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The role of safety culture in establishing an effective safety information system in the oil and gas industry

A case study of an onshore facility

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Summary

The main purpose of this study was to contribute to understanding of how safety culture affects the performance of safety information systems (SISs). More particularly, to investigate how safety culture can both facilitate and inhibit a SIS to function effectively.

The thesis has been carried out as a qualitative, single case study of an onshore facility in the oil and gas industry. Seven semi-structured qualitative interviews were conducted. Informants included employees from the operational, line-management and management level. In addition, textual analysis of internal management system documents was used.

Analysis has revealed that safety culture both facilitates and inhibits performance of a SIS. The facility has implemented multiple organizational measures directed at safety that together influences the development of safety culture. This safety culture further affects performance of the established SIS. Facilitating factors to several of the SIS' phases were: personal reporting in combination with a mutual established trust between the management and operative personnel. In addition, there is an established practice of asking the operative personnel follow-up questions related to reported incidents, which enhances the understanding and accuracy of conducted risk analysis in the system. At last, there is a continuous monitoring of incoming reports in the SIS, seeking to avoid particularly personnel injuries and facilitating response time.

However, several inhibiting factors have also been identified: there is a strong belief that under-reporting is happening with the facility, which potentially inhibits the performance of the whole SIS. There is also a need to use the operative personnel's expertise more in cases when they possess the best knowledge. In addition, the multiple workshops within the facility know little about each other's preventive work. At present, lack of experience transfer internally inhibits performance of the SIS.

The facility is moving towards having an effective SIS. However, there needs to be continuous improvement, starting by acting upon the identified inhibiting factors. Overall, a basis has been already established. The future is about developing the safety culture further.

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Chapter 1. Introduction

1.1 Background

Since the discovery of the Ekofisk field in 1969 in the North Sea and up to today, there has been an overwhelming, unexpected and profitable oil adventure in Norway. The industry has contributed to over 10.000 billion kroner during the past 40 years of activities (Berthelsen 2014). Approximately 42% of the recoverable oil and gas on the Norwegian Continental Shelf has been sold since the start of production in 1971. Oil industry stood for 22% of the value creation in 2013 in Norway, which was more than twice as large as the industry on land (ibid.).

However, as history reveals, the oil and gas industry has a great hazard potential (Kilaparathi 2014). The industry's hazard potential was demonstrated in one of the first large-scale accidents of the Norwegian Alexander L. Kielland platform that heeled in the North Sea in 1980, resulting in 123 fatalities (Petroleumstilsynet 2013a). There have been several other incidents on the Norwegian Continental Shelf throughout the years. For instance, blow-out on the Bravo platform in the North Sea in 1977, and the subsurface blowout from one of Treasure Saga's wells twelve years later which caused 20.000 barrels of oil flowing into the ground beneath the seabed each day (Petroleumstilsynet 2013b; Petroleumstilsynet 2013c). One of the more recent blowouts was seen on the Snorre A platform in 2004. 216 people were on board on Snorre A when gas flowed up under the installation from one of the wells, simultaneously as the platform torch was burning (Petroleumstilsynet 2013d).

In order to prevent accidents at workplaces, the Norwegian government has developed a number of measures. One of these measures that came into practice during the 1970s is the requirement for operators to implement Safety Management Systems (henceforth: SMS) (NOU: 2005:14). Initially, the purpose of SMSs was to systematically prevent large, potential accidents through documentation, supervision and coordination. Today SMSs also include prevention of occupational accidents, health, internal and external environment pollution through measures as internal reporting. The requirement of SMSs is not limited to offshore activities, but also includes other onshore industries in Norway (ibid.).

In addition to the requirements of implementing SMSs, the Norwegian government adopted a number of laws and regulatory documents. Likewise, the Internal Control Regulations (1996) and Working Environment Act (2005) both reflect the need to establish SMSs. These regulations set requirements for all employees within an organization to participate in the daily, systematic safety work. One of such requirements is an obligation to notify about potential hazards in the daily work so that risks can be reduced and documented in an organizational system (Working Environment Act, §2.3 2005; Internal Control Regulations, §5 1996). In addition to aforementioned legislations there are numerous other health, safety and environment regulations, since the oil and gas industry is heavily regulated (Petroleumstilsynet 2015).

In order to comply with relevant regulations in practice and systematically prevent accidents and emissions, organizations need a safety information system (henceforth: SIS) often integrated in the overall SMS (Kjellén 2000). A SIS constitutes a process that consists of three phases, including data collection, processing and distribution of processed information (ibid.). Employees use a SIS to report on hazardous conditions, operational failures, near-misses and accidents. Information submitted into a SIS is further processed and distributed to relevant decision makers within an organization so that corrective measures can be implemented (Kjellén 2000; Oltedal and McArthur 2011).

SISs are commonly implemented as means within contemporary safety management that is “all measures being implemented to achieve, maintain and further develop a safety level in accordance with defined goals (Aven et al. 2004,67). Formal systems like SISs continuously steer, sustain and improve safety level in relation to predefined goals within an organization (Aven et al. 2004). However, to have an effectively functioning SIS is not necessarily an easy task. A SIS’s effectiveness is influenced by a number of factors. One is related to employees’ willingness to report (Reason 1998). Accurate reporting at all organizational levels contributes to more adequate prevention of accidents (Kjellén 2000). Another crucial factor for effective functioning of the SIS is well-developed organizational safety culture (Stock, McFadden and Gowen 2007). However, whether the right safety culture is established within an organization will depend on how formal, organizational measures directed

at safety are institutionalized within a given organization (Reason 1997). Organizational measures include for instance operational inspections, different means to increase personnel competence and stimulation through campaigns – all aiming at “directing” employees to the achievement of the required safety level (Aven et al. 2004). Continuous and successful implementation of such measures will seek to increase safety, but will in the long run contribute to the development of safety culture within an organization (Aven et al. 2004; Reason 1997).

Thus, there is interplay between safety culture and the performance of SISs. An effective SIS is essential for building up safety culture. At the same time a SIS relies heavily on an organization’s emphasis on safety culture (Reason 1997; Reason 1998). Organizational focus on safety culture will lead to better awareness of the factors that both facilitate and inhibit its employees’ overall focus on issues related to safety. (Aven et al. 2004). As Antonsen (2009) highlights that an organization’s focus on safety culture helps to identify informal, social processes that influence the performance of the formal SIS. This is not to say that a cultural approach is superior, but compared to traditional management assessments that are limited to the formal aspects of safety, greater knowledge about how the system actually performs can be obtained (Antonsen 2009).

1.2 Previous research

There is limited knowledge on how safety culture affects an effective functioning of SISs in the oil and gas industry. Previous studies have focused on measuring reporting systems’ effectiveness and evaluating effectiveness of SMSs in general (e.g. Andriulo and Gnoni 2014; Robson et al. 2007). However, safety culture has been commonly acknowledged as a factor that may both facilitate and/or inhibit employees’ propensity to report (Rasmussen, Drupsteen and Dyreborg 2013; Oltedal and McArthur 2011; Waring 2005).

Rasmussen, Drupsteen and Dyreborg (2013) previously conducted a study of three Danish companies in the oil and gas industry in the North Sea. The authors explain that reporting of unwanted incidents resulting in personal injuries or material damages (near-misses) can provide important information to prevent future accidents. If organizations obtain better knowledge of their use of near-miss data and reporting,

they can avoid similar incidents by learning from previous ones and enhance the organizational ability to identify malfunctions at different levels. In relation to the topic of this study, the authors emphasize that organizational culture is one out of several essential components necessary to facilitate reporting.

The reporting culture was found to be varying between the three investigated companies. In one of the organizations, the propensity to report was influenced by experience; novices were more deterrent to report, but became more confident over time. In addition, inadequate follow-up of reported events, management not using reported improvement suggestions and general delay in closing cases in the system – all contributed to a lack of motivation to report within the company. In another organization, employees particularly from contracting companies were anxious to report, and some were afraid to report due to potential reprisals. Employees within the third organization were the only ones mutually positive to report, since there was no focus on blaming individuals. Reporting was instead seen as a mean to facilitate learning and create awareness. The employees even reported their own mistakes in the latter organization (Rasmussen, Drupsteen and Dyreborg 2013).

Oltedal and McArthur (2011) have previously examined factors that influence the reporting frequency in the Norwegian merchant shipping. Based upon 1262 questionnaires from 76 different vessels, safety culture was verified as a key factor that facilitated and inhibited the reporting of accidents and incidents. The following factors facilitated and increased the reporting frequency: safety oriented management, feedback of reported events, open interpersonal relationships between the management and crew, and actual execution of pro-active safety work. However, if management under-emphasizes safety work and dedicates most of its time to efficiency instead, this seemed to inhibit the reporting frequency.

