competition and by the aspects of affordability that require them to maximize the utilization of their assets. For this reason, the meaning of the asset management has grown (Tywoniak et al. 2008:1). The proliferating asset operating data and its usage in the decision making enables the management of the assets as a fleet (Kinnunen et al. 2015). If the data and the processing capabilities that connects the units of the fleet is missing, fleet asset management cannot be facilitated.

As the improved productivity, the maximized utilization through life-cycle and the lowest possible cost of owning are the eventual objectives of the asset management, the aspects of fleet management allow more data to this work. Due to the similarities between the member units of the fleet, the fleet and its units can offer exploitable data that enhances the prognostics of each individual unit (Voisin et al. 2013:1). As the number of sources and therefore the volume of the information are grown, the probability for the occurrence of significant information is increased. The data that the units of the fleet

can generate can be valuable on the level of the entire fleet (Kinnunen S.K et al. 2015:2). As Voisin et al. (2013:1) also state, “the fleet dimension facilitates predictive diagnostics”. Therefore, the owner of the fleet can benefit from the generation and the distribution of the data.

Kinnunen et al. (2015:1) perceive the locus of the fleet asset management to be situated to the decision making. Rising to the fleet level allows the utilization of wider data and thus facilitates optimizing decisions that result in improved management. (Kinnunen et al. 2015:5). When maintaining a fleet of assets, it is critical to understand the different kinds of decisions that are related to the improving of their management, because as Kinnunen et al. (2015:5) suggest, “the fleet data can be utilized in diverse optimizing decision making situations in order to improve asset management”. Kinnunen et al. state that the IoT permits the collecting of large amounts of data and therefore enables the utilization of the ecosystem in the fleet management (Kinnunen et al 2015:3). Thus, the decision making that realizes the benefits of fleet asset management is facilitated.

Also Stoller connects the data needs to the decision making and to the handicap that the decision makers experience due to the lack of information. According to him, the organizations need to make sure that the answers gained from the data are worth the big-data solution. To facilitate this, they first need to identify their most critical questions that, when left unanswered, can cause meaningful problems. (Stoller 2012:19) Otherwise, the introduction of the big-data solution might not be beneficial for the organization.

In their article, Kinnunen et al. (2015:5) collected different kind of fleet decision making situations from the fleet management associated literature. *Reactive decisions* take place right after and due to the occurred event. In fleet management for instance a decision of fleet-wide corrective maintenance can result from a fault in one of the similar assets. *Real-time decisions* aim on instant utilizing of the real-time data. Scheduling decisions based on the location of the unit can for instance be classified as such. *Pro-active decisions* have a preventive nature as they aim at avoiding for instance a system break-down before it takes place. To enable such decisions, diagnostic and prognostic tools are needed. *Strategic decisions* have a longer time frame and they cover issues such as strategy and investments. Long-term history data can be utilized in these fleet decisions during the whole life-cycle of the assets.

Fleet decision making is not similar in every business environment as the logic of the assets' operating and the operating conditions vary. A marine environment is different from some other fleet operating environments.

#### 4.1.3 Data in Marine Fleet Asset Management

The marine business and operating environment differs rather much from the normal production industry or logistics that both are common scopes covered by fleet asset management. In the marine industry the total number of units is much lower and the sizes of the fleets are considerably smaller than for instance in the road transportation. The life cycles of the units are, due to the high production costs and limited amount of usage, rather long. This leads to a rather slow cycle of renewal. Medina-Oliva et al. note that the vessels in the marine industry are also highly customized and therefore the units are heterogeneous. This leads to a reality where the amount of exploitable historical data from identical units is very limited. (Medina-Oliva et al. 2012:3). Because the operating conditions (waves, wind, ice etc.) change a lot and the water resistance and propulsion system are also subject to change, significant variance exists in the data compared to road transport.

A fleet consists of a system, sub-systems and equipment. In the marine context, an example of a system is a vessel. Subsystems in a vessel are, for instance, its propulsion and electric power generation systems. The highly important diesel engine and propeller shaft are classified as equipment (Medina Oliva et al. 2012:1). The correct categorization comes to question when the data-structures are defined in the fleet management systems.

According to Ristic et al. (2008:40), "the most important self-reporting maritime system is the Automatic Identification System Automatic Identification System (AIS)". It is regulation based vessel identification system. In addition, data needed for the identification, the system also constantly broadcasts vessels' spatial data. It can be used onboard the vessels for collision avoidance and other safety and security purposes (Mou et al. 201:484). In addition, the data is also collected by data stations and made available on the internet, which makes it a useful source of data for analysis purposes.

Another source of exploitable and automatically produced data is CAN-data. A Controller Area Network (CAN bus) is a vehicle bus standard. The CAN data is produced for instance in modern diesel engines and it contains at least part of the relevant metrics that are needed to monitor the engine. The monitoring devices can use the data that is transferred through the CAN bus into them. Automated data logging and telematics are commonly used to collect the bus data and to transmit it to the IT cloud environment. (Beusen et al. 2009:550). These automated data processes form a basis for the engine monitoring and analysis.

#### 4.1.4 Synthesis of Fleet Asset Management

The fleet asset management aims at providing tools for the decision-making that pursue the maximization of the individual fleet members' whole life-cycle value. In order to provide the desired value and to manage the asset risks, analysis of the collected fleet data is used to align the work with the goals on the different levels of the organization.

The exploitation of the fleet dimension combined with the prognostics provides tenfold of potentially useful and industry-relevant data and, in best cases, allows the fleet owner to react in advance on the soon befalling failures. The fleet asset management presents a tempting ability to pay itself, as the cost originating from the predict-and-prevent method is generally cheaper and resulting overhauls cause less asset downtime compared to the fail-and-fix practices.

To reach these high-hanging and challenging fruits, the organization needs to create tools for collecting and analyzing the fleet data. The knowledge created out of the data needs to be distributed to the individuals that make the variety of the fleet decisions situated on the different levels and in the different domains. In order to serve this consequential function, the organization needs to approach the demand of data from the angle of the decisions so that the right people can apply the right kind of data for their decisions, right on cue.

When viewing the promising sights of the asset management, also the more traditional governance functions need to be kept in the minds and exercised. The management needs to complement the new activities with the owners' asset-related long term goals by providing the asset related policies and strategies. The organizational and operational change needs to be ensured with the support of the periodic reporting of the

monitored performance. The mental absorptive capacity of individuals fails short from the required processing abilities. Hence, the harnessing of the available data and analysis method requires a technical solution. However, the unavoidable IT-based fleet asset management system must not be seen or presented as a real solution, but only as a system that can both guide and motivate the adaptive change within the organization. In practice, the intuition and the choices made by the individuals still hold the linchpin in the operational reality.

According to Janssen et al. (2017:344), the collaboration is essential for the quality of the big data decision making. The actors of the data chain need to have trust for each other, capabilities and willingness to contribute. The application of the methods of change management and organizational learning can help to direct the orientations towards a state that is needed for the successful big data decision making.

The fleet asset management is said to be so complex that it limits the application of its contents in business. Unfortunately, the literature contents do not provide such synthesis or application methods out of the key concepts that would lower the bar within the organizations. The over-simplifying might not serve the purposes as the matter is complex matter, but placing the key practices and fleet logic to an application-supporting framework and process model would open a structured way to support the exploitation of the fleet asset management.

This subsection discussed the theory of fleet asset management. The next subsection discusses the contents of a body of theory that is pivotal for the realization of an organizational change.

## 4.2 Management of Change in Organization

*“Any great change must expect opposition because it shakes the very foundation of privilege”.* (Lucretia Mott, 1853, speaking in New York)

When discussing the area of change management, Kotter (2014:3) details how the accelerating business environment requires constantly more agility from the companies. The challenges that organizations experience relate to issues such as disruption of existing business models, the growing amount of data and ever more complex sources of competitiveness. All of these issues require transformation abilities from

organizations and cause the question of change management to be more topical than ever.

#### 4.2.1 Principles of Organizational Change and its Management

Reaching the objectives of the change is known to be challenging. Ashkenas (2013:1), referring to multiple studies that are carried out, places the organizational change project failure percentage to 60-70 %. This section describes some of the basic concepts and models of change management that can help avoid setbacks and conflicts.

If the organization's emerging objectives and the employees' current ways of working and mind-sets are seen to conflict, an unprepared introduction of new courses can threaten the achievement of the objectives or at least require immense managerial attention.

Organizational change is commonly seen as a management project. Nevertheless, Moran et al. (1999:111) highlight that the change management reality means management of the people that are facing the change. Moran and Brightman (2001:111) give the following definition of change management: "Change management is the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers." Weich and Quinn (1999:381) suggest that change is connected to the ability to adapt. Change starts when adaptation fails. On the other hand, they suggest that change is a natural state. Therefore "the change never starts because it never stops" (Weich and Quinn, 1999:381). More et al. (1999:111) observe that change is not linear which means the beginning and the end of it often cannot be clearly defined.

The body of change management theory also contains views in which change is seen either as planned or as emergent. The planned approach was introduced by Lewin already in 1946 and it is the most prevalent approach to change (Bamford and Forrester 2003:547). This section describes change management as a process.

In Lewin's approach, organizations move through a process of pre-conceived and fixed steps. The structure allows the management to construct a picture of the progress in a similar way as in AR model, which was also created by Lewin (Bamford and Forrester 2003:547). In 1958 Lewin introduced the classical three-step change model which con-

sists of such steps as *unfreezing*, *moving* and *refreezing*. Firstly, in the model's unfreezing step, a perception of the need for change is created. Secondly, in the moving phase the organization moves towards the desired behavior. Thirdly and finally, in the refreezing phase the new organizational behavior is set as a norm. (Lewin 1958:210-211). The model has served as a basis and starting point for many further developed modern change models.

#### 4.2.2 Change Management and Personal Motivations

Kotter's eight-step model for transforming the organization (Kotter 1995:61), later referred to as Leading Change model, has become very popular and widely known for dealing with change. He has lately released an updated model of his theory (Kotter 2014: Accelerate), which responds to the experienced acceleration in the change of business environments and to the development of the organizational models.

In this model, selected key individuals, appointed in the hierarchy, form the core group for transformation process. In new the solution, later referred as Accelerate model, several change processes are carried out simultaneously and in an agile way (Kotter 2014:14). By creating a networked operating system around the transformation need and only by supporting it with the traditional hierarchy, more flexibility is created and more individuals are participated. Kotter states (2014:30) that this develops "a whole new capacity for speed and agility. In this transformation of the operating system, the organizations' focus shifts from doing a single thing very thoroughly to thriving for opportunities and to completing those opportunities quickly (Kotter International 2017:8). This way, the organization can develop a higher ability for the creation and capitalization of innovations.

The Accelerate model is circular and built around the big opportunity. The steps of a change leader, extracted from Kotter (2014) are presented in Figure 7 below.



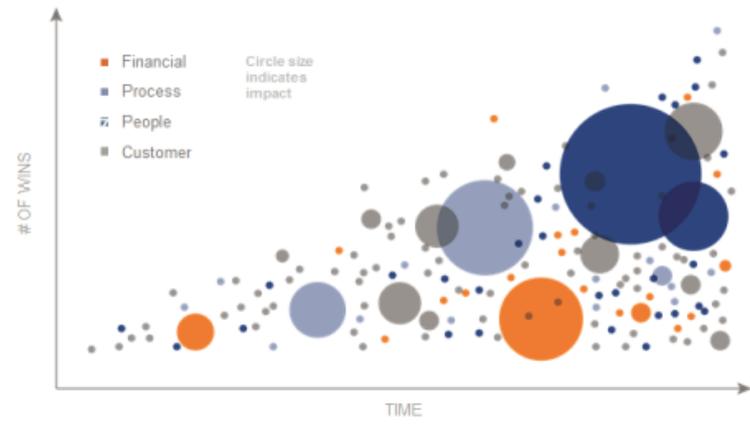
Figure 6. Steps for the change leader, formed from Kotter (2014).

In more detail, Kotter's updated Accelerate process model (2014) consists of the eight following accelerators that are the steps of the organizational change process (Kotter 2014:29-34), as shown in Table 5 below.

Table 5. Eight accelerators of Kotter's Accelerate process model.

Accelerator (process step)	Key functions
1. Create sense of urgency	Sense of urgency is very much connected with the big opportunity which is the starting point of the whole process. The leaders' task is to <i>define and elucidate the targeted opportunity in a way that appeals to individuals and gets their minds attached to it</i> . This leads to focused readiness. (Kotter International 2017:10-11)
2. Build guiding coalition	Whereas in the Leading Change model the guiding coalition was formed from people with power (Kotter 1995:61), in the Accelerate model a larger group and more <i>diverse group of effective individuals</i> is harnessed as the engine of the organizational change. This allows a <i>direct and natural way to participate the different levels of the organi-</i>

	<i>zation through the people who can all communicate and interpret the message of the opportunity.</i> (Kotter International 2017: 12-13)
3. Form strategic vision and initiative	In order to be motivated and focused, people need to be able to see the purpose and the goal of their work. When <i>aiming to capitalize a further-off opportunity</i> that is obscured by the distance, the <i>leaders need to make it more visible</i> for everybody by using presenting a strategic vision. The strategic initiatives are a mean of taking <i>fast and good enough steps towards the realization of the strategy</i> (Kotter International 2017: 14-15)
4. Enlist volunteer army	Whereas in the Leading Change model the task of the leader is to empower others to reach towards the vision (Kotter 1995:61), in Accelerate model the goal is <i>to involve and activate a bigger group of individuals</i> with the help of all available means (Kotter 2014:93). A large-scale change can be carried out when the sizable mass of individual aligns themselves with the direction of the opportunity. For this to take place, the individuals need to experience a <i>freedom to be active and participate</i> (Kotter international 2017:16-15).
5. Enable action by removing barriers	The fifth accelerator is a lot connected with the fourth one. Different kinds of barriers, such like silos, rules, processual inefficiency, can limit the change initiatives from succeeding. In the Accelerate model <i>new ideas and the needed change are raised to a higher meaning that the other organizational matters</i> and the leaders' task is to <i>remove barriers that limit them</i> . The collapse of organizational silos and forming of new co-operation leads to innovations. (Kotter international 2017:17-18)
6. Generate short-term wins	The strategic vision is too far for most individuals and the wins don't happen in one specific moment, but accumulate over a longer period of time, as presented in Figure 6. The wins are not only limited to financial wins, but include also process, people and customer related wins. The two models created by Kotter both aim to the generation of short-term wins that are visible improvements from the past. By <i>recognizing and celebrating the wins and the individuals that participated in the improvement</i> , the <i>organization energizes itself, possesses a part of the wins and displays progress of all involved</i> . (Kotter International 2017:19-20)

	<p>Wins accumulate over time and lead to tangible business results.</p>  <p>© 2015 Kotter International THE "WHY" 44</p> <p>Figure 7. Accumulation of wins over time (Kotter International 2017:21).</p>
<p>7. Sustain acceleration</p>	<p>Instead of the consolidation of the improvements, the seventh step of the Leading Change model, the Accelerate model aims on ensuring the positive development of the acceleration and the agility that has been planted to the organization. This phase demands both ability to adapt quickly and balancing management from the change leaders. Their everyday task is to <i>support the acceleration</i> for instance by finding and involving the talent and by removing the misalignments. <i>The over-management must be avoided so that other efficient individuals have space to lead the development.</i> (Kotter International 2017:21-22)</p>
<p>8. Institute change</p>	<p>Whereas in the Leading Change model the goal was to institutionalize the new approaches (Kotter 1995:61), in the Accelerate model the <i>goal is to determine and to communicate the connection that exists between the seen development of the organization and the change in individuals' behavior.</i> This creates awareness and cohesion of the organizations improved agility that the change has led to. (Kotter International 2017:23-24)</p>

Accelerate model which is presented in Table 5, was introduced in 2014. Kotter's Leading Change model has existed for a long time. In their article, Appelbaum et al. (2012) reviewed the relevance of Kotter's 1996 change model against wider change management literature. They report that such studies do not exist that would cover all the eight processual steps, even though separate support for most steps exist. Some questions, such as the importance of maintaining the order of the processual steps cannot be approached through the existing studies. (As a conclusion they state that Kotter's theory

can be seen as a relevant change management reference. Appelbaum et al. 2012:776). However, they state that it can be helpful to supplement Kotter's model with other change management models in order to create to best mix for the particular change process.

Even though Kotter's model does contain few approaches to the participation of the employees' to the change, the model does not eye the change much from the individual's perspective. However, organizational change and personal motivation are closely connected as the change touches the individual's inner work life and tests its fundamental parts. And, as Valcour (2017:2) expresses it, "motivation is a dynamic process, not a stable employee characteristic".

Leadership is needed because the individuals' changing situation affects the most powerful drivers of their behavior in work; purpose, identity and mastery (Moran et al. 1999:111). Therefore, Moran et al. define that the leaders' *task is to manage the impact* that these three individuals' core performance activators experience. Purpose is pivotal for the individual's ability to give their best in the work and change. Hence, violating of the sense of purpose can threaten the individual's position and therefore causes resistance. The identity is an even more intimate factor than purpose. By affecting the status quo in the work place, the change denies some of the sense of personal integrity from the individual and shatters the personal consistency. This can act as a source of strong resistance. Mastery is connected to the individual's ability to stay operant and to manage oneself and the working environment. The change can lead an individual to a situation where the possessed abilities, knowledge and skills do not correspond to the new situation. (Moran et al. 1999:111). Therefore, the effect on the individuals' core performance activators should to be recognized when leading change. The following actions, presented in Table 6, can be taken to manage the core activators above (Moran et al. 1999:112):

Table 6. Action for the managing of the individuals' core performance activators (Moran et al. 1999:112).

Core performance activator	Management's actions
1. Purpose	Map the employees' purposes in order to assess how the particular change will affect the employees' sense of purpose and what kind of effect to expect in employees' performance. <i>Discuss the necessity of the change and try to plan the change so that the individual's purposes and new working situation meet.</i>
2. Identity	Find and communicate an appealing reason that can be widely accepted. Create a <i>dialogue on how the change affects the identities</i> and on <i>how the identities and change at hand can be aligned</i> .
3. Mastery	Start a discussion on what kinds of skill gaps are created and what kind of development on individual levels is needed after the change. <i>Provide the needed training and possibilities for developing the needed competencies.</i>

As shown in Table 6, the approach created by Moran et al. offered practical angles for the management of individuals' performance. However, the factors affecting the individual's motivation in work are nothing new to the social sciences. Herzberg researched these factors in his studies in the 1950's and 1960's and presented a theory of hygiene factors and motivators (Herzberg 1968:87). His observation was that the factors causing dissatisfaction at work were different from the factors that induced satisfaction in work. A rather surprising result was that brilliant management only does not lead to motivation and more productive working. Instead, the factors resulting to the satisfaction and motivation were in the locus of the inner work life and touched the individual's "deep-seated need for growth and achievement". (Hertzberg 1968:87) The satisfaction in work grows from the factors of inner work life.