Holmström, Laaksonen and Airaksinen (2015) explored different factors necessary for a successful development and implementation of medication error reporting systems. Based upon responses from 16 medication safety experts from 16 nations; safety culture was identified as one out of several important factors in the work of developing and implementing successful reporting systems. Safety culture contributes to openness and learning from previous errors. However, safety culture was found to be under-emphasized in many of the countries. In addition, adequate resources were

argued to be an essential prerequisite to sustain the different processes of the reporting system, but were also often lacking and inhibiting learning from previous errors. According to the author's findings, safety culture must be established at higher regulatory levels in the first place to guide the organizations' reporting practices to a greater extent than as of today.

The three, aforementioned articles imply that safety culture plays an important role in the organizational work of trying to achieve effective SISs.

1.3 Research purpose and questions

This study aims to contribute to understanding of how safety culture affects the performance of SISs. More particularly, I will investigate how safety culture can both facilitate and inhibit a SIS to function effectively within an onshore facility. The chosen facility works with subsea technology, primarily maintenance and testing of heavy equipment provided for offshore activities.

This study will examine how the studied organization has implemented the SIS's three phases: data collection, processing and distribution of processed information to relevant decision-makers, and how these function in practice. Further, the study will, examine other organizational measures implemented within the organization to enhance safety. The study seeks to provide analysis of how these measures contribute to the development of safety culture. Finally, the study will analyse how the safety culture established within the organization affects performance of the SIS. The study tests the applicability of the analytical approaches offered by my theoretical framework (chapter 2) regarding implementation of SISs and informed culture i.e. safety culture. The study will also be useful for the facility since it provides knowledge of its safety culture and the SIS' performance, and will hopefully indicate the potential for improvement.

Based on the research aims, the following research questions were formulated:

a) ***How is the safety information system implemented at the facility?*** The study examines the three phases of the SIS including collection, processing and distribution of processed information to relevant decision-makers and how these function as a whole in practice.

b) ***How organizational measures contribute to the development of safety culture?***

The study seeks to provide a broader understanding of how other organizational measures directed at enhancing safety contribute to the development of safety culture. The study provides an overview of these measures, examines how they are understood and practiced by organizational employees and further concludes on how they contribute to the development of safety culture. The concept of safety culture is broad and narrowed down to the notion of the informed culture (consisting of the four essential subcomponents: reporting, justness, flexibility and learning) suggested by Reason (1997).

c) ***How does safety culture affects the performance of the safety information system?*** Finally, the study examines how the four subcomponents of safety culture facilitate and inhibit each of the three phases of the SIS. This will allow providing tentative conclusions on the effectiveness of the SIS.

1.4 Structure of this thesis

This thesis is built up in six chapters. The first chapter starts with an introduction of background and problem, which is further facilitated by previous research. Thereafter, the research purpose and research questions are elaborated on. In chapter two the theoretical framework for further analysis is presented. Here theory related to safety information systems and safety culture is included. Arguments are given why the specific theory was chosen and analytical implications of it. Chapter three presents chosen methodology and how the empirical data has been collected. In the end of this chapter, the quality of the study including limitations and ethical considerations are reflected upon. The fourth chapter is dedicated to present the empirical findings, and further analysed in chapter five. At last, in chapter six, conclusion and issues for future research are provided.

Chapter 2. Theoretical framework

2.1 Introduction

The purpose of this chapter is to present and discuss the analytical framework within which I seek to answer the research questions. I outline the key points of the framework and reflect on their analytical implications for the analysis. In addition, I explain limitations and choices that were made.

I will first define and explain central concepts related to the SIS. Second, I elaborate on a model of the SIS. Third, essential components of safety culture will be presented. These components are used as key analytical instruments to identify and analyse how organizational safety culture facilitates or inhibits performance of the SIS. Fourth, organizational measures' roles in developing safety culture are presented. At last, analytical implications of the theory are provided.

2.2 Safety information system

The SIS is part of the organization's SMS (Kjellén 2000). A SMS is a formalized way of dealing with safety management (Wold and Laumann 2015), which is "all measures being implemented to achieve, maintain and further develop a safety level in accordance with defined goals" (Aven et al. 2004, 67). The SMS includes structures, procedures, resources and processes (Kjellén 2000). Organizations use the SMS to control the different hazards that can affect employees' safety and health. SMSs help an organization to comply with relevant regulations in a simpler manner (Fernández-Muñiz, Montes-Peón and Vázquez-Ordás 2007). However, accidents, unsafe acts and incidents are not directly controllable. Their causes vary greatly; therefore an organization cannot avoid or remove all of them, but only defend itself against developing hazards. This is why one needs effective safety management, where one regularly monitors, measures and improves everything from procedures, maintenance, communication, and goal conflicts – i.e. the processes that can be managed, which subsequently determines a system's safety health (Reason 1997).

The SIS plays an important role in the effective safety management and monitoring of an organization's different activities (Reason 1997). A SIS or in Kjellén's words named a SHE (safety, health, environment) information system, can be defined as a

“system that provides the information needed for decisions and signalling relating to safety, health and the environment” (Kjellén 2000, 377). When counterforces develop the SIS helps an organization to sustain safety, which is far more difficult than simply working towards achieving better safety. A SIS does not only focus on uncovering right conclusions about previous events (reactive measures), but also enhance regular checks of the organisations basic processes (proactive measures). The proactive checks guide the development of relevant preventive actions (Reason 1997).

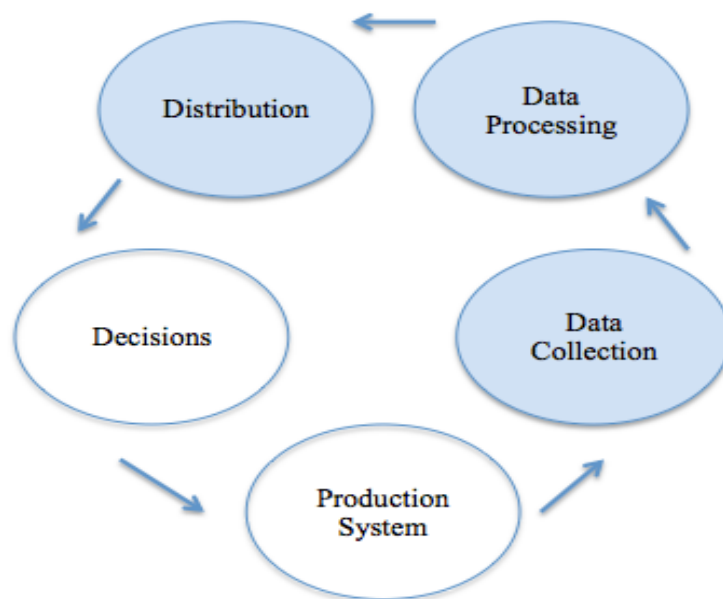


Figure 1. The safety information system integrated in the safety management system (adapted from Kjellén 2000).

Figure 1 illustrates an overall SMS where the SIS is embedded. It is a simplified model due to SMS’ different ways of being implemented and designed across different industries (Grote 2012). In figure 1, the blue areas illustrate the SIS. An organization has a production system as illustrated by the figure, which is maintenance work on subsea-devices in case of this study. It is in the production system that different unwanted events occur before they are further reported into the next phase, data collection, constituting the first phase of the SIS (Aven et al. 2004).

In the first phase of the SIS, data collection, everything from accidents to near-misses are reported when experienced or observed by the employees. Accidents are “(...)

deviating events involving an incident that results in injury to personnel or damage to the environment or material assets” (Kjellén 2000, 376). An incident can be defined as “all undesired events, including accidents and near misses” (Jones, Kirchsteiger and Bjerke 1999, 60). While accidents are a set of unwanted and unplanned events, the events will rarely lead to consequences as injuries, but more likely to result in material damages, stop in different production steps and substandard quality of products (Kjellén 2000).

A near-miss on the other hand is “a hazardous situation, event or unsafe act where the sequences of events could have caused an accident if it had not been interrupted” (Jones, Kirchsteiger and Bjerke 1999, 60). To put it simple, a near-miss is “any event that could have had bad consequences, but did not” (Reason 1997, 118). Along with incidents and accidents, near-misses are important because they provide an organization with reactive and proactive data for improvement, as well as being a type of safety measurement (Reason 1997).