Herzberg divided the researched motivational factors into intrinsic motivators ('motivators') and hygiene factors based on their effect on the individuals' work motivation. The motivators were the factors that mostly contributed to the generation of the work satisfaction. The hygiene factors were factors that, in turn, mostly resulted to the work dissatisfaction. Clear hygiene factors, listed based on their strength, were company policy and administration, supervision, relationship with the supervisor and work conditions. Clear motivators, again in the same order, were achievement, recognition, the work itself, responsibility, advancement and growth. (Herzberg 1968:90) In order to create

extreme satisfaction in work, the role of company policies needs to be limited and the work itself needs to offer possibilities of growth from the employee.

Herzberg's lesson of the personal achievement's importance for the work motivation has not been widely assimilated by the current business leaders. Amabile and Kramer (2011) carried out a survey among 669 managers from various organizational levels and from dozens of companies around the world. Only 5% of the respondents ranked the supporting of the progress in work as the most important factor, whereas most positioned it as the least meaningful factor. (Amabile and Kramer 2011:3-4). The development, in order to support motivation, should not provide an experience of progress at work.

Amabile and Kramer, based on their research, complement Herzberg by stating that supporting of the *consistent progress in a meaningful work* is the manager's most important task when aiming to motivate their employees. The reward is tempting as, by doing so, they make a positive input to the employees' inner work life which results to the improved organizational performance (Amabile and Kramer 2011:15). According to the authors, ignoring of the importance of the employees' work and ideas and weakening of the workers' sense of ownerships over their work are, in turn, efficient ways to strip the meaning out of the work.

#### 4.2.3 Pitfalls for Change Management and Managers

When not implemented right or taken into account, many of the factors presented in previous sections can cause stumbling of the change management processes. This section introduces a few more valuable lessons for the change leaders.

Kotter presents change management as a processual matter and focuses on providing a framework for the matters that the organization faces in changing. In his model, the personal position of the change leaders stays rather untouched. Heifetz and Linsky (2004) complement the picture of the change management with the violent and risky aspects of their article. The source of the danger is rooted to the position of change's initiator which easily sets the initiator to a vulnerable position. The unavoidable adaptation to the changing situation that is presented by the leader will seem unfamiliar and unattempting for the employees. The change initiator himself will set to obstruct the employees' return to the order that is normal to them. This created disequilibrium can

cause a natural reaction in which the employees will use all the possible means to displace the obstruction, the initiator of the change. (Heifetz and Linsky 2004:50) In those moments, the manager's goal is to avoid responding to the attacks on a personal level and keep the debater discussing the change itself as the dialogue is needed.

One important requirement for the change leader is, even among the busy and stirring moment of organizational transformations, to be able to step back and reflect. The situations require ability to react to the situations and hand steer, but they also demand the ability to withdraw, return to monitoring and reflect (Heifetz and Linsky 2004:45-46). Failing to take distance denies the leader a possibility to view the proposed measures and the state of the organization from other angles.

Even it is attempting, the leaders still should not take a sole responsibility over the change initiative, but should commit to the task also others that can protect him of her when it is needed. The behavior and the actions of the leader need to be balanced. Whereas the people need to know that the leader is serious with his intentions, he also needs to recognize and name the losses that the people suffer because of the transformation that takes place. (Heifetz and Linsky 2004:45-46) Avoiding recognizing and discussing the issues those are painful for the employees limit the progress in the change management.

The leader's own vulnerabilities and needs often present a challenge in the midst of the change management as many of the attacks are directed to them. The leader often feels an urge to create order, relieve the stress of the people and take a big role in solving the people's problem. Hence, all these tendencies present a risk. Firstly, if the leader only focuses on the order, it might take away focus from the change that must, instead of order, be the goal. Secondly, some level of stress is helpful as otherwise the attention of the people might weaken and the motion can stop. Thirdly, the leaders must avoid taking others roles in the finding of the solutions and needed answers. Otherwise, the leader's excessive role and workload can either lead to passivation of others or to the failure of the leader. (Heifetz and Linsky 2004:45-46) Even working through many reluctant individuals may be a slow down the achieving of a single development goal, it offers a less risky working method and outcomes are organizationally more sustainable.

The big challenges are the situation-related attacks that the leaders face, even on a very personal level. Heifetz and Linsky (2004: 52) explain that in most cases the source of the offense is rooted to the change's effect on people's work life, not to the leaders as a person. Consequently, the leaders must refrain from responding on a personal level to the attack. As the leader, despite his own feelings, is not the issue behind the attack, he must not make himself such by showing aggression, becoming defensive or attacking against the assailants.

#### 4.2.4 Synthesis of Change Management

Organizations need new ability to thrive for opportunities and to complete them quickly. The organizations have a natural ability to adapt to the changes, but when the adapting capability is not sufficient, a separate change management process needs to be initiated. These processes have an uncertain nature. This challenges the leader, who is given a risky, uncertain and closely monitored leadership mission. Therefore a widely tested and easily grasped organizational change management process model is a valuable tool for change leaders as it allows them to outline their own change processes and perceive their progress in the project.

Kotter's renowned 8-step process, being a generic change leadership model that is aimed the organizational change, closes out some elements of personal motivation that can be valuable for the individuals' behavior and performance. Individuals' most powerful work motivation drivers are affected by the change and – in order to sustain the work performance - change leaders need to manage that impact. Accordingly, the change should, if possible, be aligned so that it responds to individuals need for growth and the transformed work contains possibilities for seeing progress in a work that is perceived to be meaningful.

After the initiation of the change, the change leader's position obstructs the employees' return what is normal to them. As a natural reaction, the people might attack the leader, which creates risk for the leaders himself. Therefore, change leadership needs to be shared and the leader needs to retain his ability to take distance and reflect. The leader needs to understand why in the change process the creation of order, relieving of stress and taking on a big role in change are all parts of the double-edged sword. Even he or she is put under a high pressure and attacked personally, the leader, despite his own feelings, is not the issue behind the attack. To keep it so, the leader

should not grant himself the possibility for not to act professionally and stay subject-focused.

Change management and organizational learning, the subject of the next section, have similarities when it comes to the development of the rate of change. Both the adjusting to the changing environment and the creation of knowledge from the surrounding world needs to pick up speed.

### 4.3 Organizational Learning

*“Over the long run, superior performance depends on superior learning” (Peter M. Senge 1990:7)*

Organizations, including also the individuals and different existing groups, ability to process information and exploit the created knowledge are essential for its performance and development. This section introduces the concept of organizational learning (OL) and explains how learning can be supported and exercised at the organizational level.

Bain (1998:420) approaches the concept of organizational learning by stating that it is in connection with the organization's growth of learning capacity and cannot be perceived as a sum of the individuals' learning processes. He also defines that the learning phenomenon to that takes place on the organizational level. Schilling and Kluge (2009:338) explain that learning has a relatively permanent effect on the skills and knowledge. Organization can be perceived in two different ways; firstly, as a social system that shares the same objectives and secondly, as a gestalt of rules and structures that regulates the behavior of people. According to Huber (1991:88), the upper level of the concept of OL consists of four constructs which are knowledge acquisition, information distribution, information interpretation and organizational memory.

Crossan et al. (1999:522-523) have developed a framework that approaches the concept of OL from the perspective of the strategic renewal. To enable this, they illustrate the tension that exists between the assimilation of new learnings (exploration) and the using of them (exploitation), a concept developed by March (1991). The existing of the tension is a highly important for the strategic renewal of the company. The tendency is to focus on the exploitation and on its predictable and proximate returns instead of in-

vesting in the exploration and on its distant, uncertain and often negative returns. However, even doing so can be more efficient in the short term, it will be self-destructive in the long run. (March 1991:71,85) Operating in a competitive environment requires from the organization also dedication to work with precarious and unknown issues.

Crossan et al. (1999:522-523) state that the process of organizational learning consists of three levels: individual, group and organization. The four different psychological and social processes (entitled 4I processes), *intuiting*, *interpreting*, *integrating* and *institutionalizing*, presented in Figure 8 below, combine these three OL levels (Crossan et al. 1999:523).

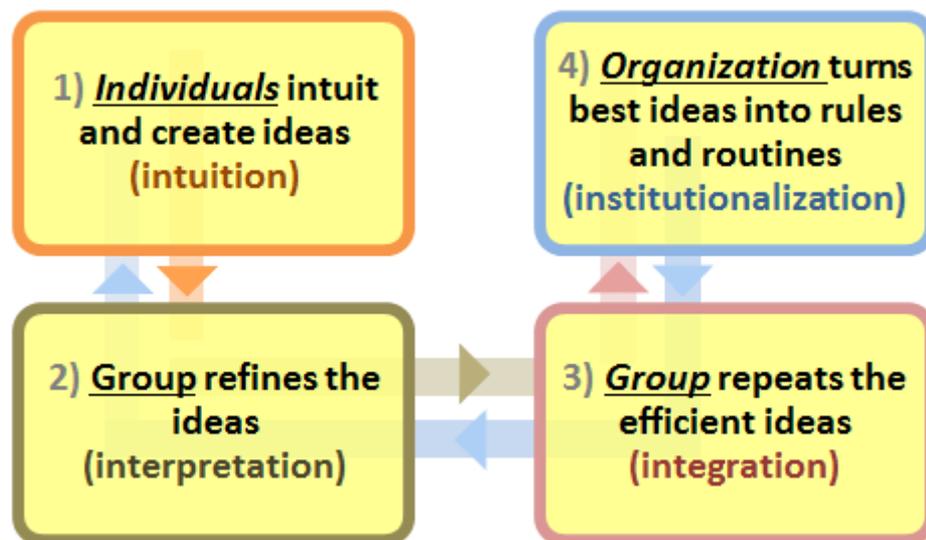


Figure 8. OL through the 4I processes (modified from Crossan et al. 1999: 523).

Out of the 4I processes, presented in Figure 8 above, intuiting, interpreting and integrating are all parts of the exploring the unknown, in other words exploration. The process of institutionalization is part of embedded learning and refinement of the existing competences; that is exploitation. (Crossan et al. 1999:530; March 1991:85). Both the keeping and transferring of the existing knowledge and the permissible learning of the new, unknown and uncertain things are needed in an organization going through a strategic renewal.

The 4I processes are at a focal point in the framework as they “form the glue that binds the structure together” (Crossan et al. 1999:524) The authors also state that “cognition (knowledge, understanding, and beliefs) and action (behaviors) are tightly intertwined” (1999:535). The action affects cognition and the other way around (1999:523). It is not automated that the changes that take place in knowledge leads to changes in the actions as understanding and beliefs affects this process.

The uniquely individual process of intuiting develops insights and inspirations and naturally takes place at the individual level of OL. This leads to experience. The process of interpreting covers the individual and group levels and allows refining and improving of individual's insight that origin from the intuition. Organizations do not intuit or interpret. Dialogue is an example of the interpretation action. In the integration process which takes place at the group level, the group develops shared understanding and decides to repeat the effective action. The processing of the intuition continues on the organizational level in the institutionalization process as the rules, routines and procedures are implemented. Diagnostics systems and routines are examples of the possible outcome of institutionalization. (Crossan et al. 1999:525) A successful organizational learning requires the operation of these processes.

The 4I's framework developed by Crossan et al. has been extended further by Lawrence et al. (2005) and Schilling and Kluge (2009). Lawrence et al. (2005:180) argued that power and politics, which provide the social energy to the 4I processes affect them and power and politics can be used to explain which ideas are institutionalized. They state that these forms of power, power, influence, force, domination and discipline, are social, political processes which affect the learning process and the results of OL.

An efficient realization of the 4I processes leads to more efficient OL. However, there are factors that obstruct the four key processes.

#### 4.3.1 Barriers and Organizational Benefits of OL

The direct business benefits of the more efficient organizational learning are easy to perceive. For instance, by institutionalizing effectively, the organization can reap the benefits of the possessed knowledge (Crossan et al. 1999:534). But the OL process is connected with the state of the organization as well on a deeper level. This section introduces the barriers of the OL and some of the organizational benefits that have been recognized through the repetition of these processes.

In their extension of the 4I framework, Schilling and Kluge (2009:337) focused on the barriers that can hamper the functioning of the 4I processes and therefore hinder the whole organizational learning. In their model, shown in Figure 9 below, the presented environment does not refer to the functioning of the markets, but rather to the information that is available for processing.

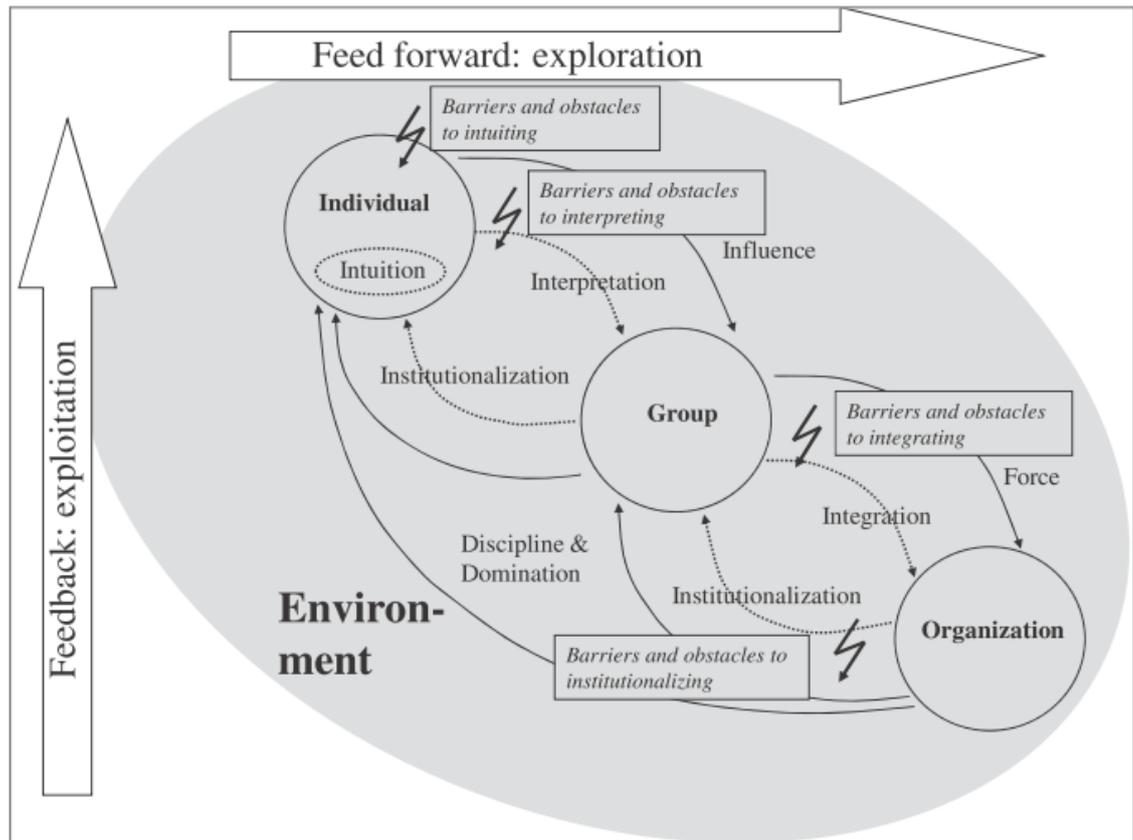


Figure 9. The expanded 4I model of the organizational learning process and its barriers (Schilling and Kluge (2009:342), based on Crossan et. al (2009) and Lawrence et al. (2005))

Schilling and Kluge introduce, based on the extensive amount of sources, the recognized barriers separately for the each level of the 4I processes. As a conclusion, they present the following propositions, shown below in Table 7:

Table 7. Barriers hampering the particular OL processes.

	4I process	Barriers hampering the particular OL process
1.	Intuiting	Recognition of faults and performance gaps is limited in a company that has monolithic culture, homogeneous labor force, non-measurable goals, large stocks and that does not utilize failure analysis in its operations. (Schilling and Kluge 2009:344)
2.	Intuiting	Knowledge is less adaptable by the people within the company if it is circuitous, ambiguous or unessential. (Schilling and Kluge 2009:345)
3.	Intuiting	Intuiting and development of the new ideas are limited if the work roles are concise, people are highly divided and stand-

		ardization is high. (Schilling and Kluge 2009:345-346)
4.	Intuiting	Dominance, restrictive management and blame culture lead to stemming of insights by causing unsecure, cynical and despondent ambiance. (Schilling and Kluge 2009:346)
5.	Interpreting	The communication of ideas to the team members is limited if the culture is such that the individual, not to be ridiculed, needs be sure about the adequacy and impressiveness of his insights. (Schilling and Kluge 2009:347-348)
6.	Interpreting	The team is less acceptable towards the individual's insights if his team status is low or there are conflicts in the relationships. (Schilling and Kluge 2009:348-349)
7.	Interpreting	The team is less permissive towards ideas when they don't include important targets or a risk of costly errors, especially in moments of high workload. (Schilling and Kluge 2009:348)
8.	Interpreting	The team is less permissive towards ideas when failure-avoidance norms are high or collective identity is either very low or high. (Schilling and Kluge 2009:349)
9.	Integrating	The team members trust each other less and are more reluctant to share their knowledge with one another if the allocation of resources is ineffective or competition exists between units. (Schilling and Kluge 2009:349)
10.	Integrating	Innovating is less practiced and lower acceptance towards new ideas exist in the company if the top managements' values and beliefs are not abreast of the times, they do not give attention to the ideas, conflicts between powerful individuals' visions and the new ideas exist or the company has a long history of success. (Schilling and Kluge 2009:351)
11.	Integrating	Other organizational units are less permissive towards innovations if orientation towards learning in the organization does not exist or they are in conflict with the existing values, organizational power or common industry views. (Schilling and Kluge 2009:351-352)
12.	Institutionalizing	Technological innovations are less welcome in organizations where rapid technology-related change is taking place, the innovation culture does not support the implementation or multiple managing trends exist. (Schilling and Kluge 2009:354)
13.	Institutionalizing	The employees' ability to implement process and product innovations is weaker in an organization where the resourcing of the implementation processes and on the communications is low and where the work is inflexible and employees change a lot. (Schilling and Kluge 2009:354)
14.	Institutionalizing	An implementation of the product, structure and process innovations is weaker if the employees are not trusted to have the needed skills or willingness, past learning experiences

		are not positive, responsibilities are spread around or lasses-faire mentality exists among any of the management levels. (Schilling and Kluge 2009:355)
15.	Institutionalizing	Vacuous argumentation and opportunistic behavior increases if the organization is highly decentralized, the implementations are not consistent or the governance is lacking. (Schilling and Kluge 2009:355)

As seen in Table 7 above, the large amount of the propositions provided by Schilling and Kluge (2009) can be hard to perceive. To help the reader, some of the actions that they propose for dismantling of the barriers of the OL are shown below in Figure 10.

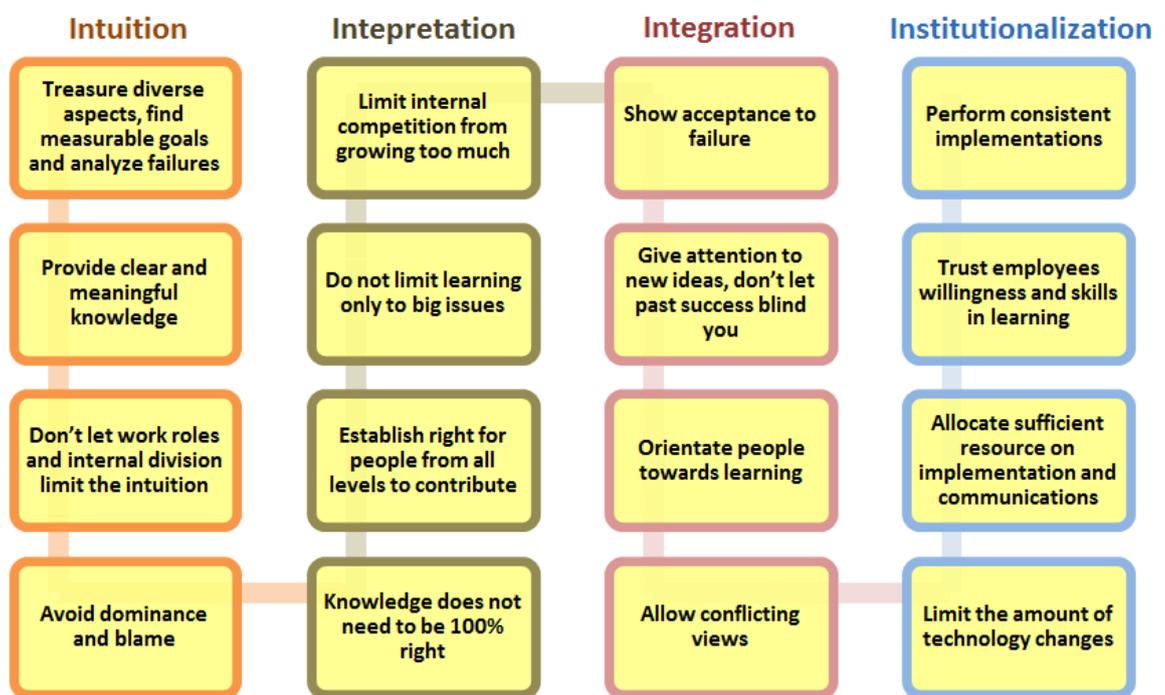


Figure 10. Actions that dismantle the barriers of the OL, formed from the propositions of Schilling and Kluge (2009).

According to the Schilling's and Kluge's (2009) results, presented above in Figure 10, the 4I processes can be hindered by different kinds of obstacles. To mention some, barriers of the intuitive process origin from the company culture (monolithic or blame-centered), homogeneousness of the workforce, quality of the knowledge and tightness of the work roles. The barriers of the interpreting process, on the other hand, are affected by the individual's team status, the level of costly risks, the level of interdepartmental competition, the level of the failure-avoidance norms and the level of the adequacy that is required from the individuals' insights. The integrating process barriers

are affected, for instance by the modernity of company's management's values and beliefs, attention given to ideas, the existing orientation towards learning and the allocation of the resources. The barriers of institutionalization process, hence, are affected, for instance by the amount of technology-related change that is taking place (more is not welcomed), the insularity of the innovation culture, the amount of existing management trends, resourcing of the implementation and communication, *lasses-faire* mentality of the management and the consistency of the implementations.

Bain discusses in his publication (1998) the social defenses that limit the organizational learning. Referring to the results of the consultancy engagements and action researches that he assimilates as OL processes, he introduces the characteristics that were observed at the end of the processes, presented below in Table 8: (Bain 1998:251)

Table 8. Characteristics of the OL process.

<b>Characteristics of the OL process</b>	
1. Primary task	In all three cases, the organizational ability to manage the primary tasks was improved. As a proof of this, profit, job satisfaction and different human relations were improved. (Bain 1998:421)
2. Project ownership	In all three cases, the ownerships over the process and the project develop positively during the 4-6 months. (Bain 1998:421)
3. Leadership, authority and roles	In all three cases, a leader with authority was present, active and provided support for the project. The change leadership became owned by the staff. The hierarchy became less meaningful when the people begin to take responsibility for the process. The development of OL led to giving of bigger role to those people that took responsibility and were fully using their capacities. (Bain 1998:421)
4. Individual, group and organizational interdependence	In all three cases, a strong link existed between the OL and individual-learning and group-learning pairs. This led to a less fragmented work which had a stronger link to the mission of the company. As a very interesting aspect, "a robust culture supportive of change was developed". (Bain 1998:422)
5. Reflection and learning spaces	In all three cases, the organizations created space for reflection which enabled them to become more aware of the whole their organizations. This helped to explore and modify the anxiety that causes social defenses.

Based on Bain's observations, presented above in Table 8, the OL process offers inevitable benefits for the organization. The performance improves and the ownership over the development widens and strengthens. The staff takes leaderships over the change and the people that are willing to accept the responsibility and use their full capacity take the lead. The work becomes less fragmented and the creation of a robust culture that is supportive to change is starting to form. People become more aware of the whole their organization and are better able to dampen the anxieties that cause the social defenses. This develops the learning and developing capacity.

#### 4.3.2 Synthesis of Organizational Learning

OL process offers inevitable benefits for the organization. The goal of the OL is the growing of the organization's learning capacity, a goal which cannot be achieved merely by developing the individuals' personal learning capabilities. The organizational learning takes place on individual, group and organization levels that are linked by the four learning processes (4Is). Intuiting, interpreting, and integrating are processes that allow the company the exploration of new information. Individuals and groups have a pivotal position in the OL as the organizations are unable to intuit and interpret. Institutionalization is a process that allows the company to sustain, distribute and exploit the created knowledge. Both exploitation and exploration is needed in a company that aims to stay competitive in a changing business environment.

The processes of the organizational learning can be hampered by issues that limit, burden, dominate or passivate the interplay between the individual, his different groups and the organization. Company culture, work roles, level of failure-avoidance, ongoing technology changes and attitude to innovating are among these issues. In order to ensure the functioning to the 4I processes the company needs to recognize and break down these barriers.

Bain's (1998) observations indicate that OL has a positive effect on the ownership of the development and on the leadership that is displayed in the change management processes. The improving bigger picture, less fragmented work, culture that supports change and dampening of the anxieties that cause the social defenses all sound tempting when examining together the bodies of fleet asset management, change management and organizational learning.

Although the theories of the OL processes have their connections to the practical work and organizational processes the practitioners might experience challenges in their exploitation as methods of application are rather absent in the introduced literature. Therefore, the OL processes should be connected to a framework that facilitates their application and capitalizes their organizational value.

The previous three sections have introduced the literature that is recognized as essential for building a proposal for the solution that corresponds to the key development areas identified in the CSA. In the next section, a conceptual framework is built based on the introduced theories.

#### 4.4 Conceptual Framework of This Thesis

The conceptual framework, presented in this section, gives a synthesis of the knowledge that exists concerning the development of asset fleet management and the management of the changes that can result from the new fleet level implementations. Furthermore, the knowledge of the organizational learning that is inevitably and with a good reason intertwined to the fleet management and organizational change is included in the synthesis.

The object of this thesis includes operating and maintaining of a fleet of assets, persons that operate it and an inducing of change that is needed in the coming transformation. In the CSA, it was observed that the organization lacks both boat operating guidelines and fleet-related long-term data and its analysis. Concerning the implementation of the new systems and guidelines, a risk for an easily activated change resistance was recognized. Additionally, it was noted that the process of organizational learning is slow.

The introduced conceptual framework, shown below in Figure 11, presents the key elements, selected based on the CSA, and their connections that facilitate the solution building for the improved fleet management.

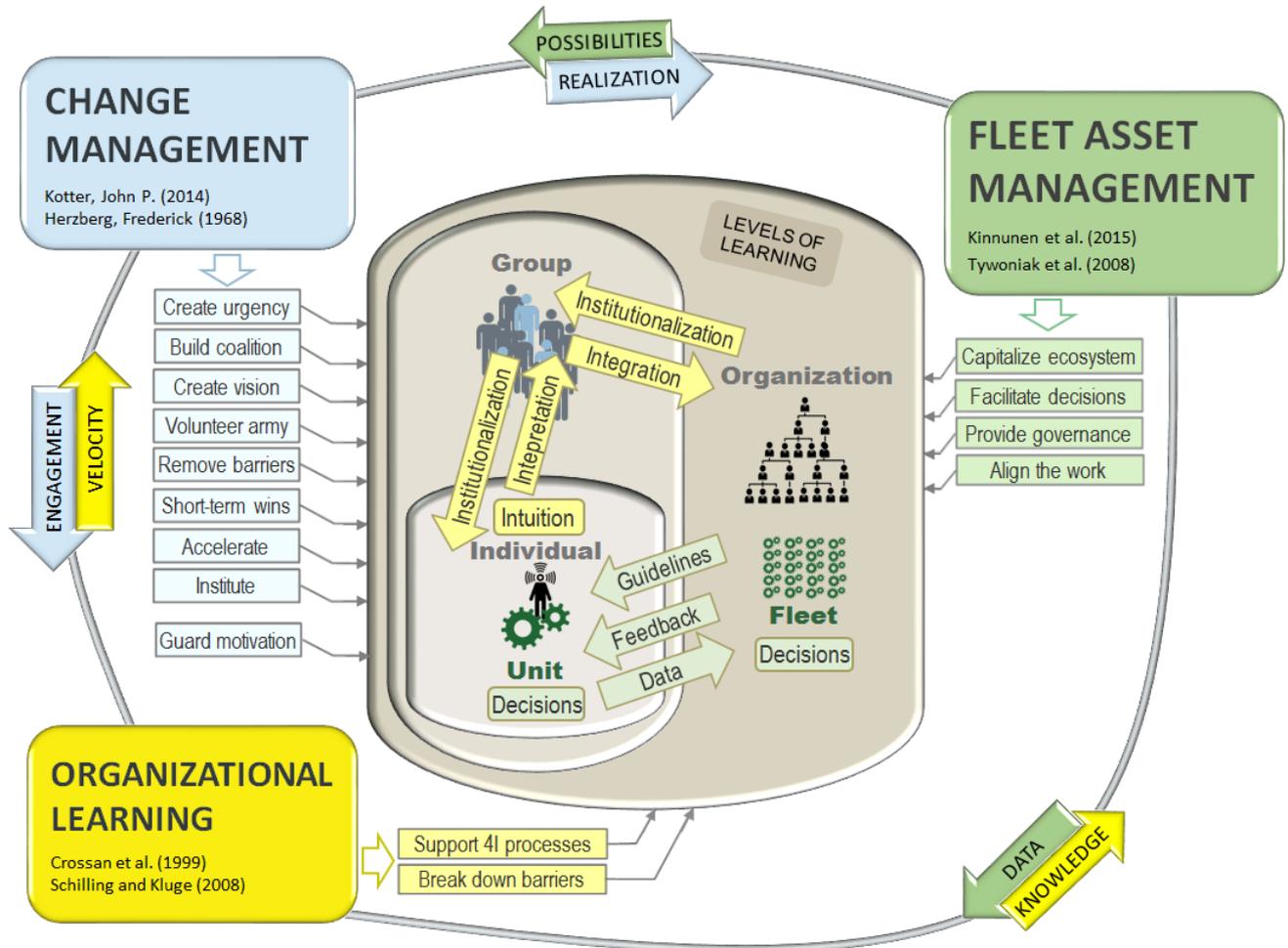


Figure 11. Conceptual framework for the fleet asset management, change management and organizational learning.

The conceptual framework, presented in Figure 11 above, allows a holistic angle to the processes that both create and utilize data and knowledge in an asset intensive organization.

#### 4.4.1 Fleet Asset Management in the Conceptual Framework

The production of long-term data and boat operating guidelines, both observed in the CSA, are in connections with a mental absorptive capacity that the individuals don't process. The high-hanging and challenging fruits of the fleet asset management require ecosystem capitalization and even more massive data processing abilities. Hence, the development of the management of the fleet purely based on organizational learning and change management and without the data system and management would most likely fail to deliver improvements. Especially the pursuing the maximization

of the individual fleet members' whole life-cycle value and the transition from the fail-and-fix practices of the predict-and-prevent methods need to be approached by boosting and utilizing of the data. The results of the analysis are used to align the work with the goals of the asset management on the different levels of the organization.

The created knowledge needs to be available for the individuals that make the variety of different kinds of the fleet decisions situated on the different levels of the organization. This also supports the exploring processes of the organizational learning. Hence, the success of the fleet asset management requires also more traditional governance, such as implementation of company policies and owner's long-term strategic goal. However, the governance measures are in direct connection with the hygiene factors that can cause dissatisfaction among the employees. This requires elaborate actions of the management when leading the change.

#### 4.4.2 Change Management in the Conceptual Framework

The natural adapting capability in the organizations is limited, which means that quite often separate change management processes need to be initiated. Several needed changes were recognized in the CSA. Change often affects the most powerful drivers of individuals' work behavior and violating of the sense of purpose can threaten the individual's position and therefore cause resistance.

The introduction of fleet management potentially will, if not taken into account and aligned with the motivational factors, affect the unit operator's sense of ownership and cause feelings of incompetence. Hence, without the support given by the systematic approaches of the change management, the reaching of fleet management targets that are behind the introduction of new systems, metrics and guidelines would most likely be challenged by the activated change resistance. Therefore, neglecting change management would create a risk that, after accepting the implementation cost of the fleet management system, the owner of the fleet would not be able to reap the benefits of the system or even cover the costs of the solution. Additionally, it would be hard for the change leaders to perceive the progression of the organizational change phases or in general interpret the employees' behaviors. As leading of change can be risky and challenging for the leader, it is also important for him to be aware of the reactions and behaviors that can be activated. Due to all these reasons, Kotter Accelerate's 8-step change process is therefore visualized in the CF.

In the CF, the support for the change is not built only through change management. The OL can also pave the way for the transformation within the organization.

#### 4.4.3 Organizational Learning in the Conceptual Framework

In the CSA it was noticed that the development of the working practices had taken decades. Hence, a need for more efficient organizational learning was recognized. The users, due to their log experience, are trained to perceive and observe things in the vessel environment. This puts them to an important position in the fleet management. The mere combination of the fleet asset management and the change management could create a situation where the individuals' and the groups' ability to intuit, interpret and integrate wouldn't correspond to the data that would be available for it. This could both frustrate the institutionalization process and lead to the unbalanced setting in the ownership of the work.

The OL and Asset Management are connected in many ways. For instance the Asset Management Council (2014:16) has positioned Learning Organization as one of the four principles of the Asset Management Concept Model.

#### 4.4.4 Interplay between Fleet Asset Management, Change Management and Organizational Learning in the Conceptual Framework

The returns of fleet asset management, organizational change management and organizational learning all support the objects of each other. This interplay and the exchange of the theories is visualized with arrows in the conceptual framework.

In the OL - change management –exchange the OL provides velocity to the processing of the changing business environment and the change management offers a higher employee engagement to the OL. Also the Kotter's 8-Step change model and the inputs of the OL theories can be seen to support each other.

In change management – fleet asset management-exchange the change management offers a means for the recognition of the change objectives and the change management offers means of the realization of the same change objectives. Nevertheless, the interplay is potentially most negative between the motivation that is discussed under

the headline of change management and the provision of guidelines, situated in Fleet Asset Management. According to Herzberg (1968:93), the motivators that can resonate extreme work satisfaction are rather much connected for instance to the employee's freedom in work, given responsibilities and to accountability. At the same time company policy and supervision are the two strongest hygiene factors potentially causing work dissatisfaction. The combination is not easy as tighter governance can both limit the motivators and strengthen the hygiene factors. This needs to be well noted in the solution.

Furthermore, in the fleet asset management- OL-exchange the fleet asset management offers data for the OL processes and the OL provides interpretation and knowledge for the fleet asset management. The input is clear to the both directions.

The conceptual framework presented in this section offers the elements for the solution that is built in Section 5.

## 5 Building Proposal for Change-Inducing Model for Field Unit

This section, by presenting a solution for the recognized weaknesses, merges the findings of the current state analysis and the conceptual framework formed from relevant literature. The parts of the proposal are introduced and connected with the key improvement needs. The purpose of this section is to provide value through the formed new knowledge and through the practical improvement suggestions on the business problem.

### 5.1 Overview of Proposal Building Stage

A separate workshop was organized for the building of the main components of the solution. The findings of the CSA acted as a starting point for the proposal building. The entire content of the theories and their applications could not be discussed with the field staff. Therefore, the aspects, discussed in the workshop, were the reason why the change is needed (change vision) and the metrics and guidelines that direct the use of the boats.

The participants were chosen so that they would be able to provide insights from different perspectives and contribute to the aligning of the initiatives that the change-inducing model contains. The answers, written down in the workshop, and the made observations with their later reflections formed the most meaningful part of Data 2 of this thesis.

After the workshop, the answers were used to form the outlined change vision, the contents of the guidelines and metrics, the change-inducing model and the plan for the model's implementation in field unit. The results were introduced to the case company's department heads and to nearly all of the field superiors. The feedback and the observations were documented in the field notes that were complemented with reflections after the presentation, forming also a part of Data 2. In addition, the initial implementation plan was used in the planning of the model's validation.

The final building of the proposal is done based on Data 2 and the aspects of fleet asset management, OL and change management that are applicable to the proposal building. The conceptual framework offers these applications. The key development elements are depicted in Figure 12 below.

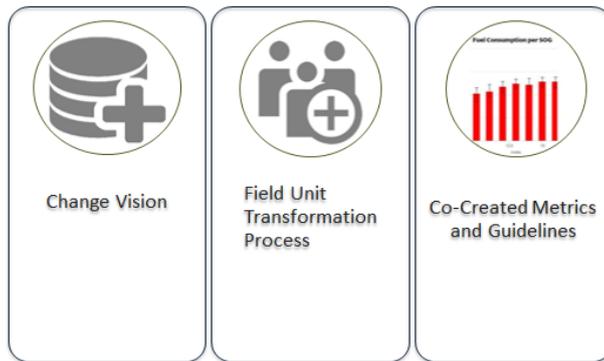


Figure 12. Key development elements within the proposal building.

Each of the elements, presented above in Figure 12, are discussed further in the next subsections. Later, they are also merged as a part of a change-inducing model.

First, the reflections are offered on the observations that are made in the course of the data collection phases. They allow the insights that are needed in steering of the proposal building.

Second, a proposal of a *change vision* for the data-based fleet management is discussed and constructed. The case company has a change management process ahead if it wishes to respond to the CSA's key development areas. Therefore, a change vision is included in the proposal.

Third, *co-created metrics and guidelines* are introduced. Their content was formed in the solution building workshops.

Fourth, a *field unit transformation process* is discussed and constructed. This process does a multidimensional merging of the collected data and discussed theories. Potentially, it also offers most of the new knowledge that this thesis provides.

Last, the whole of the draft of the *change-inducing model* is formed. The entity of the model is introduced as this phase.

## 5.2 Comments to the Findings from Data 2 and Observations from the Proposal Building Discussion

The proposal discussion showed the direction for the building of the individual elements of the proposal and, eventually, also the whole change-inducing model.