Employees can also report other unsafe conditions they experience in the data collection phase. For instance flaws in systems and routines, giving the management a basis to act upon, before they can potentially develop to accidents and near-misses. Common measures applied to collect the different aforementioned events are paper schemes or electronic devices. Other collection measures are through observations of workplace, investigations, risk analysis, for instance before it is stored electronically (Kjellén 2000).

The second phase of the SIS, is data processing of reported information. Here one retrieves, assembles and analyses the reported information, and plans corrective measures based upon it. One might also need to check the database for other relevant documentation, such as previous risks analysis reports, standard, rules, and regulations. This will give a more adequate analysis and summarisation of the data, and development of corrective measures (Kjellén 2000)

The last phase of the SIS encompasses a distribution of the processed information from previous phase to relevant decision-makers, such as the line management and safety representatives (Kjellén 2000). The processed information consists of different results from rendered analysis or sometimes even unprocessed data. The decision

makers will then further take action and implement corrective measures back to production system where an unwanted event has occurred. These measures may be simple safety campaigns, or more comprehensive measures as training for personnel (Aven et al. 2004).

The different phases (including decisions and production system) reflect a feedback control mechanism. This mechanism implies that an organization compares the current situation with for instance predefined goals, and then corrects potential deviations. Afterwards one look at the results of the corrections, register them, and this forms the basis for potentially new corrections. The SIS reflects a continuous process where measurements and corrective measures are used to control the system's different activities (Aven et al. 2004).

A SIS is a valuable tool, because it contributes to sustaining of an organizational awareness in the absence of frequent hazardous events (Reason 1997). It is also an important decision-makers tool, seeking to prevent and handle a multitude of aspects found in organizations: from occupational diseases and environment pollution (sea, land, air), to keeping the general working environment's different parameters (noise, toxic gases) within accepted limits as well as the psychological aspect of employees (Kjellén 2000). Therefore, the SIS relies on a continuous collection, analysis and dispersion of information about accidents, incidents, near-misses and other unsafe conditions so that decisions can be taken and corrective measures be implemented (Kjellén 2000; Reason 1997)

2.3 Safety culture

To get a complete image on how things work in an organization, the informal aspect (culture) must be observed (Schein 2010). Formal and informal aspects of organizational life are complementary. To fully understand the organizational processes, the formal system (i.e. SIS) must be studied together with interpretations of informal characteristics including everything from power differences to loyalty among employees (Selznick 1948). Selznick highlights that out of formal organizations; an inevitable informal structure will arise. This will have an effect or consequence on the formal system that tries to control itself (Selznick 1949).

Aforementioned informality affecting the formal system is manifested in the definition of culture. Uttal (1983) defined organizational culture as “shared values (what is important) and beliefs (how things work) that interact with an organization’s structures and control systems to produce behavioural norms (the way we do things around here)” (cited by Reason 1997,192). Every organization has culture that will have potential impact on safety. By investigating how culture influences safety work, valuable knowledge can be obtained on which of the organizational system’s processes work or need to be modified (Hopkins 2006).

Uttal’s definition above captures safety cultures’ most important factors (Reason 1998). Safety culture is a subgroup of the organizational culture when specific values and beliefs refer to aspects of health and safety (Clarke 1999) such as in Uttal’s definition. As mentioned in the introduction, safety culture and SIS are linked concepts that reinforce each other: an effective SIS constitutes the primary component of working towards a safety culture (Reason 1997). On the other hand, SIS depends on an organization’s emphasis on safety culture to work effectively (Reason 1998). According to Hudson (2007), safety culture can contribute to a more effective approach to safety work, since one look at employees’ errors and mistakes in relation organizational limitations and can then improve these limitations to enhance safety (ibid.). However, safety culture is a complex and disputed concept (Guldenmund 2000). In this study, the concept of safety culture is narrowed down to the notion of informed cultures introduced by James Reason.

2.3.1 Informed culture

James Reason explains that “in most important respects an informed culture *is* a safety culture” (Reason 1998, 294). Informed culture is “(...) one in which those who manage and operate the system have current knowledge about the human, technical and organizational factors that determine the safety of the system as a whole” (Reason 1998, 294). To have an informed culture includes all levels within an organisation and the employees’ awareness of not forgetting to be afraid, so that they are cautious and look for potential hazards (Reason 1998). If organizations understand what such a culture encompasses, its development can be ‘socially engineered’ (Reason 1997).

Reason's point is that "(...) a culture is something that an organization 'is' rather than something it 'has'. But if it is to achieve anything approaching a satisfactory 'is' state, it first has to 'have' the essential components" (Reason 1997, 220). The establishment or in his terms "engineering" of these components, are seen below. It is the process itself that is important. Reporting and justness can be seen as the main foundation of an informed culture (Reason 1998) and therefore will be explained more in detail.

Reporting culture

To establish and maintain a SIS, it is according to Reason required to develop a reporting culture (Reason 1998). This has however several challenges. Employees must be able to interpret what constitutes incidents, which is not always intuitively granted. In addition, employees must be willing to potentially report incidents, accidents and near-misses that they have themselves been involved in. (Reason 1997). Kjellén (2000) has also previously made arguments that if incidents are perceived as not that severe, this can prevent reporting as well. Below, different factors that can contribute to a better reporting have been summarised, and if not implemented, can be seen as barriers for employees to report. The five factors have been promoted by Reason based upon the previous studies of O'Leary and Chappell's successful aviation reporting systems in 1997.

The first factor is related to disciplinary actions for employees. The employees should have some kind of assurance of not being subjected to disciplinary actions as far as practically possible. A second factor is confidentiality, where the employees should have the possibility of being anonymous. For instance, in situations where employees seem to have trust issues to report informally to nearest supervisors. Third, the responsible department for collecting and analysing reported information must be separated from the ones with upper authority to proceed with disciplinary actions. The fourth factor focuses on feedback to the ones reporting; it needs to be accessible, useful, intelligible and rapid. At last, a fifth factor that is needed is an easy way to send and complete reports (Reason 1997, 1998).

Just culture

However, it can be challenging to see the value of reporting if personnel are sceptic to supervisors' handling of the reported information. Mutual trust is therefore needed to achieve an effective reporting culture, requiring a just culture. A total just culture is quite difficult to achieve, but if most of the personnel share the assumption of this being in place in an organization, such culture can be achieved. How organisations handle blame and punishment reflects its trust to personnel within it. This does not mean that nobody should be punished when performing unsafely, because this will cause a credibility problem with the rest of the employees. When personnel habitually stretch rules, operative personnel are the ones who can experience the consequences of it. Removing such personnel increases the trust (Reason 1997).

In order to build a just culture, it is important that personnel understands what is unacceptable behaviour, when disciplinary actions are actually necessary, and when it is not appropriate in cases where it will not enhance the overall safety (Reason 1998). Reason (2000) mentions that nearly 90% of unsafe acts are mostly blameless, thus employees should report without the fear of being punished. A shared awareness and agreement where the line should be drawn, is necessary for a proper reporting culture (Reason 2000).

Flexible culture

Flexible culture involves an organization that can manage to adapt effectively to different changing demands of operational pace. It is a matter of acknowledging and respecting the personnel's experience and skills. For instance, when critical situations arise, the hierarchy of an organization must change into a more flattened structure, which means that personnel with the best expertise take charge over an operation (regardless of position and title). When the situation is back to normal status, the hierarchy goes back to its ordinary function (Reason 1997).

Learning culture

This component is a continuous process as with the SIS. According to Reason (1997), a learning culture might be the easiest to construct, but most difficult to make work. A learning culture requires top-management's encouragement to work properly. The

management needs to be willing and able to act and understand correctly the information reflected by SIS, such as previous incidents and near-misses, and learning from them to be able to stay in business. However, decision-makers ability to act also constitutes one of the greatest challenges regarding prioritizing what is important. When there are overwhelming, issues arising, something might always seem to be more important (Reason 1997).

Summarised, the reporting culture's main emphasis is how employees prioritize reporting in the daily business. Reporting can be enhanced by the five success factors or potentially inhibited if not established. Second, the just culture is used to look at the established trust relations between the management and operative personnel, and how disciplinary actions are usually handled. Third, the flexible culture is reflected through the practice of including the operative personnel and listening to them in safety-matters. For instance, when incidents or "critical situations" happen. At last, the management's practice and commitment of using previous reported incidents in the SIS to learn and prevent future ones will give indications of the facility's learning culture.

2.3.2 Organizational measures

However, it is not enough to only focus on the four subcomponents of safety culture presented above, the organization has to facilitate and build these components by using everyday, practicable measures: "a safety culture is not something that springs up ready-made from the organizational equivalent of a near-death experience, rather it emerges gradually from the persistent and successful application of practical and down-to-earth measures" (Reason 1997, 192). Therefore, for an organization to continuously work towards being a safety culture, it needs a set of implemented measures that can be practiced to function more safely in the daily work.