In the course of the proposal discussion several important observations were made. The observation was that discussing any of the theoretical or more complex issues of fleet asset management within the case company can be challenging. If the different organizational goals, levels of decision-making, behavior of the people and guidelines are brought to discussions, things become complicated for the people. Furthermore, the structured processing of the variety of different emerging perceptions and ideas is challenging. This was seen in the struggles that were experienced in the directing of the discussions in the interviews and solution building workshop. Also, for a few of the participants, the connections between better data and new possibilities were not easily perceivable. As also the summarizing of such discussion can be challenging, processing of too far-reaching thoughts can be detrimental for the needed group cohesion and co-creation. Therefore, the communications and discussions need to be based on well-defined and perceivable targets. This also sets requirements for the change vision and general outspoken goals of the development work.

A lot of the questions and discussions concerned the staff's concerns about the tracking of the fleet and the fears that are connected to the rather x-raying data. As a conclusion, the risk exists that the change in question faces resistance, but on the other hand it shouldn't be exaggerated. At least many of the boat operators were keen on having access to the long-term data and therefore were willing to accept the data collection.

The case company has a demo phase data system that includes a test set of metrics and other visualized data. In the solution building workshop it was seen that whenever this data is used, only the most relevant data can be used and material needs to be sent to the participants in advance. Also the agendas need to be well prepared. Otherwise, as the data systems contain vast amounts of data, it can be hard to ensure that all the participants will be able to contribute in the co-creation moments. In this case this might be a valuable routine as the case company's employees' average age is over 50 years and some of the individuals have a limited familiarity with the data systems.

There were also certain tensions between the two groups of employees, the pilots and the boat operators. Some field superiors rejected the results of the interviews that stated that the pilots' make more often than the boat operators such choices that lead to the use of the boats' maximum speed. They stated, in turn, that the boat operators drive half of the trip without any pilot onboard and are then many times driving gratuitously fast. Hence, the feedback was valuable as it indicated that the pilots might become defensive if they are labeled in the discussion. Realistically, for both employee groups it can be easier to perceive needs to the improvement of action among the other group of workers. This has a negative return on their participation in the process. As the standard driving times tackle both the boat operators' and pilots' timing decisions, it is unnecessary to pinpoint one of the groups in the communications.

These observations were indicated since they resonate strongly with the elements of the change-inducing model. The first of them is the change vision that is discussed in the next section.

### 5.3 Proposal for Vision of Data-Based Fleet Management

The change management theories (i.e. Kotter 1995, 2014) alert the change leaders by stating that every change needs its own vision that enables the leaders to create urgency and introduce the new possibilities for their employees. As discussed in Section 3, fleet asset management offers different kinds of benefits through the capitalization of the eco-system and boosting the data. Therefore, it can be said that the need of a change vision is strongly supported by the theories and there are such opportunities that need to be elevated by the vision so that the employees can perceive them.

As a result of the solution building workshop (Data 2), it can be said that the business problem of this thesis itself is not sufficiently motivating for the employees. This was noticed in the discussions that resulted from the introduction of the CSA key findings and the objective. At that stage, the business problem was presented solely through the boat operating that was not optimal. As an observation, this affected the employees' aspects of the study and also fell short of the potential that was defined in fleet asset management.

Data 1 and Data 2 interviews, work group and discussions showed that the level of awareness concerning the fleet benefits is low. Seemingly, the employees observe the benefits from the perspective of singular boats (unit level) and approaching the issues from the fleet level is not natural for them. Furthermore, the big picture of the fleet asset management or the economical use of boats was not easy to perceive. This can be seen in the diversity of the comments that were given from the issues. For instance, some people perceived it to stand for better maintenance, some as better planning of the transportation, some as fuel efficiency and some as better understanding of the engine as a system.

In Data 1 interviews it was clearly stated that the employees need to understand the reasons behind the changes and new system introduced. Additionally, as described in the earlier section, the targets that the vision contains need to be perceivable and attractive to the employees. Even though the fuel efficiency can produce most of the costs, it alone does not present a sufficient vision for the coming change. Furthermore, the maximization of the fleets' lifetime value and minimizing of the upkeep costs - the high level theoretical definitions for fleet asset management - are not tangible enough goals for the employees.

All the above mentioned facts need to be reflected in the change vision which, in order to support the transformation towards data-based actions, needs to comprise of targets that are also appealing for the employees. As a result of this consideration, the *vision for data-based fleet management* was formed in the following way, presented below in Table 9:

Table 9. Vision for data-based fleet management.

	<b><i>We want to collect and analyze long-term engine and spatial data, because it allows us to:</i></b>
1.	<i>Develop a more economic fleet by optimizing</i>
2.	<i>Avoid unnecessary fuel consumption and wear &amp; tear</i>
3.	<i>Monitor the degradation of the engines over long periods of time</i>
4.	<i>Provide comprehensive engine system data for the employees' analysis needs</i>
5.	<i>Develop advanced analytics that allows us to anticipate and avoid breakdowns</i>
6.	<i>Minimize the out-of-service times of the boats</i>

Practically all of the aspects of the vision, presented above in Table 9, were mentioned by the employees during the study process. At the same time, all of them are potential sources of benefits for the company. The following section introduces the tools that allow the case company to realize some of the benefits listed in the vision.

#### 5.4 Proposal for Co-Created Metrics and Guidelines

In the CSA, the lack of guidelines and metrics was recognized as a key development area. These areas are positioned to the transport process and presented below in Figure 13.

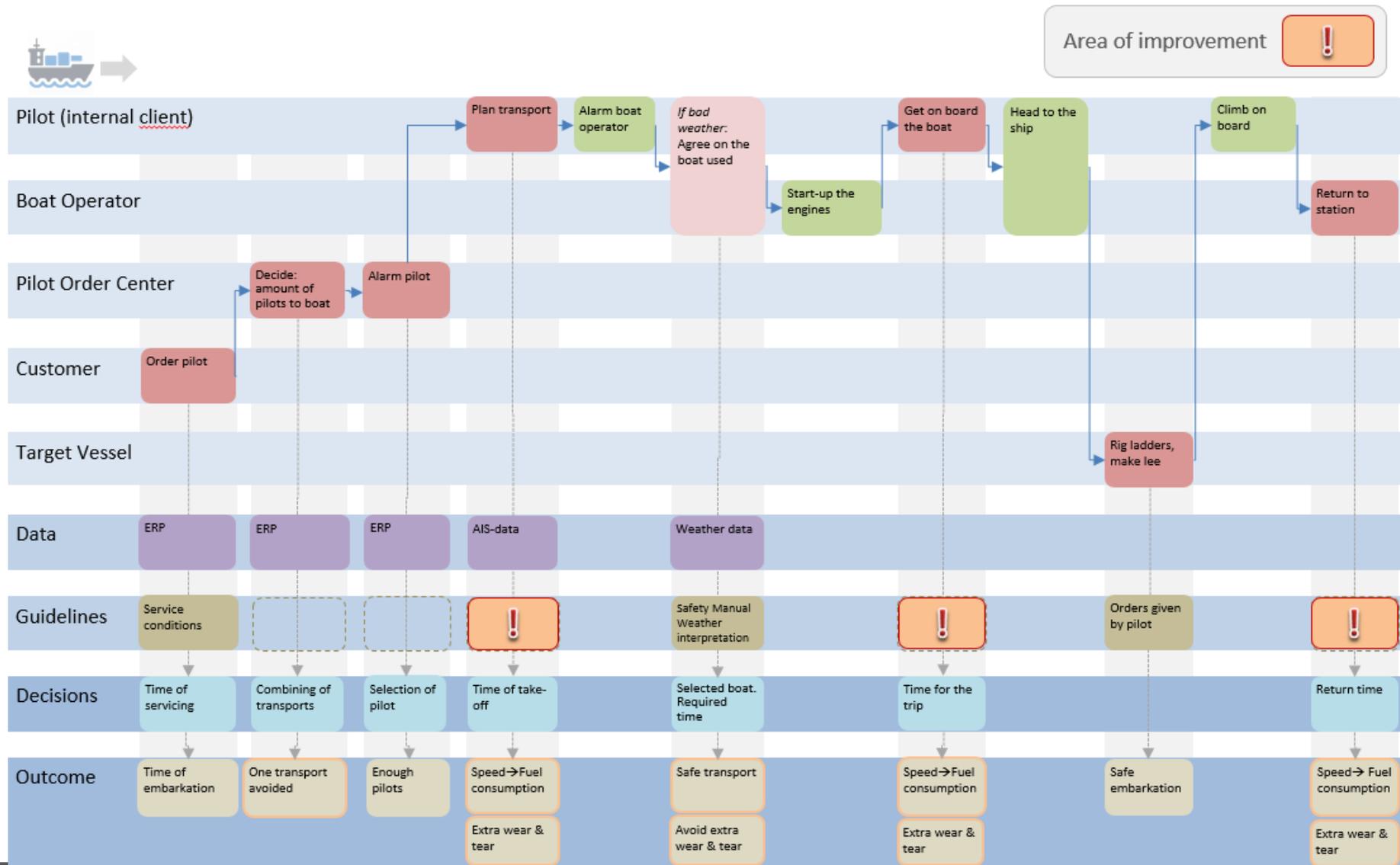


Figure 13. Areas of improvement in the transport process.

As depicted in Figure 13, new guidelines are needed. The question of measuring the employees' work can raise concerns and that can limit the implementation of the changes. Therefore, it was defined early in the study that the metrics and guidelines would be co-created in the field unit with the employees in question. Also, as stated in the business challenge, the participation of the boats' end-users to the development enables more applicable practices and measures that have a higher relevance. Herzberg's (1968) researches on motivation highlight the importance of succeeding in this phase of the work as company policies - when unsuccessful - can harm the work satisfaction heavily. The inner work life could be harmed and the work effort damaged, if simultaneously the employees' experience that the changes hinder their personal achievement and responsibility in work.

Currently the case company is doing tests with a fleet management demo system. The engine data logging devices have been installed to four different boats and mostly they have collected data from over 12-months' time. In the data system, the engine data have been connected with the positioning data. This has allowed metrics that describe the economy of each individual trip. The company has also tested the possibilities of analyzing the engine data. This has led to some new observations and corrective actions. While writing this thesis, the case company is preparing for the procurement of the data system for each of its boats. The solution combines the AIS data and CAN data, which also allows a possibility to monitor the boats that do not have a CAN-bus.

Data 2 suggests that, in order to support the credibility of the metrics, it is important to make sure that the logic behind them regards the general professional knowledge. An example of this is the correct use of the diesel engine; discussion is needed, whether the metrics that give points about the economy of the driving should still be refrained from rewarding from giving better score for the using the engine with very low RPMs. If the engine is used without proper turbo pressure, provided by the high RPM, for long periods of time the deposit might damage the engine in the long run.

As discussed in Section 4, the decision making is a core function of the fleet asset management. The collected data and its analysis are used to facilitate those decisions. This is also the purpose of *the co-created metrics and guidelines*, proposed in this section. In Table 10 below, the levels of analysis are described and their connection to decision making is described.

Table 10. Time-scales, levels and goals of analysis in fleet asset management

Levels of the analysis	Timeline of the decisions	Requirements	Related fleet decision making	Goals	Participating 4I processes
Analysis based on fleet data (fleet level)	Far from past to the end of lifecycle; whole lifecycle of the fleet	Encompassing fleet data Artificial intelligence, data mining, machine learning Participation of experienced individuals; teaching of the AI	Anticipatory maintenance, investing, complex optimization	Prognostics, detection of incipient and statistically detectable malfunctions	Intuition, interpretation, integration (explorative)
Analysis based on user perception (mostly unit level)	Far from the past to near future	Visualized history data (spatial and engine data) Users possess experience that allows the interpretation	Maintenance, optimization	Diagnostics, interpretation of observations and intuitions, detection of existing malfunctions	Intuition, interpretation, integration (explorative)
Analysis on individuals' performance	From recent history to present	Historical data from the used units Automated metrics and feedback functions	Operating of units, planning of the transportation	Repetition of best practices and behaviors (governance)	Institutionalization (exploitative)

As seen from Table 10, the decision facilitating analysis within the fleet asset management contains at least two different dimensions. Firstly, the decisions are related to the time and time intervals. On the simplest level, the decisions such as the time reserved for the trip or the RPM that is chosen to be used, concern the present day. In practice, due to the amount of the units, users and measurable events, data-based metrics and automated feedbacks are needed to ensure the repetition of best practices and behaviors. Secondly, the decisions are situated to the organizational dimension. Here, on the simplest level, the decisions concern a single boat on a short time span. On the other end of this dimension, the decisions concern the whole lifecycle of the whole fleet. Within this dimension, the complexity of the decision making and the intensity of the required data - due to the required ecosystem capitalization - grow when rising from the unit to the fleet level. The different levels of analysis also contain different organizational purposes and balanced participation of both exploitative and explorative processes in needed.

Realistically, the solution proposed in this thesis will not be able to cover all the aspects depicted in Table 10. However, it allows the initiating of the development. Furthermore, it offers a model that will help to case company to harness the levels of analysis to its benefit in the future.

In the solution building workshop, the work group discussed the idea of measuring the economy of the boats' use. Each boat and operating area is slightly different and therefore the creation of the accurate metrics was seen as a role of the field unit. However, in the solution building session, applicable aspects of measuring and instructing were defined in order to support and facilitate the co-creation work in the unit. As a conclusion of this discussion, the following set of *metrics and guidelines*, presented below in Table 11, were predefined as follows:

Table 11. Predefined guidelines and metrics.

Predefined metrics and guidelines	
1.	Desirable RPM range for all the boats
2.	The optimal RPM is also defined
3.	Logic of the Economy Score metrics for each boat
4.	Standard travel times for each boat and for each trip

These pre-defined metrics and guidelines, shown above in Table 11, act as a starting point for the more specific unit level metrics. This pre-defining is a meaningful phase as it facilitates the discussion in the field unit and it also ensures that the metrics are applicable in the data systems. At the same time, the results will fill in the guideline gaps in the transport process.

The communication of the change vision and the co-creation of metrics and guidelines are both parts of a field unit transformation process, defined in the next section.

### 5.5 Proposal for Field Unit Transformation Process

The transformation process is a combination of the change-leadership step-model, OL learning processes and valuable fleet asset management practices. The groundings for introducing a separate change process in the proposal are introduced in this section. Also, the logic of the building of this transformation process and its connections to the introduced theories are explained.

As an outcome of the CSA, it was noted that the introduction of the new metrics, guidelines and long-term data collection can easily stir up change resistance. A failure in the initial implementation of the metrics could require a great deal of extra effort from the

management and could threaten the reaching of the targets. Hence, the case company, when pursuing the data-based opportunities, is facing a compulsion for a change management process.

In Section 4.1.4, groundings were introduced for the statement that key practices of the fleet asset management and of the fleet logic need to be placed into an application-supporting framework and to a process model. Accordingly, in Section 4.2.4 it was grounded that the OL processes should be connected to a framework that facilitates their application and capitalizes their organizational value. Also, in Section 4.3.2 it was noted that Kotter's process model closes out some elements of personal motivation that can be valuable for the individuals' behavior and performance. On these groundings, a separate transformation process is formed as a part of the proposal of this thesis.

In this thesis, the theoretical aspect of fleet asset management is processed through many different publications. In the operating reality of the company, a very limited amount of theories can be raised for discussion and the management's task is to find the relevant contact surfaces between the complex and practical angles of approach. This needs to be supported by the solution of this thesis.

Both Lewin (1958) and Kotter (1995, 2014) approach the change from a perspective of a step model. Experience over the decades has shown that such a model is easily perceivable and allows a possibility to monitor the progress in the company. Out of the Kotter's two change models, the Accelerate (2014) model is used in the conceptual framework of this thesis as its aspects of volunteer army, acceleration methods and constant change respond better to the situation of the case company. An approach similar to Kotter's is used in the created field unit transformation process, presented in Figure 14 below.

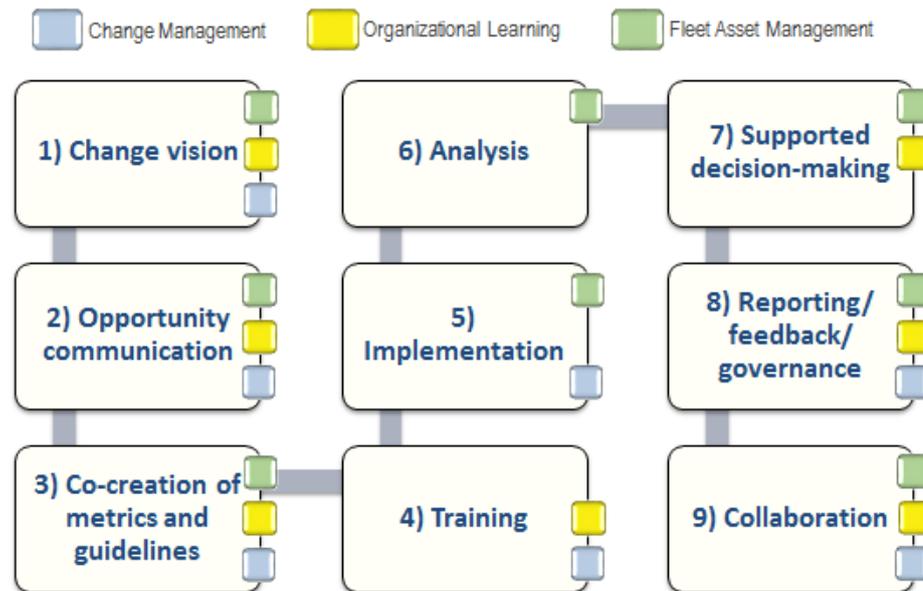


Figure 14. Field Unit Transformation Process.

The proposed 9-step process model consist of the phases that are pivotal for an organization that firstly wishes to introduce a change process that improves its ability for learning and secondly, at the same time, seeks to utilize data-based fleet opportunities in the management of its physical assets. As seen in the process (Figure 14), the application of different theories to the different process steps is visualized in it. The steps of the 9-step process are introduced in Table 12 below.

Table 12. Field unit transformation process description.

STEP	AREA OF MANAGEMENT	CONTENTS	REASONS
<b>1. Defining of the change vision (opportunity):</b> Why do we need data-based fleet management?	FM CM OL	Fleet optimization, anticipatory maintenance, monitoring of technical degradation, analysis and prognostics based on long-term data, reduction of the fuel consumption and of the extra wear & tear	Communication makes the target visible for all. Open discussion of the needs and purposes allows participation of the employees. The participant interpret the opportunity to their co-workers.
<b>2. Communication of:</b> • Change vision (opportunity)/ necessity of change • Importance of the individuals work and intuition • Co-creative nature of fleet management work • Learning orientation	FM CM OL	Fleet level benefits are defined and communicated.  Open access to collected and analyzed data needs is granted to all. The importance of the individuals' intuition is recognized.  The ownership over the work is left to the workers  The workers sacrifices are recognized; addition to travelling times.  Meaning of the OL is highlighted.	The goals of the fleet asset management , due to complexity and several different aspects, have proven to be hard to perceive. Employees' perceptions seem to be limited to a unit level, but benefits are reaped on the fleet level. Data-based fleet management allows more insight and intuition possibilities for the employees The aim is that the sense of purpose in work is secured. Learning orientation supports the integration process.
<b>3. Co-creation of the metrics and guidelines</b>	FM CM OL	Separately for each field unit and boat: Agree at least on the desired RPM range, standard minimum travel times and logic of the economy score	All the boats are individuals and the trips are not the same either. Unit-level co-creation allows time for dialogue. Participate both boat operators and pilots to increase the validity and acceptability of the metrics.
<b>4. Training of the employees</b>	CM OL	Discuss and recognize the skill gaps with employees.	Change's effect on mastery: New data systems can make employees experience incompetence, especially the elderly employees
<b>5. Implementation of metrics and guidelines</b>	FM CM	Implementation of the standard travel times.  Communication of the new guidelines.  Avoid dominating the work with the company policies.	If the compliance with the standard travel times becomes social norm it will support the change. Company policies, when unsuccessful, can harm the work satisfaction heavily.
<b>6. Analysis of the data and monitoring of the results</b>	FM	Automated generation of earlier defined metrics and other reports  Utilization of all the accessible data from all the fleets (CAN, AIS, user-based data etc.)	Changes take place over a long-term and such analysis requires good statistical data. Higher data volume allows a higher probability for an occurrence and recording of significant but infrequent incidents, such as breakdowns.
<b>7. Support for the decision-making</b>	FM OL	Leave space for efficient individuals  Provide knowledge to support the decision-making on all organizational levels	Acceleration takes place when management gives space to efficient individuals. In order to improve the results, the decision-makers need better relevant knowledge on the expected outcomes.
<b>8. Reporting/ giving of feedback/ provision of governance</b>	FM CM OL	Connect the change in individuals' behavior and the seen development.  Integration: Repeat efficient ideas.  Provide governance, if needed.	The connection creates awareness and cohesion of the organizations improved agility that the change has led to. Along the way, better practices are invented. The feedback will display them.
<b>9. Collaboration:</b> • Development of the metrics, diagnostics and prognostics • Collaborative data work spaces	FM CM OL	The employees participate to the development of the diagnostics and prognostics.  The data system interfaces that are utilized in the fleet management are collaborative from their structure.	Maximized interpretation through the utilization of the employees insights and experience. Development work gives possibility for growth and personal contribution. Achievements affect the work satisfaction strongly. Collaborative work space visualizes the individuals' contribution, lowers the barriers between units and links the individuals' actions to task of the company as a whole.

In the process description, presented above in Table 12, the content of each step is defined and the readers are also explained the reasons that exist behind both the different measures and the steps themselves.

The other elements of the model, the co-created metrics and guidelines and the change vision, shown above in Table 6, and the 9-steps of the processes are not totally an element of their own, but are interconnected. The vision is formed as the first action and the metrics and guidelines are the third step in the process.

The contents of the three first steps and step 5 have already been discussed in this study. Step 4 is connected to the effect of the change on the employees' experience of mastery. As the new data systems can cause the employees to experience incompetence, it is important to discuss and recognize the skill gaps with employees and organize the needed training for them.

Step 6 is a rather fleet management centered step where the guidelines and metrics are produced from the collected data. It is important to notice that, as the discussed fleet asset management theories state, the bigger volume of data allows a higher frequency for the moments of valuable knowledge. Hence, the harnessing of the available data and analysis method requires a technical solution.

Step 7 is connected both to the fleet asset management and to the OL. When knowledge is provided to support the decision-making on all organizational levels, better decisions are facilitated. When efficient individuals emerge in the process, they are given space to make decisions that accelerate the process. A very practical example could be the changing of the technical parts, such as boat propellers, if it leads to a more optimal outcome.

Step 8 contains functions of reporting, giving feedback and, if needed, provision of governance. Here the individuals are guided to repeating the most efficient ideas and ways of working. Connecting the change in individuals' behavior and the seen development institutes the change and creates cohesion and awareness of the achieved agility, all important for the permanent change (Kotter 2014).

The last phase, Step 9, contains measures that are meaningful both for the development of the advanced analytics and for the employee work satisfaction. The employ-

ees' knowledge and long expertise, factors raised by the data, allows maximized interpretations of the fleet data. At the same time, the development work gives possibility for growth, personal contribution and new achievements that all affect the employee work satisfaction strongly. As stated in Data 1 by the field staff, the case company has successfully utilized an IT collaboration platform ("work space") in the management of the user-based knowledge and generally the whole fleet. The collaborative work spaces visualize the individuals' contribution, lower the barriers between units and link the individuals' actions to the task of the company as a whole. They also contain advanced communication options. Hence, the data systems utilized in the fleet management are to be collaborative from their logic and structure.

The field unit transformation process, the subject of this section, is the most detailed part of the change-inducing model. The whole change-inducing model is introduced in the following section.

## 5.6 Proposal Draft of Change-Inducing Model

The model consists of three elements that have been introduced in the earlier sections; change vision, co-created metrics and field unit transformation process. The contents of the theories of change management, organizational learning and fleet asset management are intertwined with all of the elements. The model, presented below in Figure 15, combines a variety of aspects that have emerged from the processed theories and the data sets of this thesis.

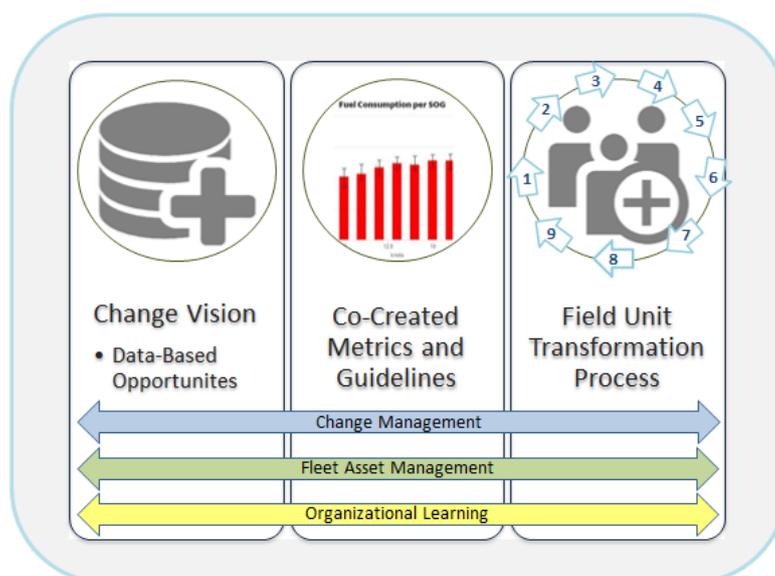


Figure 15. Change-Inducing Model for the Field Unit

When applicable, Data 1 and Data 2 were utilized in the development of the model's separate elements. However, the model itself situates on a rather complex level and its direct processing by the company would not have supported the study process.

The model does not replace existing and well known change management processes, such as Lewin's or Kotter's, but allows a possibility to connect the objectives of the change management process with the targets of organizational learning and fleet asset management. The reviewing of the contents of the change management, OL and fleet asset management, several different points of contacts can be perceived. This is a similar observation that was made in the conceptual framework (Figure 13) when it was seen that a clear exchange and interplay exist between the theories.

The field unit transformation process is the most detailed element in the study and also contains the two other elements. However, the roles of the change vision and the metrics and guidelines are pivotal, when the organization seeks to define its purposes and contributions for the transformation to the data-based fleet management. Such transformation does not take place without costs and effort. The highly applicable and relevant guidelines and metrics have an important role in the governance of the fleet and the resulting benefits.

When successful, the process can provide the organization the needed ability to adapt so that it can utilize the previously inaccessible opportunities of big data and gain the ability to intuit, interpret, integrate and institute new knowledge more efficiently. Hence, it is good to notice that the validation of the entire change-inducing model would require further studies.

The next section describes the validation that was done with the elements of the model.

## 6 Validation of the Proposal

After the proposal of the solution is formed, its soundness and accuracy needs to be tested. Therefore, the solution is predisposed to the practical context. In this section, the process of validation that was done on the proposal is explained. In Section 6.1, an overview of the performed validation is drawn. Furthermore, the groundings for the choices that were made in the validation are presented in it. Section 6.2 introduces Data 3 findings and the changes that were made to the change-inducing model and its elements based on them. Section 6.3 introduces the final proposal that is the outcome of this thesis.

### 6.1 Overview of Validation Stage

The validation was done as a partial piloting of the change-inducing model. The pilot was carried out at one of the case company's pilot stations. The selection of the station was based on the availability of the relevant boat and transport data. The observations and reflection of the field pilot provided possibilities for the further development of the model.

First, the session was prepared in advance and the learnings from the solution building were taken into account in the preparations. The needed data was pre-assessed, pre-selected and the initial interpretation was made in advance. At this stage, the validation workshop was also planned.

Second, an invitation was sent to all the boat operators, pilots and field superiors that were potentially present at the pilot station and could participate the validation session. The fuel consumption data and explanation of the meeting were sent with the invitation. This allowed time for the employees to get acquainted with the data before the session took place.

Third, a pilot was organized in a form of workshop. The two elements of the change-inducing model, the *change vision* and on the *co-creation of metrics and guidelines*, are able to be approached from a rather practical angle and therefore were chosen as the content of the field pilot workshop. Data 3, resulting from the validation, was collected both from the verbal feedback and from the observations that were made concerning the reactions of the participating individuals.

In the end, no pilots or field superiors participated in the session due to the traffic situation. In the case company, encompassing participation of the employees in the co-creation is challenging due to the work setting where the work is always primary function.

The field unit transformation process and entity of the change-inducing model were assessed based on the observations and subsequent reflections that were gained from the field pilot. The developments of the proposal that the validation led to are introduced in the next section.

## 6.2 Developments to Proposal Based on the Findings of Data Collection 3

The testing that the validation contains is meant to bring the development needs of the proposal to the surface so that the final changes can be made to it before the final introduction. The developments resulting from the validation is discussed below.

### 6.2.1 Validation of Proposal for Vision of Data-Based Fleet Management

*Change vision* was the first element of the change-inducing model that was directly validated in the field pilot. The validation was started by introducing the change vision, introduced in Section 5.3. The vision was complemented with some rather practical applications that the utilization of the fleet data would allow for the case-company and its employees. The particular vision was a part of the material that was sent to the group in advance.

In the material, the word vision was avoided so that the development work taking place would not have appeared to be alienated from the concrete issues which could have had a negative impact on the co-creation taking place in the session. Therefore, the purpose was to display the opportunity that the practical applications of the long-term fleet data can allow, so that the opportunity could be internalized on the field. After the introduction, the content of the vision was discussed so that the developer was given direct feedback and observations, and later on reflections based on them.

The first area of discussion was whether the need of data actually exists. This issue is not without contradiction which is visible in the comment that Participant 1 gave in the orientation of the validation:

*All the Boat Operators have engineer certification so that they can do the monitoring of the engines. Where do we need additional monitoring? (Participant 1)*

The comment of Participant 1 shows, that the data can be misconstrued as a substitute for the employees' experience. In the discussion, it was pointed out by the developer that the interviewees in Data 1 phase raised the issue on the limited ability to memorize and exploit data on a long run so that the changes would be noticed and could be analyzed. This was seen to be applied to the work also in the field unit where the pilot took place. Participant 1 commented the following in the orientation of the validation:

*I guess that is true that when it comes to the long-term changes, it would be easier to see them from the computer. (Participant 1)*

The answer of Participant 1 indicates that the need of the data, when first explained, is also visible for the employees. Also, the question of incentive that would be connected to the economical use of boats was raised. It was seen to support the change in the behaviors. Respondent 3 commented the following in the orientation of the validation:

*Some sort of bonus system should be considered to support the achieving of the goals. (Respondent 3)*

As Respondent 3 states, the lack of personal incentives can limit the results in the economical use of the boats. In the discussion, it was stated by the developer- also the Head of Transport Department - that the wins of the new ways of working are still rather undefined and therefore the time was too early for the discussion of the incentives.

The observation was that the participating employees seemed to be able to relate to the introduced vision and no real anxiety was expressed. However, the discussion that contained some confrontation between the data-based work and the expertise of the staff seems to indicate the relevance motivational factors and their consideration in the change-inducing model. No direct needs for the development of the introduced vision were recognized. However, the feedback contained items that need to be introduced in the case company for the future discussions.

The reflection on the validation session was that it enables dialogue and knowledge exchange between the different organizational levels and gives the management an opportunity for the communication of the existing opportunity. As a result, the management has a better understanding of both the practical applications of the development and the directing of the communication that is needed.

### 6.2.2 Validation of Proposal for Co-Created Guidelines and Metrics

The validation of the second element of the change-inducing model, the proposal for the *co-created metrics and guidelines*, was also organized by piloting the co-creation. The amount of the boats that the definition of the metrics and guidelines was formed for was limited to two, based on the availability of the engine data needed in the definition.

The input data and an introduction of the pilot's content were sent in advance to the workers of the field unit. First, the group familiarized itself with the fuel consumption and speed data of the different boats. The need to define the range of the normally used RPM's was discussed. The purpose was to define the range that would be the most optimal from the perspective of the fuel consumption and engine wear & tear. As in Data 2 it was stated that in the Economy Score –metrics the gaining of extra points from idling should be avoided, also the sensibility of the lower limit of the optimal RPM range was discussed. After that, based on the defined optimal speed, standard minimum driving times were agreed on for the most common trips that are driven in the particular field unit. Participant 2 commented the following when discussing the definitions for the RPMs:

*The lowest consumption recognized in the data seems to be at 1500 rpm's. Could we still later on get the exact RPM that is the most optimal? Even the speed is low (~ 16-17 kts), we could then use it if when even we have time. (Participant 2)*

The beneficiary of the field unit co-creation is demonstrated in this issue as it raises the applicability of the solutions. The idea, presented in the comment of Participant 2, is rather self-evident, but still it had not been raised in the solution building phase. The fuel consumption profile that Participant 2 refers to in his comment is depicted in Figure 16 below.

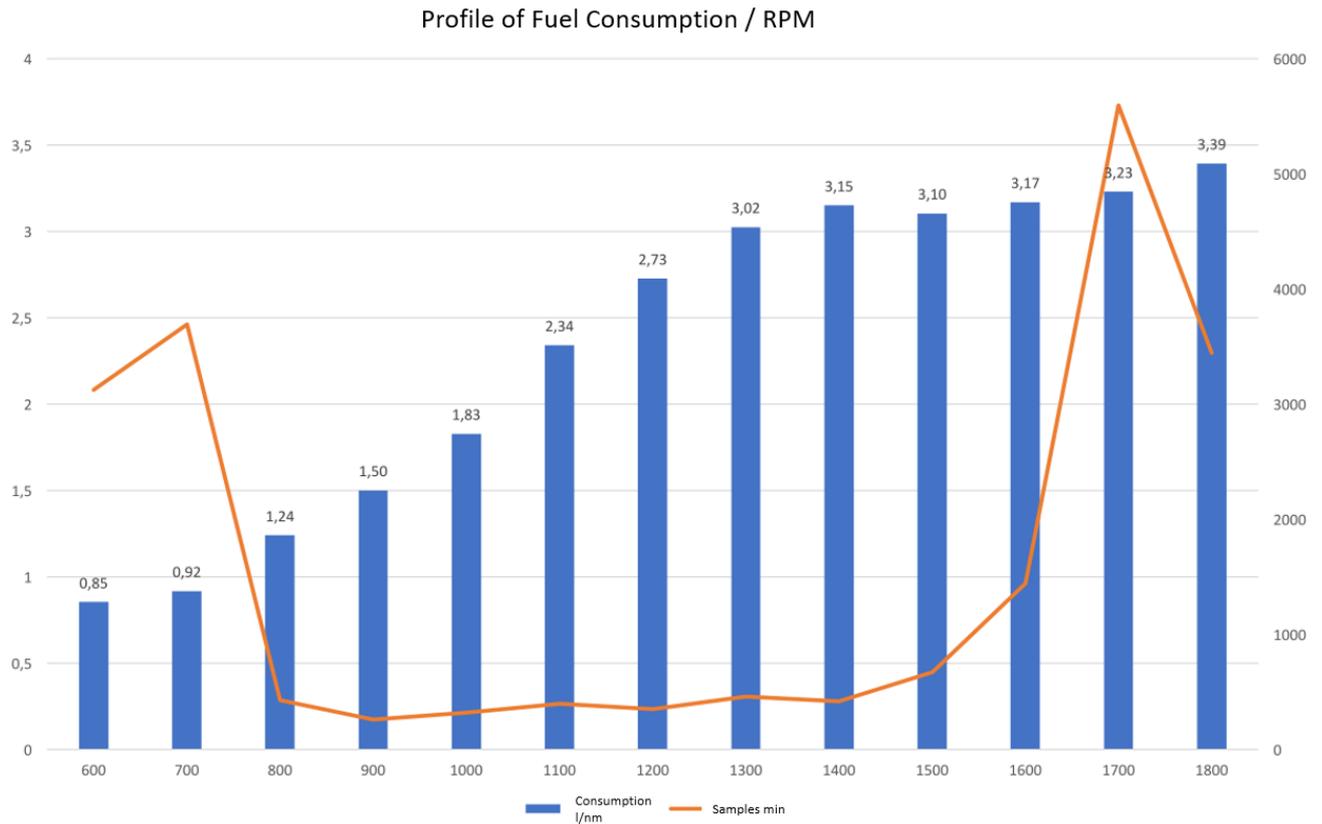


Figure 16. Fuel consumption profile of a fast pilot boat.

As seen in Figure 16, in this graph, the fuel consumption (3.1 l/nm) seems to be the lowest with the RPM of 1500. However, there can be differences in between the 100 RPM intervals that the graph uses. Therefore, a more accurate examination is needed.

The definition process again went through without any manifested anxieties. One reason for this could be the rather strong correspondence between the optimal usage and the field unit's habits of operating the boat, a fact that could be analyzed from the data. The co-creation session also produced few valuable insights. For instance, it was analyzed that the fastest speed recorded for the fast pilot boat must have been recorded in tail wind conditions, a fact that has not been recognized earlier and could have caused mistakes in the interpretation of the data.

In the co-creation session it was noted that the definition of the RPM range for the fast boat in questions was not useful due to the rather prominent limitations on the particular boat's speed reserves. As a conclusion, it was stated that the power production and propulsion line is not as optimal as it is in the other similar boats. With the boat in ques-

tion the existing data should be used also for the recognition of the needed improvements and optimization in those systems.

In the summation of the co-creation session the employees were asked to comment on the session. All of the three field unit participants were cautiously positive on the goals of the development work. Most of the value identified by them concerned the access to long-term data and the benefits that the analysis based on it could produce. However, Participant 3 commented the following:

*I think there are some possibilities to make savings but still I feel that the big savings are connected the pilots' turn-orders and combining of transportations. (Participant 3)*

The comment of Participant 3 indicates that even bigger targets of saving can exist in the arrangements of the pilots' work and transportations. Even though this issue is not discussed further in this thesis, the management needs to assess the possibilities for the rearrangements in these issues.

As a conclusion, the co-creation of guidelines and metrics is a process that can be performed in the field unit and it does provide also additional insights for the management. However, in the particular field unit, the benefits of the compliance with the defined guidelines and metrics were estimated to be rather moderate. The situation is likely to vary from station to another, but the management should not exaggerate with their expectations on the fuel consumption savings of the data-based fleet management. Hence, it needs to be remembered that the fleet asset management theories highlight the meaning of sophisticated methods of analysis and the resulting anticipatory maintenance.