Organizational measures directed at enhancing safety can for instance be operational inspections, campaigns and other means to increase personnel competence (Aven et al. 2004). Being a safety culture consists of numerous of interacting elements, ways of doing and thinking, seeking to enhance safety as a natural by-product. As Reason (1997) highlights, one first has to use and practice organizational measures (particularly found in technological organizations as this case) at first to be able to start thinking and believing.

2.4 Analytical implications

Uttal's definition of safety culture provides a starting point of the analysis. His definition designates three key points of investigation: what is important, how things work and are practiced in relation to the SIS. These three key points provides the overall logic of this study that makes an attempt to establish a link between informal and formal aspect of organizational life, i.e. safety culture and the SIS.

Kjellén's model has provided a structural framework to examine the SIS established at the facility and how it functions in practice.

Reason's notion of informed culture has made it possible to narrow down the broad and complex concept of safety culture. The study seeks to find out how the four subcomponents of the informed culture (reporting, just, flexible and learning) are influenced by broader organizational measures directed at safety and how they further affect the performance of the SIS. More specifically, the study examines how each of these subcomponents facilitates or inhibits the three phases of the SIS: data collection, processing and distribution of information to relevant decision-makers.

The SIS' effectiveness has not been assessed in this thesis as such. Effectiveness is a challenging concept, because its interpretations vary depending on the case under investigation (Houck 2013). However, this study will provide tentative conclusions of the effectiveness.

Chapter 3. Methodology

3.1 Introduction

In this chapter, the process of empirical data collection for the study will be presented and discussed. I will discuss: what sort of material was collected, which methods of data collection were chosen and why, different challenges I faced as well as general experiences and learning in the process. Finally, thoughts will be given regarding the quality of the study, including limitations of data collected and ethical considerations.

3.2 Qualitative method and research strategy

To use a method, means to follow a certain direction towards a goal. It is about what measures one chooses to apply to collect information about the reality, how to analyse it, and what the collected data tells us about different conditions and processes (Johannessen, Tufte and Christoffersen 2010). In research, it is common to distinguish between qualitative and quantitative research strategy (Ringdal 2009).

A quantitative strategy is based on numerical data collection, requiring usually large number of informants so that descriptions of the reality can be displayed and analysed through tables and numbers. A qualitative strategy on the other hand, relies on the proximity and collection of data from a relatively less amount of informants where text, sound and/or picture material is interpreted by the researcher (Ringdal 2009). The latter one was seen as most relevant for this study due to the theme of the thesis and the structure of my research questions.

3.3 Case study as research design

My thesis is based on a case study design. Case studies are characterised by an in-depth investigation of a contemporary phenomenon in its real-world context (Yin 2014). There is no definite standard how case studies shall be performed exactly, but it is common to gather as much as possible information about a delineated phenomenon (Johannessen, Tufte and Christoffersen 2010). This can for instance be organizational and managerial processes (Yin 2014); like the study of a safety information system in this case.

The case in this study comprehends a single case: Organization “X” - an onshore facility in Norway within the oil and gas industry, giving a natural delimitation of the collection of data. The facility is part of a larger, global organization that has a multitude of other facilities and offshore operations worldwide. It was agreed with the facility at an early point that its name would be anonymized in the thesis. Naturally some of the findings may be considered a competitive advantage in the industry, which the facility might want to keep for themselves.

3.4 Interviews

Interviews are one of the most commonly used methods to collect qualitative data (Johannessen, Tufte and Christoffersen 2010) and often the main source of empirical information in case studies (Yin 2009). It enables past, present and future-oriented perspectives from the informants (Ryen 2002) which was seen as appropriate to use to get better understanding of previous experiences, opinions and the complexity of a larger organization as this one (Johannessen, Tufte and Christoffersen 2010).

The data collection was limited to management, line management and operative personnel. The operative personnel work in the workshops. However, being part of an international organization with multiple localizations worldwide, there are naturally top-management and decision makers above these levels. In addition, the workshops constitute only some and not all of the facility's departments in total. The management and line-management are for simplicity reasons referred to as management throughout this thesis.

All of my interviews were collected in the period of 19th January – 30th January year 2015. All informants were interviewed separately and I was the sole interviewer during all the interviews. The interviews lasted between 1 hour 10 minutes and 1 hour 50 minutes. Seven informants volunteered and was mainly based on a point of saturation; i.e. when I experienced that I had enough interviews and information to process in further analysis (Ryen 2002).

Table 1 contains information about the informants, which have been categorized according to their interview dates and work experience. The level of work experience is based on how long they have worked within the organization or relevant background of discipline. For anonymity reasons, the work experience is not further elaborated. The table also include information about the informants' hierarchical work position in the organization and utilities used during the interviews to collect data. In this manner, provide the reader with a more transparent insight in the interview process. The informants have been numbered 1-7.

Table 1. List of informants

Position	Informant	Work experience	Interview date	Utilities
Management	1	High	19.01.2015	Dictaphone
Management	2	High	19.01.2015	Dictaphone
Operative	3	Medium	21.01.2015	Dictaphone
Operative	4	Medium	21.01.2015	Dictaphone
Operative	5	High	23.01.2015	Dictaphone
Operative	6	Medium	30.01.2015	Dictaphone
Management	7	High	30.01.2015	Dictaphone

All the interviews were semi-structured, where I used an interview-guide with main themes and questions nourished by my research questions and theoretical framework. By conducting semi-structured interviews, the process became flexible and the order of questions varied naturally according to the answers from the informants (Johannessen, Tufte and Christoffersen 2010). I believe the face-to face communication contributed to a certain atmosphere of trust, because the informants seemed willing to share previous experiences and were mostly open about their opinions (Ryen 2002).

I established a contact person at an early point within the company. This person recommended specific informants that were relevant for me to interview throughout the process. This is named snowball-sampling method (Johannessen, Tufte and Christoffersen 2010). I also had some general criteria of who to interview: the informants needed to have knowledge of the SIS' framework and operative personnel using it in their daily practice. The reason for these specific criteria was that I wanted an accurate as possible examination of the safety culture and its influence on the SIS. Blaikie (2010) explains that by setting necessary criteria in advance of data collection, I have been using a strategic sampling method as well.

The contact person and I had a continuous and open dialog, which I believe contributed to a better planning of whom and when to interview. Before the interview process I sent an information letter to my contact person (appendix 1), along with two

different interview guides (appendix 2 and 3): One for the management and one for operative personnel. Both the information letter and interview guides were then sent by e-mail to relevant management and operative personnel by my contact person.

The information letter contained background and purpose of my research, the interview process itself, including voluntary participation, anonymity and that the recordings of the interview were going to be deleted after the transcriptions had been processed. The interview guides included main themes and the questions were based upon my research questions and theoretical framework, which I had in place before started collecting the empirical data through the interviews. To have the theoretical framework established prior data collection is an essential component of case-study design (Yin 2014). In addition, I had two different interview-guides for myself with notions of potential follow-up questions, building on the guides delivered to management and operative informants. Before each interview I checked that my informants had read the information letter and had printed out the interview-guides. If they did not do it, I gave them the papers personally so that they could read them and/or told them about the process myself.

When conducting each interview I used the interview-guides sent in advance. Two different management interviews represented the initiation of the interview process. Thus, to get a better understanding of SIS and its prerequisites in advance of the next following interviews and so that I could easier ask follow-up questions. Both the management and operative personnel interviews started with simpler, identical questions introduction wise; regarding general experience and the importance of reporting within the organization. Further the interviews lead over to questions related to my theoretical framework about personal reporting, trying to avoid the informants leaving with a bad feeling, which can happen if sensitive questions are asked at the end of interviews (Ryen 2002).

After these initial questions, the two interview-guides differentiated. The management were naturally asked of system-processes related to implementation of SIS that were not relevant to ask workshop personnel about due to field of expertise and knowledge. Except of this, questions between all of the informants were similar, comprehending questions of the their opinions of SIS, safety culture and potential room for improvements. At the end of each interview, the informants were given the possibility

of coming up with topics that had not been highlighted or extra input. To avoid confusion about the term SIS, it was referred to as a reporting system in the interviews of the operative personnel. However, in the aftermath I acknowledge that this probably did not really make any difference as I in all of the interviews explicitly explained what I meant by the terms asked in my questions.