Reaching of good coverage for the metrics and guidelines requires documentation and communication, because due to the nature of the work, the limited participation that can otherwise cause problems. Therefore, a *proper description of guidelines and metrics* needs to be made and communicated. In the future, *pilots need to indicate their representative* for the co-creation, so that the coverage of the co-creation would not be limited from their side. This ensures the participation of a pilot who, after the co-creation can interpret the definitions to the pilots in the particular field unit.

The standard minimum driving times apply as a guideline only to a part of the trips. There are too many variables in many of the trips so that they could function for all the trips. Therefore, RPM ranges and Economy Score seem to be rather prominent metrics and guidelines in the organization. The RPM range seems to be the best way to define the speeds that are used with the different boats. In session it was noted that *the RPM with the lowest fuel consumption should be defined for each boat*. Even the particular speed might not be usable most of the time it could still be applied whenever the schedule allows limited speeds.

The development work with the boat operators seem to function well, when they get to participate. This field pilot did not give experiences of the pilots' participation and their attitudes towards the development of the transportations.

As a conclusion, the validation displayed a need for the following developments in the co-creation of metrics and guidelines: Firstly, a proper description of guidelines and metrics needs to be formed. Secondly, pilots need to indicate their representative to the co-creation. Thirdly, RPM with the lowest fuel consumption should be defined for each boat.

### 6.2.3 Validation of Proposals on Field Unit Transformation Process and Change-Inducing Model

As discussed earlier in Section 6.1, the validation of the entire field unit transformation process and the whole of change-inducing model could not be carried out in the course of this thesis project. That would have required a full process pilot, which would have also included time for both monitoring and follow-up. Therefore, the validity of these concepts relies mostly on their theoretical groundings and their successful application on the model. However, the earlier experience in the company, carried out interviews, solution building session, the field pilot and all the rest of the interaction between the management and the field units' employees allows some reflections that can be used in the assessing of least parts of the process and model contents.

The field unit transformation process steps from one to three were validated in the field pilot. The case company has experience in the implementation of new data systems and the training that has been organized. In these cases, providing training for the field

employees has been a central function in the successful implementation, covering participation and limited anxieties. The challenge lies in the difficulties that exist in the provision of the training that reaches all the employees that are in a need of training. Therefore, the step four could be valid in the context of the case company.

The validation of the step 5 which is the implementation of guidelines and metrics is a very limited as the development of the emotions and behaviors are not easy to predict. The reflections of the interactions that took place during this thesis project highlight the fact that, when unsuccessful, the company policies can harm the work satisfaction heavily. The co-creation is expected to play a key role in limiting the change resistance and the case company has good experience of using such an approach with the field employees.

Step 6, the analysis of data and monitoring of the results, is most concerning the processing of data within data systems. This has been piloted in the company and therefore is not expected to present a challenge. According to the external fleet management system specialist who participated the field unit pilot the processing of the discussed metrics and the organizing of the monitoring is not problematic.

Step 7, the supporting of the decision-making, is a phase that contains decisions that all are not yet defined within the case company. Also, the experiences and reflections on this issue are rather limited within this thesis project. However, in general the case company has seen the benefits of supporting the decision-making in the field operations.

Step 8, the phase of reporting, feedback and possible provision of governance, contains many objects. This phase is essential for the development of the ways of working. During the thesis project, the company has not had a possibility to pilot the individuals' feedback-adaptation-processes. Therefore, the displaying of early wins has not been possible. However, the case company has earlier recognized the positive effect of the integration - the repetition of efficient ideas - in the boat operating and maintenance.

Step 9, the phase of collaboration, contains the development of the whole data systems and their analytics. This phase also utilizes the collaborative work spaces. The case company has excellent experiences in the participation of the employees in the system development work. This limits the development-related anxiety and widens the

ownership of the progress that is seen. The execution of fleet management within a collaborative work space was also raised by the employees as a good example of successful development as they mentioned introduction of Podio-based fleet workspace in the case company's.

As a conclusion, some parts of the model and the process that it contains can be seen partially tested. However, the validation cannot be performed at a level where the needs of the development would be recognized.

### 6.3 Summary of Final Proposal

The subject of Section 6 and its subsections was the validation of the proposal. This section introduces the final proposal which contains the recognized needs of changes.

The changes resulting from the validation were rather limited and no larger corrections of the presented proposal were needed. All of the development needs concerned the co-creation of metrics and guidelines: The description of the created guidelines and metrics, naming of the pilots' representative to the session and definition of the RPM with the lowest fuel consumption for each boat. Therefore, the pre-defined set of *metrics and guidelines* was corrected to read as presented below in Table 13:

Table 13. Predefined metrics and guidelines after the validation.

Predefined metrics and guidelines after validation	
1.	Desirable RPM range for all the boats
2.	The optimal RPM is also defined
3.	Logic of the Economy Score metrics for each boat
4.	Standard travel times for each boat and for each trip
5.	<i>RPM with the lowest fuel consumption for each boat</i>

The following amendments, shown below in Table 14 are made to the step 3 of the field unit transformation model that was introduced in Table 5.

Table 14. The amendments made in the step 3 of the field unit transformation process.

<b>3. Co-creation of the metrics and guidelines</b>	  	<i>Pilots name their representative</i> For each field unit and boat: Agree at least on the desired RPM range, standard minimum travel times and logic of economy score. <i>Description is made.</i>	All the boats are individuals and the trips are not the same either. Unit-level co-creation allows time for dialogue.  Participate both boat operators and pilots to increase the validity and acceptability of the metrics.
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The amendments described above in Table 14 are included in the final field unit transformation process description table. It can be found in the Appendices of this thesis.

This section introduced the validation that was done to test the proposal in order to make sure that is functioning in practice in the case company. As the proposal is finished, the next section concludes this thesis.

## 7 Conclusions

This section summarizes and further interprets the results of this thesis. At the same time, it allows the reasoning that backs up the provided analysis.

### 7.1 Executive Summary

The objective of this thesis was to introduce *a change-inducing model for field units*. This model supports the transformation process that is needed in the implementation of data-based fleet management in 20 of the case company's field units.

The study was conducted according to the Action research approach. The research design consists of five stages. The major part of the collected data was obtained by involving the field employees to the defining and developing of the solution.

Through the current state analysis, the following key development areas were identified: *the absence of the guidelines, the lack of long-term data, the easily activated incentive-related change resistance and the slow process of organizational learning*.

The theory of fleet asset management allowed discussing applications on the development of more economical boat operating and capitalization of the fleet level benefits. The change management offered a well-established application on the execution of organizational transformation process. The theory of organizational learning offered the case company knowledge on the supporting of the essential processes of organizational learning. The theories have clear areas of interplay, complement each other and provide separately and together input for the solution.

Since successful implementation of data-based working model requires multidimensional change management, this thesis formed a change-inducing process model that responded to these issues.

First, the *change vision* as an element of the change-inducing model ensures that the opportunities of the data-based fleet management are visible for the employees. This helps to motivate them for the introduced changes and challenges them to utilize the data in their own work.

Second, the *co-created metrics and guidelines* allow a dialogue, learning process and governance for the economical use of the boats.

Third, the 9-step *field unit transformation process* allows the management to lead the field unit through a transformation process that facilitates the implementation of the data-based fleet management. The model simultaneously takes into account the motivation of the individuals and enhances the organizational learning.

The reaping of the benefits offered by the data-based working requires adaptive change that reaches the decisions that individuals make in their everyday work. The utilization of the presented model allows more applicable practices and measures that have a higher relevance for the organization. Due to the participation of the employees, the measures are more easily implementable. At the same time, the individuals' angles of contribution and key factors of their motivation are supported. The model also provides clearly perceivable steps that can be followed when leading the case company to the upcoming transformation.

## 7.2 Next Steps and Recommendations toward Implementation of the Proposal

Before the model can be taken to use, a sufficient data collection period needs to be carried out. Prior to the installation, the employees are informed about the plan and the schedule for the measures is communicated. Thereafter, the model is rather simple to follow.

To support the process, the management needs to seek and arrange opportunities for a dialogue so that the employees have possibilities for expressing their doubts. Even mostly the employees' loss of time caused by the lower speeds is rather limited the management should still recognize their loss and not try to deny the realities. However, in the best cases, the employees will experience ownership over the development. Then, the management needs to be able to draw back from being too much on display.

This thesis raised some areas of discussions that were not able to be treated due to the time limits. Seemingly, the case company will need to prepare for a discussion about incentives that would reward the economical behaviors. In the first phase, the monitoring is not done on a personal level, which means that a certain trip is not tagged to a particular boat operator. If some sort of bonus system is considered, the tracking

could be extended to the individuals' behaviors and the incentive could be connected to the personal economic driving style. Currently, the economic benefits are too unclear for such discussions.

Another recommendation for a future discussion is the transportation planning, and even more, the pilots' turn-order system. If the pilotages are carried out in a sequence, the possibilities of the back-and-forth pilotages are not utilized. This increases the amount of transports. The question was raised in the interviews and if the operating contains wasteful procedures it can be hard to motivate other savings.

The levels of analysis, presented in Table 6, are highly relevant both for the concrete outcomes of the fleet asset management and the beneficiary of the big-data. This thesis could only touch lightly on the questions that are situated on the level of fleet data analysis. The creation of practical applications that utilize the fleet dimensions and ecosystem benefits requires further developments from the case company. The visited fleet management theory sources discussed the fleet level goals and benefits on a rather general level. Practical applications, organizational measures and aspects of individuals' participation are rather distant in the discussed literature. Further studies and research are needed to enable the further development of the fleet asset management functions from these perspectives. Deeper understanding of these complex questions will also facilitate the development of related fleet management system businesses.

This study seeks to understand the changes that need to be introduced to the organizational learning in a digitalizing business environment in order to benefit from the growing amount of interpretable data. Generally, research is needed for gaining a better understanding of the implications that the digitization and big data have on the 4I processes. As the data allow more grounds for the intuition, the meaning of interpretation might be highlighted. Certainly, the 4I processes and data systems are very much interlinked and higher understanding can support both the development of data system businesses and the organizational learning.

Finally, the case company, due to the nature of its safety service business, should evaluate its possibilities to exploit the organizational learning in its operations. The company is an expert organization whose pilots themselves serve the customers. The vital information is accrued to the individuals in a pronounced way. Therefore, the functioning of the 4I processes and the group and organization levels' efficient participation

to the learning can be pivotal in the supporting of the pilots' work and eventually the safety of the customer vessel.

### 7.3 Thesis Evaluation

The logic of a thesis is seen as an analogy between the effectuated study and the established objectives of the study. In order to conduct a thesis in a rigorous and relevant way, attention needs to be paid to the quality of the research. To serve this purpose, the key concepts of the evaluation are introduced and the steps of the evaluation are presented below.

#### 7.3.1 Relevance

The purpose of the relevance in a research is to ensure that the thesis addresses a relevant business challenge. Relevance in practice means that for instance the findings, the literature used and the solutions developed all serve the purpose of the study.

In this thesis the purpose was to create a change-inducing model that is relevant for the development work of the case company. The theories that were used found their own angles of approach and all of them appeared to have clear areas of interplay, complement each other and provide input for the solution. Also, the sources of the collected data - the interviews, the solution building, the feedback session and the validation that was done as field pilot - seemed to evidence the relevance of the discussed business challenge.

#### 7.3.2 Validity

AR, the method of this thesis, belongs to the family of the case study research. According to Yin (2009: 24), the quality of the case study is maximized with three tests: Construct validity, internal validity, external validity and reliability.

In general, the validity ensures that the developer's methods and approaches relate to and measure the studied questions (Blaxter et al. 2010:245). This requires a setting where the developer is enough acquainted with the business challenge. Validity has also to do with the data; its sufficiency, triangulation and saturation needs to be en-

sured. The solution that is developed also needs to go through a separate process of validation where the content is predisposed to the practical context.

The *construct validity* means identifying the correct measures that can be used for the studying of the concepts in question. It can be ensured with three tactics: By using multiple sources of evidence, by establishing a chain of evidence and by having the key informant to review the draft of the study. (Yin 2009:41-42) In this thesis, a substantial number of sources are used to provide evidence from the body of theories. The chain of evidence is displayed both in the text and in the attached data. The key informants have been informed several times during the study. Therefore, the construct validity can be stated to fulfil in this thesis.

According to Quinton and Smallbone (2006:126) the concept of *internal validity* can be explained by comparing the measuring that, when designing the research, was intended to be done and the measuring that actually was done. In this study, this can be ensured by comparing the research design, the conceptual framework, the logic of the proposal building and the solution. All these form a consistent line of logic in this thesis.

With the *external validity* it is assessed whether the results are applicable to other contexts and if, to what extent (Quinton and Smallbone 2006:129). Good questions are whether the results could be used in a different context and would it be relevant. In the course of this study it needs to be evaluated whether the created change-inducing model can be used on all the stations of the company and also in the development of other issues than guidelines and metrics or the data-based fleet management in general.

During the progression of the study, attempts were made to ensure the presence of different aspects. Therefore, individuals from different organizational levels were involved in this thesis project. External fleet management specialists were used in the solution building and field pilot phases. Their purpose was both to bring their own aspects to the work and to ensure that the discussed data solutions such as the economy metrics would be feasible. This triangulation can be seen to enhance the validity of the study. The question of the *researcher bias* has been raised in this thesis, as the position of the developer has been stated. Presenting of neutral aspects has been the developer's goal in the forming of the research the design and planning of the interview questions.

The conceptual framework forms a basis for the fleet management of any kinds of physical assets and is therefore also generic. The change-inducing model was developed to be generic in a way that it can be used for the carrying out of the transformation process in any of the case company's field units. The model, however, does not contain details that would only apply only to the case company and the model could probably use for the similar transformation processes also in other organizations. Therefore, the external validity appears to be fulfilled in this thesis.

### 7.3.3 Reliability

Reliability in a research is connected its linkage to the data and availability of the data stages and also to the diligence and the transparency of the documentation. The purpose is that the finding, solutions and interpretations would have similarities even if the research would be repeated by others (Blaxter et al. 2010:245).

In the case of this study the aim was that, despite the insider status of the implementer, this project was carried out in an objective way. Therefore, the goal was to leave a space of the interviewees to define their own perspectives. The documentation of Data 1, Data 2 and Data 3 phases is attached to this thesis. As the goal was to create a model that would function in the field unit, the interviews, solution building and validation were also done among the field employees and the management's role was kept limited.

As mentioned in Section 6, the rather extensive model could not be validated fully within this thesis project. Hence, the model can contain element or aspects that the realities of the business will reveal to be invalid or in a need of further development. The model can contain only a minor portion of all the knowledge that exists in the areas of the fleet management, organizational learning, personal motivations and change management. Therefore, the model likely fails to contain some significant knowledge. The implementation of the model will probably indicate needs to deepen some aspects, create new solutions and renounce some redundant contents.

The effectiveness of the measures was not ensured in this thesis, although it presents practical and applicable measures for developing and supporting more economical ways of boat operating. Obviously, the implementation of the developed metrics allows

the company a possibility for cost reductions through the reduced fuel consumption and decreasing wear of the boats and their engines. However, due to the limitation that had to be applied to this thesis project, the study cannot offer estimation on the level of those savings. Especially the financial significance of the anticipatory maintenance and the returns of the decisions that maximize the fleets' value during its whole life-cycle remain indeterminate.

Certainly, the model is not complete and should not be considered as such. Nonetheless - being as they are - the contents of the model are well able to educate managers that seek for a holistic picture of the unavoidable phenomena that will be encountered in the introduction of data-based fleet management. It also provides some well-founded steps that can be taken when pursuing an organization that maximizes the value of its physical assets, has motivated and contributing employees and has the ability to process information and learn efficiently.

#### 7.4 Closing Words

The abundance of data and constantly developed analysing measures are offering new opportunities for the acquiring of the most complex areas of ineffectiveness. However, the potentially negative organizational effects of the fleet tracking and the contribution needed from the staff can be a challenging combination. Therefore, the common ground needs to be found; the employees' desire to learn new things and see progress in their work needs to be harnessed to serve the organization's will to gain insight and solve complex problems. The individuals' ability to intuit and interpret can benefit from the new data. Thus, covering data and human experience are not substitutes for each other.

The managing of asset fleets together with the organizations is so complex puzzle that it limits the business applications within this domain. The literature contents do not provide such application methods that could be said to lower the bar in the organizations to pursue of these new compatibilities. The solution of this thesis and others similar to it, are needed as they combine existing knowledge in order to study and understand the multidimensional causalities under which the data and individuals meet within the organizations and asset fleets. This will help the organizations to both create new opportunities and access into them.

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## Appendix 1: Data 1 - Research Interview and field note samples.

## Data 1: Research Interview (Discussion) – Sample 1

TOPIC: MANAGEMENT OF THE FLEET

## Information about the informant (Interview 1)

Table 1

Details	
Name (code) of the informant	Respondent 3
Informant's position in the case company	Boat Operator
Informant's role concerning the management of the fleet	Boat operating, maintenance
Date of the interview	26.1.2017
Duration of the interview	19:35 – 20:45 (telephone interview)
Document	Field notes

## Field notes (Interview 1)

	Topic(s) of the interview	QUESTIONS	FIELD NOTES
1	Role of the interviewee	<i>How have are you involved with the managing and the operating of the fleet- in what role, when?</i>	Mostly by using the equipment and looking after the inspections and permits.
2	Work and progress in the unit and in the company	<p><i>How are things going in your unit?</i></p> <p><i>What kind of positive things or struggles do you see in your unit?</i></p> <p><i>What kind of positive things or struggles do you see generally in the company?</i></p> <p><i>What would want to see changed in the unit and in the company?</i></p>	<p>Internally things are well. The group works well.</p> <p>If someone new will come, he will probably be amazed how much things that would be easy to do by ourselves are purchased from outside. Especially in the moments when we have more men working.</p> <p>I don't see bigger struggles.</p>

		<b><i>What would be the ideal situation in your unit and in the company?</i></b>	
<b>3</b>	<b>Current transporting process</b>	<p><b><i>What is the current transport process?</i></b></p> <p><b><i>How does a transport develop from phase to phase: How is the transport instructed, planned, communicated, prepared, timed, executed and finished?</i></b></p> <p><b><i>How is the departure defined?</i></b></p>	<p><i>Planned</i> The call center tells the order to the pilot. The pilot wakes up the drivers.</p> <p><i>Communicated</i> With a phone</p> <p><i>Prepared</i> Let go the boat.</p> <p><i>Timed</i> There are general rules for the timing. Cutter 1h, fast boat 30 min.</p> <p><i>Executed</i></p> <p><i>Finished</i> Check the engine room after the trip.</p>
<b>4</b>	<b>Instructions</b>	<p><b><i>What kind of instructions, orders or guidelines do you have concerning the managing and the operating of the fleet? Please specify.</i></b></p> <p><b><i>Please specify all the target sand metrics within this issue?</i></b></p> <p><b><i>When where the current ways of operating created?</i></b></p>	<p>Not that I can think of. It is clear that in the start-up we warm up the engine. The drive-down of the engine is automated.</p> <p>I can't think of any metrics. What should be done is that the pilotage orders would be handled in a more precisely and kept up-to-date.</p> <p>The current ways of working are created over longer period of time. The development has been slow.</p>

5	<b>Strengths</b>	<i>What the strengths in the current the operating processes? In the way of doing things?</i>	The boats are quite much the same models everywhere. They are good and safe. The staff is also professional.
6	<b>Best practices</b>	<i>What kind of current best practices can you name in your unit? What practices work well and are valuable?</i>	We have a good habit that the safetyman stays on the boat's deck as long as the pilot climbing the ladders is safely onboard the ships. After that their waves hands to each other before the safety man goes to the cockpit.
7	<b>Weaknesses of the process</b>	<i>What phases of the work well in boats operating the process?  What phases do not work?</i>	Not really.  We are a bit struggling with the administrative task. Also the purchases are a little bit challenging to handle.  Things aren't too clear. Right and wrong doesn't exist really here. I would at least like to have clearer rules.
9	<b>Level on economics in operations</b>	<i>How economically are the boats operated currently in your unit? How do you perceive the economical use of the boats? When is the use organized ideally?</i>	The fleet isn't operated too economically.  My first aspect is the speed of the boat. The problem is that by using more time you would save time, but the employees lose time without compensation.  There would be a possibility to add-on the number of the transports where we take more pilots out to the sea at the same time.
10	<b>Analysis of the development possibilities</b>	<i>In which areas do you think there is space for improvement? In what way? In which part of the <u>process</u>? How could that be done?  What kind development needs do you see in the economical use of the boat?</i>	We could also use our men in the maintenance work. There are people that have skills but they are not utilized in the use of the company.  The employees would need to own the matters of the company. For instance the employees themselves would need to control the costs that they create. For instance in the purchases. The culture and the habits are probably herited from the state organization.
11	<b>Development possibilities regarding the use of</b>	<i>What development possibilities do you see in the use of boats in your unit?  What possibility is the most</i>	A faster ice-strengthened boat would be needed in Rauma.  A bonus system would be motivating. It should be built on unit level.

	<b>boats</b>	<b>important?</b>	
<b>12</b>	<b>Personal level and focus of interest</b>	<p><b><i>How aware or interested are you about the economical use of the boats?</i></b></p> <p><b><i>How interested are you about the sustainability of the engines and boat?</i></b></p> <p><b><i>Which one interests you more?</i></b></p> <p><b><i>Would you be interested to develop the working modes of your unit?</i></b></p>	<p>The biggest interest is to do some maintenance and repair work by ourselves. For instance the works in the winter drydock should be listed and it should be checked what we could do ourselves in the empty moments. If you know that you have certain jobs you need to do, there will be enough time to finish them before the spring comes.</p>
<b>13</b>	<b>Limitations for the more economical development</b>	<b><i>What limitations can you recognize in the development of the more economical use of the boats? What could limit your company from achieving such development?</i></b>	<p>The connection with the travel time and the costs. No one wants to spend extra time in the boat.</p> <p>Pilots don't want spend to time in the boat. There might also have their own agenda at the background as they receive part of their salary from the pilotages.</p>
<b>14</b>	<b>Key concerns regarding the use of boats</b>	<b><i>What are your fears in the development of the use of boats?</i></b>	No
<b>15</b>	<b>Availability of data concerning the usage of boats</b>	<p><b><i>What kind of usage data do you have available from the boats or the engine?</i></b></p> <p><b><i>What kind of data would be needed to help you to succeed in your work?</i></b></p>	<p>The meters exist in the boats' cockpits, but they are not easy to use.</p> <p>The results are not easy to remember later on. I was later on trying to remember a certain temperature from the moment when the boat was new but I couldn't.</p>
<b>16</b>	<b>Fleet tracking</b>	<p><b><i>What opportunities do you see the tracking of the fleet?</i></b></p> <p><b><i>What kind of concerns does it raise to you?</i></b></p>	<p>If all the engine data is available, then operators could see the change that happens over time.</p> <p>Not really. I do not have a summer cottage that nearby.</p>
<b>18</b>	<b>To add</b>	<b><i>What would you like to add that we have not yet discussed?</i></b>	

**Data 1: Research Interview (Discussion) – Sample 2****TOPIC: MANAGEMENT OF THE FLEET****Information about the informant (Interview 1)**

Table 1

<b>Details</b>	
<u>Name (code) of the informant</u>	Respondent 7
<u>Informant's position in the case company</u>	Pilot
<u>Informant's role concerning the management of the fleet</u>	Internal client
<u>Date of the interview</u>	01.02.2017
<u>Duration of the interview</u>	09:00 – 10:25 (face-to-face)
<u>Document</u>	Field notes

**Field notes (Interview 1)**

	<b>Topic(s) of the interview</b>	<b>QUESTIONS</b>	<b>FIELD NOTES</b>
1	<b>Role of the interviewee</b>	<i>How have are you involved with the managing and the operating of the fleet- in what role, when?</i>	As a passenger.
2	<b>Work and progress in the unit and in the company</b>	<i>How are things going in your unit?</i>  <i>What kind of positive things or struggles do you see in your unit?</i>  <i>What kind of positive things or struggles do you see generally in the company?</i>  <i>What would want to see changed in the unit and in the company?</i>  <i>What would be the ideal situation in your unit and in the</i>	<p>I feel like in our unit things are going fine.</p> <p>The weathers are a challenge, especially for the boats.</p> <p>The staff consists of excellent professionals.</p> <p>For each watch there seems to be a person who likes to take role in the maintenance of the fleet.</p>

		<i>company?</i>	
3	<b>Current transporting process</b>	<p><b><i>What is the current transport process?</i></b></p> <p><b><i>How does a transport develop from phase to phase: How is the transport instructed, planned, communicated, prepared, timed, executed and finished?</i></b></p> <p><b><i>How is the departure defined?</i></b></p>	<p><i>Planned</i></p> <p>The planning is largely done in cooperation with the call center and the duty pilot. The call center does the foreseeing that is needed for combining the pilot that we will transportation and the rides (boats, own cars and taxis). The combining save a lot. This is developing all the time. The co-operation between the senior pilots is important thing for this.</p> <p>The boats departure time is asked from the call center or the duty pilot. The pilot or the boat operator does the estimation about the needing travel time. Many times the pilot calls the boats operator and they discuss about the boat that is used and the travel time. The weather affects a lot.</p> <p>There has earlier been big differences between the pilots in the timings and the habits as a whole. The pilots used to think almost only themselves when they took a transport. I remember when each pilot was transported alone between the island and the mainland. Now we wait for a joint transportation or stay in the island for the next ship. Now this working a lot better, there much more standardized and sensible ways of doing things.</p> <p><i>Communicated</i></p> <p>Many times the pilot calls the boats operator and the they discuss.</p>

			<p><i>Prepared</i></p> <p>The weather at sea has to be taken into account. We are also trying to avoid the usage of two boats by timing the boat rides right.</p> <p><i>Executed</i></p> <p><i>Finished</i></p>
4	<b>Instruc-tions</b>	<p><b><i>What kind of instructions, orders or guidelines do you have concerning the managing and the operating of the fleet? Please specify.</i></b></p> <p><b><i>Please specify all the targets and metrics within this issue?</i></b></p> <p><b><i>When where the current ways of operating created?</i></b></p>	<p>The boat operators have certain instructions in the boats. Partially they are coming from the engines' user manuals and partially from the experience.</p> <p>I guess the goals that exist are in a way inbuilt to the operations. For instance, the avoidance of the engine failures is one clear goal. Tidiness is also one target.</p> <p>Such information has been collected by the operators over decades and the habits are molded by the experiences.</p>
5	<b>Strengths</b>	<p><b><i>What the strengths in the current the operating processes? In the way of doing things? What should not be changed.</i></b></p>	<p>The pilots' respect for the boat operators expertize has grown a lot.</p> <p>I would say that the biggest strength is the staff's expertise and experience. It had also been handed over so well from an operator generation to another. We have generations of knowledge that can be used to sight, understand and interpret things.</p>
6	<b>Best practices</b>	<p><b><i>What kind of current best practices can you name in your unit?</i></b></p> <p><b><i>What practices work well and are valuable?</i></b></p>	<p>The call center does foreseeing that is needed to combine the transports (boats, own cars and taxis). The combination does a lot of saving. This is developing all the time.</p>
7	<b>Weaknesses of the process</b>	<p><b><i>What phases of the work do not work well in boats' operating the process?</i></b></p>	<p>Within our organization the methods of doing the normal maintenance have not developed during the last decades. The</p>

			<p>ways of doing things have not been modernized. An example would be the ATV's cart for the lubricant oil transport. I see this as a thing that is worth developing.</p> <p>The drydocking is something that could be developed.</p> <p>Something that the operators should get rid of is the limitations in their mindsets. For instance, an operator from the Kotka sees himself different from the operators on Orregrund. We should have more cohesion.</p> <p>There would be a great step if the personnel could change their weeks in an overlapping way. A part of the pilots could for instance exchange the duties on a different day than another half. The difference between the two shifts should be diminished.</p>
9	Level on economics in operations	<p><b><i>How economically are the boats operated currently in your unit?</i></b></p> <p><b><i>How do you perceive the economical use of the boats?</i></b></p> <p><b><i>When is the use organized ideally?</i></b></p>	<p>If the cutters are used in the open water, it would be helpful to know the optimal speed setting on them.</p> <p>I remember times when the boats were going on a full speed wherever they were going. Now the personnel is more conscious about the things.</p> <p>Joint transports are important from the perspective of savings. In addition, the economical speed and engine use are rather important.</p> <p>In Orregrund there is not enough electricity to keep all the cutter boats electrified. In a hard winter, the boats' generators will face tough times.</p>
10	Analysis of the development possibilities	<p><b><i>In which areas do you think there is space for improvement? In what way? In which part of the <u>process</u>? How could that be done?</i></b></p>	<p>One thing that could be brought to knowledge is that there is plan for the life cycle of the boats. If the people would know the future plans considering the boat that they are responsible for they would maybe act a bit different. If the</p>

		<p><b><i>What kind development needs do you see in the economical use of the boat?</i></b></p>	<p>staff expects the boat to change all the time, they might not upkeep the boats in an optimal way.</p> <p>The anticipatory maintenance could make a big difference. For the extensions of the life cycles of the boats, a big problem can be the updating of the electrical installations. It can be very costly.</p> <p>What I have sometimes been thinking about is the fast boats winter drydocking. It is in a way good that they are drydocked by each unit. There is a big differences in when the winter is coming in different locations. Therefore, I have been thinking whether the Orrengrund boats should be lifted ashore in Emäsalo and not in Kotka.</p>
12	<p><b>Personal level and focus of interest</b></p>	<p><b><i>How aware or interested are you about the economical use of the boats?</i></b></p> <p><b><i>How interested are you about the sustainability of the engines and boat?</i></b></p> <p><b><i>Which one interests you more?</i></b></p> <p><b><i>Would you be interested to develop the working modes of your unit?</i></b></p>	<p>What I am interested a lot is the lifecycle of the boats; the boats are used as long as possible. I am really keen on the technical issues.</p>
13	<p><b>Limitations for the more economical development</b></p>	<p><b><i>What limitations can you recognize in the development of the more economical use of the boats? What could limit your company from achieving such development?</i></b></p>	<p>The differences between the fuel consumption to my understanding is smaller with the fast boats in different years. With the cutters there are lot bigger differences.</p> <p>If we look at only our own area, I could examine the possibility to expand the fuel storage in Orrengrund. I would increase the amount of refueling of the boats in Tallbacka.</p> <p>I don't see a big difference in my own work and day if the boat proceed in an</p>

			economical speed. I don't care about a loss of few minutes and therefore don't see big difference.
14	<b>Key concerns regarding the use of boats</b>	<i><b>What are your fears in the development of the use of boats?</b></i>	<p>The communications from the head office to the field needs to be given in a way that does not sound like an order.</p> <p>I am proud of the boats operators' expertise. I have seen a lot of example of other organizations that handle their boat in a poor way, far worse that our people.</p>
15	<b>Availability of data concerning the usage of boats</b>	<p><i><b>What kind of usage data do you have available from the boats or the engine?</b></i></p> <p><i><b>What kind of data would be needed to help you to succeed in your work?</b></i></p>	<p>I can't really say. For the pilots the AIS data is only data.</p> <p>A better understanding of the whole operating cost would be meaningful. It would educate the men.</p>
16	<b>Fleet tracking</b>	<p><i><b>What opportunities do you see the tracking of the fleet?</b></i></p> <p><i><b>What kind of concerns does it raise to you?</b></i></p>	<p>Such data can be used in a useful way.</p> <p>I can't say. What happens even nowadays that the driver is for instance picked up from an unoptimal place.</p>
18	<b>To add</b>	<i><b>What would you like to add that we have not yet discussed?</b></i>	

## Appendix 2: Data 2 - Solution building workshop: Questions, field notes, observations, feedback and reflections

### TOPIC: MANAGEMENT OF THE FLEET/DATA 2/Solution Building

Table 1

Details	
<u>Name (code) of the informant</u>	Solution building workshop
<u>Informant's position in the case company</u>	Boat Operator (BO), Senior Boat Operator (SBO), Areal Chief Pilot (ACP), Vessel Engineer (VE), Data Specialist (DS), External Fleet Management Specialists 1&2 (EFMS 1& 2) + the Thesis writer (Head of Department)
<u>Date of the workshop</u>	28.3.2017
<u>Duration of the interview</u>	09:12 – 10:40
<u>Document</u>	Field notes

### Field notes

	Topic(s) of discussion	QUESTIONS	FIELD NOTES
1	Need of change	<p><b><i>The need of change based on data 1 introduction.</i></b></p> <p><b><i>The keys questions:</i></b></p> <p><b><i>Why is this important?</i></b></p> <p><b><i>What can we get out of the data?</i></b></p>	<p><i>DISCUSSION ABOUT THE CSA RESULTS:</i></p> <p><i>Transport process:</i></p> <p>ACP: there in a contradiction in this: Boat operator is the master of the boat, pilot decides on the transportation.</p> <p>VE: The engine should be warmed to 60C before take-off</p> <p>BO: Couldn't there be a more powerful block heater in the boat.</p> <p>SBO: Scania does not want the more powerful block heaters</p> <p>BO: We warm up the engines</p> <p><i>Existing guidelines:</i></p> <p>DS: Should there be guidelines? Does this say that</p>

			<p>we need them?</p> <p>VE: We have the safety manual that contains instructions and guidelines.</p> <p>ACP: The question is whether we abide by the rules that exist.</p> <p><i>Strenghts:</i></p> <p>EFMS1: seen from outside, the pilot role is in a pivotal role.</p> <p>ACP: We don't of course know how the boat operator use the boat when the pilot is not onboard.</p> <p>EFMS2: Why do the pilots want to minimize their time in the boat</p> <p>ACP: I don't know. The boats are so good nowadays.</p> <p><i>Development needs:</i></p> <p>ACP: The human side also needs to be considered. Who wants to be out on the sea for two hours when the sea is rough?</p> <p>EFMS2: Have you tough of making the transport decisions visible? This could affect the situation and make the decision more sensible.</p> <p>VE: There would be quite a few factors to concider.</p> <p>Discussion about the decision making.</p> <p>BO: Knowing the boat operators, the written rules would be challenging to pull through. Bad weather is a moment when real decision are needed.</p> <p>Discussion about the bad weather decision making.</p> <p><i>Attitudes:</i></p> <p>Discussion about the available engine power.</p> <p>BO: What is sensible use? The engine needs some turbo charging pressure every now and then to re-</p>
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			<p>move carbon deposits. The problematic time is the open water where the power is not needed.</p> <p>BO and VE: Discussion about the dual engine and electric-diesel-system.</p> <p>ACP: At least our men are afraid that they are compared to the stations where the boats are used in the open waters.</p> <p>BO: The speed, fuel consumption and rpm connected will tell about the ice conditions.</p> <p>EFMS1: The wave situation is a harder one to analyze</p> <p><i>Discussion about the g-forces:</i></p> <p>EFMS2: Transmission of wave data cannot be sent out due to the needed sample frequency</p> <p>BO: The more sophisticated devices tell the heaving data.</p> <p><i>Limitations to the development:</i></p> <p>EFMS1: If you work from home you can be more tempted to arrive late</p> <p>Discussion about the vibrations.</p> <p>SBO: All the boats are individuals, but vibration is not a common problem.</p>
2	<p><b>The focus of needed progress</b></p>	<p><b><i>What kind of progress do we need to see in the work?</i></b></p>	<p>DS:</p> <ul style="list-style-type: none"> <li>· Do not take power out of the cold engine. This is easy to control by with the data system</li> <li>· It there is no limitation of pilot resources, the pilot needs to arrive early enough. In the future, when the standard transport times exist, an explanation the deviation from the timing needs to can be required</li> <li>· In a situation where the resources are limited, the transports needs to be planned well</li> </ul> <p>SBO: In principle, an incentive for the economic use of boats should be thought trough</p>

			<p>DS: A great thing is that in this matter the safety and the economic efficiency are on the same side of the coin.</p> <p>ACP: I would like to raise the position of the boat master more. He could take a bigger role in the transport planning.</p>
3	Feedback from the usage	<i>What kind of feedback from the usage of the boats would be useful and constructive?</i>	VE: The principles of diesel engines need to be understood when building the metrics. This means that the boat users should not be guided to idling.
4	Access to data and the transparency of data processes	<i>What kind of boat usage data would be transparent? How can we provide an access for all to the data?</i>	<p>EFMS2: Access to data system can be given to all users.</p> <p>BO: Quite many on the boat operators are more interested about the data than they are concerned about the tracking.</p>
5	Employees possibility to contribute	<i>How should and could we facilitate a possibility for the employees to contribute? How and we make it visible?</i>	EFMS2: After the introduction, discussion is needed for the development of the system. The system team and the users need to meet regularly for discussions and for the of the metrics, analytics and prognostics development.
6	Feedback from the work	<i>What kind of feedback from the usage of the boats would be useful and constructive?</i>	<p>The fleet management specialists showed their reporting system. The metrics implemented for the measuring of the trip where seen as helpful.</p> <p>EFMS1: There are many decision making situations that this kind of system can give answers for.</p>
7	Guidelines and metrics	<i>What does it sound like that we introduce minimum standard travel times for each location and boat?</i>	<p>SBO: The anticipative maintenance in possible if we would have the long-term data that we could interpret.</p> <p>SBO: I would not test these metrics in Emäsalo. They are so busy there that sending more minutes on the boat is not in the minds.</p>
8	Metrics		<p>In the economy score the turbo pressure needs to be taken into account. Idling is not ideal thing.</p> <p>DS: The test metrics don't answer to the question how the full throttle affects to the engine life-cycle. This is a big matter when it comes to the benefits of the fleet management.</p>

			SBO: A big question is the oil-change-interval. What is the right interval? To us it is not probably to 400 hrs that Scania would give. Rather we do it every 200 hrs.
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### Workshop observations

- Introducing of the objective of the thesis fails to motivate the employees
  - Other important aspects needs to be raised when discussing with the employees, not just the more economical boat operating
- The big picture that covers fleet asset management and boat operating is not easy to perceive
  - Especially when metrics, guidelines and people behavior are brought to the picture, the orientation is easily lost
- The discussion in the work shop wasn't easy to control and direct to the planned questions
- People perceive a variety of different kinds of issues as "economical use of boats" and a lot depends on the work role.
- The time that was reserved was not sufficient and the final synthesis of the issue was not done. The agreeing of the solution was done over the e-mail, which was not an ideal setting.
- Not everybody in the administration is supporting the development of the data systems, metrics and guidelines as they don't seem to find the connection between the data and the possibilities
- Nevertheless, the participated boat users saw the data collected through the fleet tracking as needed and useful
- The using of the data system within the workshop didn't make it easier for the participants to perceive the data. This is especially harder for the older individuals.