Changes were done throughout the interview process. After the first interview I experienced that I could eliminate some of the questions for my second management interview regarding the SMS and reporting as part of this, due to less time available in combination with already having received required information in the first interview. In the last interview with the management it was necessary to ask follow-up questions regarding subjects mentioned in previous interviews that I needed more information about.

In the beginning, it was an uncommon and new setting for me as a researcher. When conducting the interviews, it was a fine balance of not becoming too mechanical when asking questions and at the same time let the informants speak freely. However, the more interviews I conducted, the more experience and confidence I obtained to keep the information flow and understand each interview as unique. Each informant had their individual characteristics, sometimes a pause was an indicator for me to ask follow-up questions, other times it was a good moment for the informants to think and afterwards answer more informative (Ryen 2002).

All the interviews were recorded on a Dictaphone, always with the consent of the interviewee, and later transcribed into text format. By doing this, I could later sort out and categorize data under relevant themes from my interview guide according to my research questions. Sentences were highlighted, making it possible to identify and find special themes in the data material and common characteristics or differences between the informants. This method of dividing data systematically into containers i.e. subsections is synonymous with “category-based classification” (Johannessen, Tufte and Christoffersen 2010) and formed the basis for my next empirical chapter (see chapter 4).

3.5 Textual analysis

Textual analysis has been done throughout the writing of this thesis, distinguished by analysis of primary and secondary data. The primary data can be seen as “new” data that was collected by myself through the interviews, giving me the opportunity to describe how and why they were collected to answer my research questions (Ringdal 2009; Blaikie 2010). The primary data constitutes the major part of the empirical chapter used in further analysis. Interview data has been an important source of information through this study, since there is limited research on the topic of my study. Secondary data on the other hand is not confined to research data and can vary from books to different documents and reports (Ringdal 2009), meaning that I am “one step removed” as a researcher and collected by someone else (Blaikie 2010). Analysis of secondary data has been used in several of the steps when writing this thesis.

At an early stage of the project I studied the facility under study’s website to enhance my understanding of key aspects within its overall HSE-management system, i.e. safety management system. This gave me additional background knowledge before conducting the interviews and worked as a reference during them. Public website articles and reports by the Norwegian Government and Norwegian Petroleum Authority have been used in the introduction of my thesis. Blaikie (2010) explains that one should be more critical to secondary data as this, but the reliability of this data is estimated to be high, since these are official, competent agencies. Analysis of secondary texts from several well-known authors within the academic discipline of safety and organizational culture have been included both in the introduction – and theoretical – chapter.

In the methodology chapter various books and well-known syllabus have been used, sometimes on the same topics to ensure an open and accurate description of the process. The empirical chapter is partially based upon analysis of the current facility’s internal management system documents (see table 2) to elaborate on themes identified in the interviews. The system documents helped me to double-check findings from the interviews to secure accuracy and facts of the facility’s SIS and other organizational measures directed at safety. Implementation processes and the purpose of the SIS

were especially valuable. Some of the descriptions in these documents are sensitive, so naturally they could not be found online and was requested by me personally.

The documents presented in table 2 below have been codified as document 1, 2 and 3 to ease the readability of the empirical chapter. Some of the documents have not been listed with their full titles to avoid recognisability.

Table 2: List of management system documents

Area of publication:	Document number:	Title of document	Release date:
Internal	Doc. 1	Health, Safety and Environment Management	04.02.2015
Internal	Doc. 2	Incident Reporting	24.09.2014
Internal	Doc. 3	Create and process HSE notifications	28.04.2010

3.6 Quality of data

In this section I will give an assessment of the quality of my empirical research and design, by explaining how I have tried to achieve reliability, internal and external validity. These three notions can be considered as quality tests, frequently used in social research as this one (Yin 2014). Limitations of the data collected and ethical considerations are presented at last.

3.6.1 Ensuring reliability

Reliability refers to the question if another researcher that applies the same methods as in this study will arrive at the same results (Thagaard 2009). It will be difficult to replicate the study because of its qualitative characteristics, and considering it is an anonymized case and informants. However, as a researcher one can argue for

reliability by explaining how the data has been developed to convince the reader about the quality and value of the results (ibid.). I have therefore throughout the methodology chapter tried to make the process as transparent as possible. Further in this section, I elaborate on accuracy of collected data and the different relations that occurred between the informants and me (Johannessen, Tufte and Christoffersen 2010; Thagaard 2009). For instance, established trust or not, and potential consequences this may have had for my empirical findings (Thagaard 2009).

To get an accurate as possible collection of data; the interviews were as previously mentioned recorded on a Dictaphone and later transcribed right after each interview to retain a right as possible image of how the interview went. Using a Dictaphone provided for less inconsistencies and interruption in the information flow compared to taking notes. It was seen as a flexible way to proceed and contributing to a mutual dialog between the informants and me. I felt like I then could fully concentrate on the informants' answers and come with follow-up questions when necessary. In one of the interviews with the management there were some technical difficulties with the Dictaphone, which was not noticed before after. This caused a data loss of approximately 10 minutes from the interview, so questions 23-25 in the interview-guide missed. However, I felt I got the essence from the interview despite of this, and from the two other management interviews.

All of the conducted interviews may have been affected by the interview-effect (Johannessen, Tufte and Christoffersen 2010). This effect is related to how I was perceived by the informants. For instance, my attitude, expressions and cloths - all having a potential effect on the answers given by the informants (ibid.). I tried to avoid this effect by having a dress code according to the situation. In interviews with the operative personnel I dressed more casually and informal, and in interviews with the management I had a more formal outfit. In situations when appropriate, I tried to ask for experiences or instances in the past related to themes developing. Such questions often engaged and motivated the informants further because the subjects seemed personal to them and I showed interest. This was part of trying to build an atmosphere of trust, since trust and interview-effect are closely related (Ryen 2002), enhancing the reliability of data collected (Johannessen, Tufte and Christoffersen 2010).

In addition, most of the management interviews were conducted in a natural context, i.e. their offices, which may have made the informants feel more safe and open (Johannesen, Tufte and Christoffersen 2010). With the operative personnel, my contact person appointed an office. This was still within the same organization, but may have created some further distance compared to normally working in the workshops. I dealt with the situation by not sitting directly next to the informant and gave them distance. Humour and drinking coffee was also common to create a more informal setting and seemed to work.

There is no guarantee that the informants always answered what they thought, either because how they wanted to present themselves or how they wanted to be understood (Thagaard 2009). It is reasonable to believe that reporting may have been a sensitive topic for some of the informants, which was noticed in at least one interview based on the non-verbal communication observed. However, since the interviews were face to face I was able to interpret their body language and facial expressions and adapt to the situation. For instance with aforementioned informant, I could read the situation and come back to potentially sensitive questions when it felt more appropriate later on. This approach provided for more adequate answers and enhanced the quality of data collected (Ringdal 2009).

One and a half hour interview is probably not sufficient time to establish total trust and openness, but the promise for anonymity in each interview may have compensated for some of this. In addition, particularly the operative informants seemed to open up more as the interview proceeded giving me longer answers combined with personal experiences, which can be an indicator of some level of trust that I managed to establish.

For me as a researcher I also had to be conscious about asking leading questions during the interviews. There is always a possibility, but I tried my best to avoid this having relatively open follow-up questions in my own interview-guide, as well as sometimes asking improvised questions based on their stories. I regularly sought confirmation through all interviews when longer answers were given, to make sure I understood their answers correctly or to get a more adequate answer (Thagaard 2009). If there were misunderstandings related to my questions, I asked them in different ways until properly understood by the informants (Ringdal 2009).

Another factor that may have enhanced the reliability of the data is the language. All interviews were conducted in my native language Norwegian, making it easier for me to interpret slang and phrases. On the contrary, the transcribed interviews were later translated into English and some sentences may have lost their original significance. However, I tried to be aware of this throughout the writing process and citations are used according to the original context of topic.

3.6.2 Ensuring internal validity

Validity is about if I have measured what I actually wanted to measure (Ringdal 2009). In qualitative research as this one, it includes to what degree my selected approaches and findings reflect the study's purpose and represent the reality (Johannessen, Tufte and Christoffersen 2010). It requires an evaluation of the interpretations I have made throughout the research project. My position and relations to the case of study also has an affect on how these interpretations are developed (Thagaard 2009).

It has to be made clear that half a year earlier this research project was initiated I had a summer internship in the same organization. However, I feel this has not affected my objectivity since I have had a conscious attitude to it in the whole process of writing the thesis. Most of the interviews were also conducted with informants I did not have any relation to from before. It has rather contributed to possibly better understand the informants' answers and the conditions of the safety information system since I have had my own experiences in the same organization (Thagaard 2009).

The informants represented all of the different levels within the facility, from operative personnel in the workshops to line-management and management. Therefore, the informants have provided broader statements and explanations to analyse safety culture and its influence on the SIS. I let the informants speak freely to avoid manipulations and misrepresentations of the case being studied. In addition, several of the informants confirmed each other's statements throughout the study, indicating that they were speaking sincerely. However, as previously mentioned there is no guarantee that the informants were not withdrawing some information.

3.6.3 Ensuring external validity

External validity means if my research results can be transferred (generalized) to similar phenomena (Johannessen, Tufte and Christoffersen 2010). Case studies are usually criticized for not being able to generalize the empirical findings to larger populations. Generalization is common in quantitative research trying to extrapolate statistical generalizations based upon the empirical findings using larger “sampling units” (Yin 2014). The empirical findings in this single-case study are rather difficult to transfer to similar phenomena, since its characterised by time- and context-dependency, personal experience and values (Johannessen, Tufte and Christoffersen 2010).

However, it is possible that parts of the study can contribute to a more general theoretical understanding (Thagaard 2009) of safety culture. In chapter 1.2, the study of Oltedal and McArthur (2011) found safety culture to both facilitate and inhibit the reporting frequency within merchant shipping. The authors also applied just (informed) culture theory of James Reason (1997) to explain how organizations’ handling of blame and trust affects the reporting propensity. Both my and their findings suggest that just culture influences the reporting propensity. More specifically, this study reveals that operative personnel have a low threshold for delivering reports, since they know the management are not going after them and there is a mutual established trust. Thus, it is possibly to transfer some of the findings that have been confirmed through theory to other industries emphasizing safety culture.

3.6.4 Ethical Considerations

There were a number of ethical issues related to this project that had to be taken into consideration. Ethics is about rules, principles and guidelines - a continuous assessment of actions being right or wrong (Johannessen, Tufte and Christoffersen 2010). The matter of confidentiality is one of these basic ethical principles. Confidentiality has been sustained by treating the informant’s answers confidential on a password-protected computer until processed and afterwards deleted.

The informants’ privacy and identities have been protected as far as possible (Ryen 2002). There are two ways to identify interview objects: direct identification through

for instance name, or indirect identification through different combinations of information as work title, sex or age (Johannessen, Tufte and Christoffersen 2010). Both of them were not used in the data collection nor further data reduction, analysis and discussion. All informants were anonymized while writing this thesis and in the text (Thagaard 2009). This was also explained explicitly prior to all conducted interviews with the informants and that my findings were restricted to research purposes only. In addition, specific names and locations that can be linked to this organization have been removed from interview data when transcribed.

Thoughts have been given if the operative personnel could in the aftermath recognize their colleagues that had been interviewed, but this is considered to be less likely. This is because the facility itself is a large one, and the operative personnel volunteered often were from different workshop-locations. There are reasons to believe that the management can easier be recognised internally by colleagues if they try to, due to their close cooperation and fields of expertise.

Chapter 4. Empirical findings

4.1 Introduction

In this chapter I will present my empirical findings. The findings have been thematized and divided according to the research questions. First I will present how the facility has implemented its SIS. Thereafter, organizational measures that contribute to the development of safety culture are presented. Here I only provide an overview of measures directed at safety, the discussion of how they contribute is taken later in chapter 5. Similarly within the last presented subsection, I present safety culture's affect on the SIS' performance, but only providing the cultural findings. The affect on the SIS is instead discussed in chapter 5.

4.2 Implemented safety information system

4.2.1 Overall reporting framework

The facility needs incoming reports for numerous of reasons. Some of these are established in the organization's internal documents. Reporting is explained as a mean to follow the multiple requirements given by laws, regulations, customers and global

headquarters (Doc 1.; Doc.2). Reports contribute to compliance of the requirements given by the overall SMS (named a HSE management system in the management system documents). The facility's SMS is in next instance used as mean to adhere to relevant national regulations and laws, and part of the HSE policy (Doc.1; Doc.2). The current facility must comply with the Norwegian Internal Control regulations (1996) and the Working Environment Act (2005) that sets demands for systematic health, safety and environmental (HSE) – work (Inf.1).

Reporting contributes to the facility's systematic HSE work, seeking to identify different causes and circumstances of incidents so that necessary actions can be implemented to prevent recurrence (Doc.2). More specifically according to the facility's HSE goals, reporting is mandatory and provides the necessary basis for analysis and corrective measures to implemented. In addition, the HSE policy explains that every employee must participate in this continuous work of HSE measurement and improvement (Doc.1). At last, in special occasions the reported information provides necessary facts to that might be needed in matters of litigation and insurance claims (Doc.2).

The global headquarters establish and distributes annual reporting goals to its worldwide facilities, including this one. These are estimated numbers that they must try to sustain. As of the year 2015, the goal has been set to increase reporting of all incidents by 10% (Inf.2; Inf.7). So far all HSE –reports are supposed to be measured on a regular basis (Inf.7). For instance, the monthly updated Key Performance Indicators (KPIs) done at the HSE department. The KPIs is a way of measuring the facility's HSE performance and distributed to customers and the corporate offices (Doc.1; Inf. 7). In relation to HSE, the KPIs include total reports on sick leave, incident reporting as well as reportable environmental incidents. Simplified, the incidents vary from cases that include Lost Time Injuries (LTIs) i.e. incidents causing absence from work to incidents involving more severe consequences like for example medical treatment etc. (Doc.1). The least severe measured incidents are hand-and – finger injuries, the so-called first aid cases (Inf.7).

However, there is a discrepancy between the local management and global headquarters. The global headquarters want to measure all reports, while the local management wants to re-direct the main attention towards measuring potential

hazardous conditions and employees' reporting of them. Therefore, work preventive in issues where there is time to implement corrective measures, compared to incidents that have already happened. For instance, near-misses which easily could have lead to a more severe accident, but by chance did not (Inf.7).

The SIS is not equally implemented to the rest of the organization's facilities. This is because the organization performs a great deal of different activities worldwide, varying from subsea to surface operations. Thus, this facility's scope of activities combined with local customer demands and the Norwegian legislation influences its implemented SIS (Inf.1). The facility has to continuously monitor and compare its implemented measures towards requirements from global headquarters, customers and the Norwegian government. However, they must always follow the strictest requirements (Inf.1).

The electronic software named SAP is used to perform most of the tasks within the organization, and includes a wide range of documentation, work instructions and procedures. Processing of reports related to HSE-matters and the SMS is an integrated part here (Inf.1). The employees can report everything from near-misses, small and large accidents, unsafe conditions, environmental emissions and psychosocial conditions. There is generally a low user threshold for what is considered acceptable reports, and the employees can report most of the things they are worried about in their own words (Inf.1).

4.2.2 Safety information system at the facility

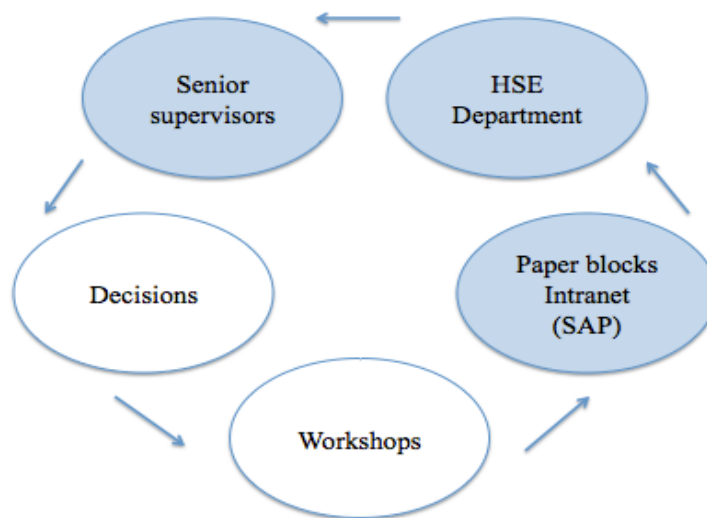


Figure 2. The facility's implemented safety information system

Figure 2 above illustrates how the current facility has implemented its SIS, seen through the three phases of data collection, processing and distribution of information to relevant decision-makers. The workshops represent the production system. It is in the workshops where the operative personnel conducts maintenance and operates heavy equipment on a regular basis.

Data collection

At present, there are different ways for employees to report due to practical reasons and how often one uses it. In the workshops they have paper-blocks/sheets containing a standard template. After reports are down-written, they deliver them in mailboxes located around the workshops, and the HSE-engineers from the HSE department walk regularly rounds during weekdays and collect the reports (Inf.1). Another way is for employees to report directly into SAP themselves on a computer for those who have training to do this. As Inf.1 highlighted, not everyone has this training because of their work tasks:

“The workshop technicians do not sit in front of the computer, they sit and screw on equipment or are disassembling equipment” (Inf.1).