### Reflection based on the workshop observations:

#### Development needs/ ideas / requirements (Data 2):

- The objective of the thesis cannot act as a vision for the transformation process. A separate vision needs to be introduced for communications. The content of the vision needs to be relevant for the employees (reflect on data1 and data2)
- The final solution needs to be as simple and as perceivable as possible.
- The workshop showed that the discussions on the field need to be very well prepared. The agenda needs to be very clear and the discussion kept on a rather simple level.
- In the co-creation that is done in the field unit, the fuel consumption data and other relevant needed data needs to be selected printouts
- For the author of the study it is important to be aware of the limited amount of the literature content that can be brought up in the discussions.
- In order to support the credibility of the metrics it is important to make sure that the logic behind them regards the general professional knowledge (ie. correct usage of the diesel engine; metrics don't reward for idling)

### The Solution:

- Why are we doing this?
  - We want to collect and analyze long-term data because it allows us

- Monitor the degradation of the engines over the years
  - Learn what is normal and what is not degradation
- Develop a more economic fleet
  - Stern extensions, propellers, trim blades etc.
- Benefit from the fleet level data
  - Anticipate and avoid breakdowns
    - Record the data from the development of breakdowns
    - Compare the data of the similar units
    - Recognize the onset of the failure
    - Perform preventive repairs
- Develop more economical ways to operate the fleet
  - Fuel consumption, wear & tear
- Monitor the accelerations experienced by the crew and the boats
- Maximize the fleets life time value and minimize the cost of upkeeping
  - Minimize the out-of-service time
  - Raise the reliability of the boats, limit the costs of the back-up boats

## Data 2: Presentation of the solution – Feedback, observations and reflection

### TOPIC: MANAGEMENT OF THE FLEET/DATA 2/Solution Builing

Table 1

<b>Details</b>	
<u>Name (code) of the informant</u>	Presenting the outlined solution for the field superiors and discussion
<u>Informant's position in the case company</u>	Executive Committee Members (excl.CEO), Areal Chief Pilots, Chiel Pilots, Vessel Engineer + the Thesis writer (TW) (Head of Transport Department)
<u>Date of the presentation and discussion</u>	06.03.2017
<u>Duration of the presentation and discussion</u>	13:15 – 13:55
<u>Document</u>	Observations

### Development needs/ ideas / requirements (Data 2)

<b>1</b>	<b>Feedback</b>	<b><i>Feedback of the presentation</i></b>	<p><i>Concerning the presented process model and the key development areas, formed as a part of the CSA:</i></p> <p>Chief Pilot 1: The process model states that the pilot is the source of the hurry. To my experience, the boat operators are driving</p>
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			<p>faster when they are driving without the pilot</p> <p>TW: This is how the interviewees, the pilots among them, stated in the interviews</p> <p>Chief Pilot 2: The process model also shows only the pilotage from the sea to the port, not the other way around.</p> <p>TW: True, all the variable of the transportation processes were not formed.</p> <p>Chief Pilot 2: I also feel that the boat operators can drive fast with the boats even the pilot are not involved with it</p> <p>TW: I will present you our initial thought on what kind of metrics and guidelines are we forming of the usage of the boat. In them, the question of who is the source of hurry is not relevant. But it probably is a good idea not to point especially to the pilots so that it does not raise resistance or the worker group don't start blaming each other.</p> <p>Chief Pilot 3 (face-to-face after the presentation):</p> <p>Collecting of the data, analysis etc. These are exactly the things that we need to be doing.</p>
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### Observations from the presentation and discussion

- Some pilot superiors rejected the results of the interviews that stated that the pilots are causing more hurry with their own timings than the boat operators are.
- They stated, in turn, that the boat operators drive half of the trip without any pilot onboard and are then many time driving gratuitously fast

### Reflection based on the workshop observations:

- All the pilot supervisors had gathered to the meeting at the same time. The setting of the meeting can have affected the viewpoints, as there are a certain tensions between the two groups of employees.
- Hence, the feedback was valuable as it indicated that the pilots might become defensive if they are pointed in the discussion. This has a negative return on the pilots' participation on the process.
- As the standard driving times tackle both the boat operators' and pilots' timing decisions, it is unnecessary to point to another of the groups in the communications

## Appendix 3: Data 3 – Validation: Field Pilot of the Proposed Model

**TOPIC: MANAGEMENT OF THE FLEET/DATA 3/Validation – Field Pilot**

*Table 1*

<b>Details</b>	
<u>Name (code) of the informant</u>	Validation – Field pilot of the proposed model
<u>Informant's position in the case company</u>	Boat Operator1 (BO1, Participant 1), Boat Operator2 (BO1, participant 2), Senior Boat Operator (SBO, Participant 3), External Fleet Management Specialist (EFMS, Participant 4) -All available staff from Harmaja island + the Thesis writer (TW, Participant 5)
<u>Date of the field pilot</u>	12.4.2017
<u>Duration of the work</u>	10:30 – 12:00 (90 min)
<u>Document</u>	Field notes

### **Field notes**

#### **Validation plan:**

12.4.2017 field pilot of the model at Harmaja Island

#### *Input data:*

- List the most common trips; lengths
- List the boats and their speeds
- Prepare the fuel consumption profiles

#### *Participants:*

- All the boat operators, pilots and foremen that are available to participate

#### *Plan:*

- The input data and an introduction of the pilot content is sent to the all workers of the field unit beforehand
  - This allows time for the employees to get acquainted with the data before the session takes place
- The group participates to the every phase of the work
- In the orientation part, the reasons for the development work is explained (Communication of the opportunity: Why are we doing this?)
- The group goes through the normal trips that are driven from Harmaja

- A list of the trips and their lengths is recognized
- The group familiarizes itself with the fuel consumption and speed data of the different boats
  - The range of the normally used RPM's is agreed
    - This forms the range of the Economy Score –metrics of which the points are given
    - No extra points are given from idling
  - The normal sustainable speed of the boat is agreed
- Based on the lengths of trips and the boat speeds, the group agrees on the minimum drive times for each boat and each trip
- The observations done in the field pilot are written down for the further reflection.

#### Outlined change vision (communicated in the orientation):

- Why are we doing this?
  - We want to collect and analyze long-term data because it allows us
    - Monitor the degradation of the engines over the years
      - Learn what is normal and what is not degradation
    - Develop a more economic fleet
      - Stern extensions, propellers, trim blades etc.
    - Benefit from the fleet level data
      - Anticipate and avoid breakdowns
        - Record the data from the development of breakdowns
        - Compare the data of the similar units
        - Recognize the onset of the failure
        - Perform preventive repairs
    - Develop more economical ways to operate the fleet
      - Fuel consumption, wear & tear
    - Monitor the accelerations experienced by the crew and the boats
    - Maximize the fleets life time value and minimize the cost of upkeeping
      - Minimize the out-of-service time
      - Raise the reliability of the boats, limit the costs of the back-up boats

	Topic(s) of discussion	QUESTIONS	FIELD NOTES
1	Orientation part	The group was given an orientation over the session. It consisted the change vision and of the description of the session	<p><i>Discussion on the vision and the orientation:</i></p> <p>BO1: All the Boat Operators have engineer certification so that they can do the monitoring of the engines. Where do we need additional monitoring?</p> <p>TW: The CSA interviews stated that the boat operators cannot perceive the long-term changes or trends in the engine performance</p> <p>BO1: I guess that is true that when it comes to the long-term changes, it would be easier to see them from the computer.</p> <p>SBO: When we would have that data, you could check from the computer whenever there would be empty moments at</p>

			<p>the station.</p> <p>EFMS: In the Netherlands, the pilot organization measures the uptime of the boat. They have set goals of the levels they want to maintain. Overall 94 % uptime is required for their boats. Half of the remaining 8 % is reserved for normal planned maintenance and half for the breakdown overhauls</p> <p>SBO: The application of the guidelines and metrics will not affect us much</p> <p>TW: This is noticed already earlier, but the pilot is done to test the model that has been put together. By doing this session we will see if the earlier thoughts will work in practice.</p> <p>SBO: Some sort of bonus system should be considered in order to support the economical use of boats.</p> <p>TW: It has been in discussions but at this stage, no commitments are made because it is hard to define the wins. It can be that the incentives would be raised too high or their level would not be motivating for the employees.</p>
2	<b>Definition of the usual trip driven</b>	<b><i>Can you define the boat trips that are repeatedly driven on your station?</i></b>	Through a discussion, the trips that contain a risk of been in a hurry we defined. Such trips we considered to be the trips from the island to the three PBG.
3	<b>Familiarization on fuel consumption based the collected data data</b>		From the fast boat data it was analyzed that the fastest speeds must have been recorded in a tail wind conditions, a fact that has not been recognized earlier.
4	<b>The definitions of the RPM ranges</b>		<p>It was noted that the fast boat (L239) was not optimal for the RPM range definition as the boat is rather slow anyway. The propulsion system is not optimal and would need to be optimized.</p> <p>BO2: The lowest consumption recognized in the data seems to be at 1500 rpms. Could be still later on get the exact rpm that is the most optimal? Even the speed is low (~ 16-17 kts), we could then use it if when even we have time.</p> <p>TW: Would it be a good idea to define the exact fuel optimal RPM?</p> <p>SBO: Yes, it would be good to know even we cannot use that speed as a default.</p> <p>BO2: Yes, but I see it so that the biggest fuel saving s are connected to the pilots' work rotation. If they work in a turn-order, no combined transportations can be executed and boat can be driving back and forth. That is hard to understand for the Boat Operators.</p>

			<p>BO1: We have considered the economical speed of our fast boat to be 1600-1720 RPMs.</p> <p>TW: The cutter boat's (L145) economical speed seems to be 1200-1400 RPMs. Is that correct?</p> <p>BO2: Yes, I think so. That is anyway what we use in here.</p>
5	<b>The logic of the Economy Score</b>	<b><i>How should the Economy Score work?</i></b>	<p>TW: In the earlier work shop it was stated that in the cutter boat, the low RPMs are problematic for the engine and it should be noticed in the Economy Score so that idling would not be rewarded. Do we need to define the lower RPM level?</p> <p>SBO: We here don't see a reason to be afraid of the lower RPM in the cutter boat. The automation will adjust the fuel injection and that prevents the engine from being covered with soot. The carbon deposits will come out of the engine anyway.</p> <p>BO1: Isn't the fuel consumption itself a rather well functioning score?</p> <p>EFMS: Yes and in our system it is always displayed. However, it would also be good to compare the measured trip to the optimal driving.</p>
6	<b>Minimum drive times of each boat</b>	<b><i>What would be functional standard minimum drive times to your normal drivings?</i></b>	<p>All the Boat Operators participated to the defining of the times below:</p> <p>Harmaja – Gråskärsbådan PBG: Fast boat 20 min/Cutter 50 min</p> <p>Harmaja – Vuosaari PBG: Fast boat 20 min/50 min</p> <p>Harmaja – Harmaja PBG: Fast boat 10 min/25 min</p> <p>BO1: On other stations there exist terms of "going to work-speed" and "going-home-speed"</p> <p>SBO: That's true, often we discuss about the speed that is used to get to the boat but some do drive fast to the station too. We do not have it here though.</p>
7	<b>Warm-up and cool down drive</b>	<b><i>What kind of monitoring needs exist in the warm-up drive and cool-down drive of the engines?</i></b>	<p>TW: The delayed rundown system exists on our boat already. It has been in discussion that should we monitor the speed on the RPM changes so that the engine load would be taken off gradually. How do you see these issues?</p> <p>SBO: Based on my experience, the way how the engines are slowed down is not an issue and does not need to be measured</p> <p>EFMS: In our system the warm up drive specification come from the User's Manuals and the cold start alarm are generated based on those specs.</p> <p>SBO and BO1: That is enough for our use. The do the warm-up run so that we don't take the power out of the engine before in has a temperature of +60C</p>

8	<b>Collaboration in the development</b>		<p>TW: There has been discussion of the development of the analytics and the diagnostics. How do you see the possibilities to develop these?</p> <p>EFMS: We have been thinking to arrange every 6 months meeting where the boat operators can give their insights to the system.</p>
9	<b>Final feedback of the co-creation session</b>	<i>Can you please give me some feedback of the thoughts that this session raised?</i>	<p>BO2: Will the metrics be done based on the driver or the trip?</p> <p>EFMS: Our metrics now in the system are based on the trip.</p> <p>TW: At this stage there has been discussion only about the trip and work week based metrics. Introduction of incentive would require personal metrics.</p> <p>BO2: I think there are some possibilities to do savings but still I feel that the big savings are connected the pilots' turn-orders and combination of transportations</p> <p>BO1: No problems, this sounds sensible</p> <p>SBO: I'm personally interested to get access to the long-term engine data. It gives so much possibilities for the analysis.</p>

### Workshop observations:

- No pilots participated due to the traffic situation
  - Observation: Covering participation of the employees to the co-creation is challenging due to the work setting
    - The work is always primary function and the overlapping of the co-creation session and the work cannot be avoided with planning
    - This limits the coverage of the co-creation
- As earlier noticed, in the particular field unit, the boats are operated in a rather optimal way and the application of the metrics and guidelines does not affect the unit much.

### Reflection based on the workshop observations:

- On top of the co-creation done concerning to the defined content, a proper description of guidelines and metrics needs to be made and communicated
  - This requires documentation and communication, so that the metrics and guidelines get a good coverage.
- The analysis done over the fast boat's tailwind speeds was a good example of the employees ability to interpret data
- The RPM seems to be the best way to define the speeds that are used with the different boats.
- The working with the boat operators seem to work well, when they get to participate. However, the field pilot did not give experiences of the pilots' participation and their attitudes.
- The standard minimum driving times apply are a guideline only to a part of the trips. There are too many variables in the trips. Therefore, the roles of the RPMs and Economy Score are rather prominent.

*Future recommendations*

- The incentives could be connected to the personal drive economics
- The management needs to discuss the pilots' turn-order system as the economy of the transportation is closely attached to it

## Appendix 4: Field Unit Transformation process

# Field Unit Transformation Process Description

STEP	AREA OF MANAGEMENT	CONTENTS	REASONS
<b>1. Defining of the change vision (opportunity):</b> Why do we need data-based fleet management?	  	Fleet optimization, anticipatory maintenance, monitoring of technical degradation, analysis and prognostics based on long-term data, reduction of the fuel consumption and of the extra wear & tear	Communication makes the target visible for all. Open discussion of the needs and purposes allows participation of the employees. The participant interpret the opportunity to their co-workers.
	<b>2. Communication of:</b> <ul style="list-style-type: none"> <li>Change vision (opportunity)/ necessity of change</li> <li>Importance of the individuals work and intuition</li> <li>Co-creative nature of fleet management work</li> <li>Learning orientation</li> </ul>	  	Fleet level benefits are defined and communicated. Open access to collected and analyzed data needs is granted to all. The importance of the individuals' intuition is recognized. The ownership over the work is left to the workers. The workers sacrifices are recognized; addition to travelling times. Meaning of the OL is highlighted.

# Field Unit Transformation Process Description

STEP	AREA OF MANAGEMENT	CONTENTS	REASONS
3. Co-creation of the metrics and guidelines	  	<p>Pilots name their representative</p> <p>For each field unit and boat:</p> <p>Agree at least on the desired RPM range, standard minimum travel times and logic of economy score. Description is made.</p>	<p>All the boats are individuals and the trips are not the same either. Unit-level co-creation allows time for dialogue.</p> <p>Participate both boat operators and pilots to increase the validity and acceptability of the metrics.</p>
4. Training of the employees	 	<p>Discuss and recognize the skill gaps with employees.</p>	<p>Change's effect on mastery: New data systems can make employees experience incompetence, especially the elderly employees</p>
5. Implementation of metrics and guidelines	 	<p>Implementation of the standard travel times.</p> <p>Communication of the new guidelines.</p> <p>Avoid dominating the work with the company policies.</p>	<p>If the compliance with the standard travel times becomes social norm it will support the change.</p> <p>Company policies, when unsuccessful, can harm the work satisfaction heavily.</p>
6. Analysis of the data and monitoring of the results		<p>Automated generation of earlier defined metrics and other reports</p> <p>Utilization of all the accessible data from all the fleets (CAN, AIS, user-based data etc.)</p>	<p>Changes take place over a long-term and such analysis requires good statistical data.</p> <p>Higher data volume allows a higher probability for an occurrence and recording of significant but infrequent incidents, such as breakdowns.</p>

# Field Unit Transformation Process Description

STEP	AREA OF MANAGEMENT	CONTENTS	REASONS
<b>7. Support for the decision-making</b>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">FM</div> <div style="border: 1px solid black; padding: 2px 5px;">OL</div> </div>	<p>Leave space for efficient individuals</p> <p>Provide knowledge to support the decision-making on all organizational levels</p>	<p>Acceleration takes place when management gives space to efficient individuals.</p> <p>In order to improve the results, the decision-makers need better relevant knowledge on the expected outcomes.</p>
<b>8. Reporting/giving of feedback/provision of governance</b>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">FM</div> <div style="border: 1px solid black; padding: 2px 5px;">CM</div> <div style="border: 1px solid black; padding: 2px 5px;">OL</div> </div>	<p>Connect the change in individuals' behavior and the seen development. Celebrate wins.</p> <p>Integration: Repeat efficient ideas.</p> <p>Provide governance, if needed.</p>	<p>The connection creates awareness and cohesion of the organizations improved agility that the change has led to.</p> <p>Along the way, better practices are invented. The feedback will display them.</p>
<b>9. Collaboration:</b>	<div style="display: flex; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">FM</div> <div style="border: 1px solid black; padding: 2px 5px;">CM</div> <div style="border: 1px solid black; padding: 2px 5px;">OL</div> </div> <ul style="list-style-type: none"> <li>• Development of the metrics, diagnostics and prognostics</li> <li>• Collaborative data work spaces</li> </ul>	<p>The employees participate to the development of the diagnostics and prognostics.</p> <p>The data system interfaces that are utilized in the fleet management are collaborative from their structure.</p>	<p>Maximized interpretation through the utilization of the employees insights and experience.</p> <p>Development work gives possibility for growth and personal contribution. Achievements affect the work satisfaction strongly.</p> <p>Collaborative work space visualizes the individuals' contribution, lowers the barriers between units and links the individuals' actions to task of the company as a whole.</p>