This way of reporting was not known among most of the informants. Only one of the operative informants confirmed to use this method. The most common thing is to rather use paper blocks when reporting. A third way is to report over e-mail, where personnel use electronic reporting schemes found on the facility's intranet, and subsequently get assistance from an HSE-engineer from the HSE department i.e. a so called quality notification (QN) – coordinator (Inf.1).

Data processing

After the reports have been collected, dedicated HSE-engineers at the HSE department sort out the reported information and create a “Quality Notification” (QN) in the SAP-system under a specific code (Doc 3.) This process include multiple steps which all shall not be included here due to the scope of investigation. The essential part is to analyse the report (risk analysis), look at where the information comes from, and add the responsible senior supervisor within the relevant workshop unit who can take further actions based upon the analysed report (Inf.1). The purpose of risk analysis is further presented in next section. Every quarter i.e. third month, the HSE department and workshop management also perform trend analyses based upon reported data in SAP. The two parties look at where there are challenges, which type of incidents that are most frequent and what needs to be improved (Inf.7).

Distribution of information

While registering the report in SAP, the HSE department creates tasks in the same system and disseminates this information primarily to senior supervisors within his/her workshop unit to implement corrective measures. When assigning tasks in SAP, the relevant person will receive a notification in their SAP inbox and regular e-mail inbox (Doc.3). Under the condition that the reporters voluntarily provide their names in the report, the HSE department can add the reporter's name when processing it. The reporter will then receive a notification link in SAP that a case has been created, and a notification when it closes. In addition, the HSE department sends out information to the reporters' work e-mails including a Quality Notification-number which they can enter in SAP themselves to check the status of their report (Inf.7). Reports can also ask the HSE department (Inf.7). If the reporter is anonymous, they will be informed indirectly during joint meetings in the workshops where generic

cases are talked about (Inf.1). See monthly HSE meetings section 4.3.

The relevant senior supervisors who receive work tasks on them will have a certain time to implement countermeasures determined by the risk analysis at the HSE department (data processing phase), which includes a classification. The HSE-engineers classify the reported information in SAP based upon a risk matrix scheme. The risk matrix is used as a template to classify the reported information either as green, yellow or red - based upon probability multiplied with potential consequence of the event:

“(...) It is about criticality, in other words red, yellow or green in relation to how important it is to act upon it” (Inf.1)

For instance, how many is affected or potentially affected by the reported incident, how critical it is in relation to time aspect or other potential risks. Red classified incidents have a high priority and shall be closed within 3 months in SAP. Yellow classified ones are prioritized as medium and shall be closed within 1 month. While green incidents have a low priority order and shall be closed within 1-4 weeks (Doc.3). The management has a procedure that requires an investigation group to be established when red incidents and Lost Time Injuries (LTIs) are reported and classified. This group has its own leader and conducts interviews and write a report of the findings in the aftermath (Inf.7). However, it is not necessarily always that the classification guides the prioritizing. If green incidents are recurring over time in SAP, this can affect the necessity of acting upon it as well (Inf.1).

It is not always relevant to delegate tasks to the senior supervisors, because different incidents or conditions might be solved simultaneously as reports are written. The information is often registered in SAP so that the organization can measure recurring incidents over time that need to be handled at a later point. For instance, personnel not wearing personal protective equipment recurring over time can at a later point lead to development of related campaigns or inspections by the HSE department (Inf.1).

In order for a HSE report to be closed in SAP, the Quality Notification - coordinator (usually a HSE engineer) needs to control that corrective measures have been implemented as well as being relevant to prevent recurrence. The coordinator must

also ensure that tasks have been followed as planned according to the initial Quality Notification and that the information fields are correctly filled out (Doc.3).

4.3 Organizational measures' contribution to safety culture

4.3.1 Safety measures

Through the interviews, a number of measures were identified that the organization implements to foster safety in the daily business. These measures are stipulated by global headquarters to be implemented locally within each facility. A detailed overview of these measures is provided below.

Campaigns

According to the management campaigns are used to set focus on areas that are mandatory for employees to follow and/or to rather raise awareness to prevent previous incidents from happening again (Inf.7). For instance, campaigns have previously focused on hand- and finger injuries, falling objects, or reporting as part of "Destination zero". The management explains that "Destination zero" has been a driver for many years, and part of the organization's overall objectives, particularly focusing on avoiding LTIs and zero high-risk incidents (Inf.7; Inf.1). The workshops have information boards where material as campaigns and monthly HSE themes are hanged up (Inf.5).

The management highlights that campaigns are important to set focus on and increase the reporting frequency (Inf.1). Previous campaigns have had positive impacts:

"If we focus strongly on campaigns, we see that campaigns have a tendency to increase reporting accordingly. It is about the eyes that see, that you are trained to notice" (Inf.1).

Campaigns are essential to build trust and credibility, and emphasize how important it is to notify about hazardous conditions (through reports) according to Norwegian legislation and regulation (Inf.1). The management highlights that the campaigns have over time been integrated as trustworthy measures that the personnel feel more comfortable to follow in their work compared to before. For instance, campaigns built

on the stop policy (explained in next subsection). The personnel have previously communicated to the management that it can be challenging to confront colleagues, particularly the more experienced ones. However, last autumn the management had the impression that these problems were gone (Inf.1) Inf.1 emphasized that it takes time to build required trust:

“So we have clearly managed to build it, and it takes time. To say that it is ok to say stop, that it is ok to react, be in a relation and notify a colleague or a supervisor that this is not good” (Inf.1).

Campaigns are created and distributed in several ways. One way is that global headquarters sends out campaigns that must be implemented by the local facilities worldwide. Another way is for the current facility to develop its own campaigns within specific issues they want to address themselves (Inf.7). However, there is apparently a disagreement between the upper management from global headquarters and local management when implementing campaigns (and some policies). Global campaigns may from time to time come without any warnings, further specifications and dialog. As elaborated by inf.7:

“When we have used a lot of time and energy to work preventive and about to implement them, then it is like no no. For instance it is about money and time, everything. We need to wait and see a little, and that is a little demotivating (...)” (Inf.7).

From time to time the management want more time to do preparatory work in advance of implementing campaigns, which is sometimes perceived as frustrating (Inf.7). Not many opinions were given about the campaigns directly. One of the operative personnel appointed that he was pleased with the frequent focus on campaigns in combination with other safety measures (Inf.5).

Stop policy

The permission to stop an operation is part of the company’s “stop policy/philosophy”. Every employee has permission to stop an operation without

questions our doubts being raised from colleagues to avoid putting themselves and colleagues in unnecessary danger (Inf.1). To stop an operation is highly acknowledged in the daily work. Safety shall surpass title and work position when working. As the management emphasizes, it is important to speak with the ones it concerns and not only write a report of the unsafe condition observed. This way the personnel become aware there and then and can do the work task in safer way (Inf.7). It is a continuous process to make the employees comfortable enough to stop operations (Inf.1).

At present, the management believes that employees are aware of their duty and authority to stop an operation, (Inf.2), and confirmed by three of the operative personnel (Inf.3; Inf.4; Inf.6). The operative personnel perceive the stopping of a potential operation as their job, which subsequently shall be reported (Inf.3). As inf.4 pointed out, the right is incorporated and accepted:

“It is really incorporated that everyone are allowed to stop an operation. If there comes a person from a different department, then he is allowed to say stop. This is accepted” (Inf.4).

According to a representative of the operative personnel it can sometimes be challenging to notice when operations lie in the border of becoming an incident. This is because they at the same time still need to do the operation (Inf.6). However, the same informant highlighted that despite of this, he still had it in the back of his head that the management expected them to work safe and stop potential hazardous situations. This expectation was seen as really reassuring (Inf.6).

Safety, Quality, Delivery and Cost

Most of the organization’s activities within its different, global facilities are regulated through the template and business driver of “Safety, Quality, Delivery and Cost (SQDC). The key function of SQDC is that during employees’ work operations, safety always comes first. SQDC follows a chronological priority order from S to C, regardless of where one works within the facility (Inf.1). Different managers have training based upon SQDC and follow up the personnel’s practice of it in the daily practice. In addition, the SQDC has previously been used as a subject in courses for

the employees, explaining that everyone are legally required through the Norwegian Work Environment Act to notify about hazardous conditions (Inf.1).

The operative personnel informed that they practice SQDC in the everyday work; it pervades most of their activities and safety comes first (Inf.4). SQDC is seen as useful measure, and can for instance be referred to if disagreements occur according to Inf.3:

“If someone challenges us because we think safety or ask questions about something regarding it, we just say that the S comes first and this is absolute and implemented. I do not feel someone contests it then, so it is nice to have” (Inf.3).

Monthly HSE meetings

The senior supervisors within each workshop location hold monthly one to two hours with operative personnel (Doc.1; Inf.4). The HSE department make monthly HSE presentations that are used in these meetings based upon challenges they observe in workshops, including workshops from other facilities in Norway as well.

Representatives from the HSE department may also be present at these supervisor meetings if there are special concerns (Inf.7). They use these meetings to talk about previously reported HSE incidents and present a monthly HSE theme (Inf.6). In the meetings injury statistics and status of organizational goals are also presented. For instance, the above-mentioned Key Performance Indicators (KPIs); and the status of working towards zero Lost time Injuries (LTIs) and near-misses etc. (Inf.3). Different concerns from operative personnel that have been communicated to senior supervisors or have been reported can also be included in the monthly HSE-meeting (Inf.6).

Most of the operative informants perceived the HSE meetings as positive, emphasizing mutual dialog and being an opportunity to raise concerns or questions. Inf.4 elaborated:

“It always ends with us being asked if there is something we want to talk about, and if not the office is always open” (Inf.4).

The meetings are seen as a positive thing, because they present status of LTIs records

and provide transfer of experience. Personnel get to see what happened, preferably illustrated through pictures and sound, to prevent it from happening again (Inf.5). The meetings are seen as highly relevant, and also good opportunities to raise questions regarding reporting. For instance, there have been some previous challenges regarding what to fill out on the reporting blocks. The senior supervisor used this meeting then as an opportunity to provide explanation and guidance (Inf.6). One of the operative was however a little more sceptical and saw it as repetitive:

“You do not have it because it has a value, but because you are required to. If you have had a survey what people meant about it, it is probably considered a nice coffee break” (Inf.3).

Safety inspections and safety delegates

To get a better understanding of the conditions in the workshops, the HSE department conducts regular safety inspections together with a safety delegate and a supervisor. Both the supervisors and safety delegates are colleagues with the rest of the operative personnel. There are several supervisors ranked beneath the senior supervisor within each workshop unit, while the safety delegates are appointed representatives (Doc.1). The safety delegates have a total of 40-hour mandatory courses according to the Norwegian Working Environment Act (Doc.1; Inf.5). They are wearing green visible helmets, and the personnel can use him/her as a contact person in the daily work of HSE-matters and general concerns (Inf.4). The safety delegates can also report on behalf of operative personnel and/or disseminate their reports to the HSE department (Inf.5). As inf.6 highlighted:

“He is the one I contact regarding HSE (...). It is like an oral reporting” (Inf.6).

There are some differences how often these inspections are done and with who, depending on available personnel. Half of the operative informants explained it as each 14th day (Inf.3; Inf.5), while one of them mentioned it as a weekly thing (Inf.6). After a safety inspection, a HSE engineer (depending on who is present) will make a report of what was observed and potential room for improvements, which will

subsequently be sent to a relevant supervisor within that workshop to be followed up (Inf.6).

Safety inspections are according to the management essential, since they offer the opportunity to get an insight in the dynamics involved in the workshops compared to sitting at the offices (Inf.1). Not many opinions were given about these particular inspections, which can be seen in relation to the few, specific people taking these rounds. However, Inf.6 operative highlighted that they could be more included in matters and decisions that affect them in the workshops, for instance exchanging of equipment:

“Then it becomes a little like that the mechanics look at the HSE engineers as crazy (...) If you are perceived as one who abandon copper sledge hammers, what will the next thing be” (Inf.6)

Management inspections

Management inspection is a relatively new measure implemented. It was used before, but recently reintroduced again. From autumn 2014, the senior managers (the director’s management group) preferably together with a HSE person walk around and do inspections in the workshops and warehouses within the facility (Inf.2; Inf.7). Previous inspections illustrate that this has been more on a periodic basis so far, a couple of rounds per year, but supposed to be sustained through the year of 2015 (Inf.2).

The management sees these inspections as a positive measure to enhance the communication and understanding between them and the operative personnel (Inf.2; Inf.7). It is a way of showing themselves, sincerely speak to them and observe so that the operative personnel is more attentive in future (Inf.7). As inf.2 highlighted:

“It is to show that the management actually care what happens out there (...). It is really important that the upper management are visible out among people and talk with them” (Inf.2).

The operative personnel also confirmed that these management inspections are good ways to get different impressions on matters (Inf.6). However, another one meant that the inspections lead to management picking on minor issues, instead of seeing all the good things implemented in the workshops. Latter person underlined that it seemed to be missing a proper agenda (Inf.3).

Alert system

The worldwide facilities (including this one) within the organization are notified about severe incidents in form of a HSE-alert through the “alert system”. This system is connected to the SAP system’s data. The alerts seek to prevent similar incidents from happening again and include general tips, potential hazardous conditions that can develop and what to look after. For instance, pressure equipment that are considered high-risk cases and might have happened at other facilities (Inf.1). Such alerts must be written and distributed within 48 hours after an incident has occurred (Doc.2). The alerts may trigger the facility to review relevant procedures and routines as well (Inf.1). According to the operative personnel these alerts are sent on their work e-mails (Inf.6).

The management perceive the alerts as a mean to raise awareness among its employees, to prevent similar incidents happening within the current facility as well. Alerts are part of learning from others unfortunate situations, considering that there have not been many incidents within the current facility (Inf.1). Inf.4 elaborated on the practice of using such alerts:

“Everyone knows about it, but if they know where to search and how it is...it is maybe a little about interests. Perhaps we could have had a bigger focus yes (Inf.4).

4.4 Safety culture’s affect on the safety information system

4.4.1 Personal reporting

All of the informants acknowledged reporting to be an inherent part of their daily activity and reported personally. From the management perspective reporting is seen as top priority, necessary to measure HSE performance and expected by their clients

(Inf.2). Reporting is perceived as a way of getting an update on the operational conditions, if the focus is right or wrong as of today, and where there are potentially room for improvements (Inf.7).

The operative personnel perceive reporting as an obligation that everyone has. HSE is the most important thing (Inf.4). According to the management the operative personnel often takes the time to add illustrations and pictures in their reports for them to understand the problem better (Inf.2). This was confirmed by one of the operative informants (Inf.3). It is not necessarily everything that is considered reportable among the personnel, for instance minor oil spills in the workshops that they clean up there and then to avoid initiating large, consecutive processes (Inf.6). However, if minor things are not reported the personnel still feels that there is a great focus on the continuous HSE work (Inf.4).

4.4.2 Under-reporting

All informants were certain that there is under-reporting within the facility and different explanations were given why it probably occurs. First, subjectivity regarding pain tolerance and different judgements of what constitutes a hazardous incident was one of the identified factors (Inf.7; Inf.4). As Inf.7 pointed out:

“What I believe has been underreported before is first aid injuries i.e. a small cut in the finger, and people put a bandage over or ice it down or something. Then they think this is something we do not need to report, and that they rather should report a broken finger or needs stitches etc.”(Inf.7).

A second factor identified was that the reporting process might be considered comprehensive and probably a burden for some employees, particularly the potential of getting follow-up questions by the HSE department in the aftermath of reporting (Inf.2; Inf.3). Third, the knowledge of reporting electronically was identified as a possibly reporting deterrent. The supervisors are often asked to report on behalf of other operative personnel. This is because some of them are better trained on using a computer and have better knowledge of the SAP system than others:

“Supervisors who usually do most of the reporting are not probably equally skilled. Being a mechanic (...) so they will use a long time, right. Only to add pictures on the computer may not be natural. Then it takes so much time that it is probably not done” (Inf.3).

A fourth factor identified was that the employees often fix problem there and then in the workshops and/or speaks to the one involved. Thus, the value of reporting may not be considered much in the aftermath (Inf.3). Finally, the fifth factor identified by the management, was the tendency that personnel writes reports together on the same unsafe condition or incident. This causes less reports regarding what was discovered (Inf.1). Some of the management and operative informants acknowledged that they could be even better at reporting themselves. On the contrary, one operative informant elaborated that the HSE department wants more reports, but from this person’s perspective they already reported enough (Inf.6).

When the management believes underreporting and mistakes occur, they emphasize communication and motivation with the operative personnel, for instance by having a chat with a sense of humour at a department meeting (Inf.1). The management uses countermeasures as review of routines and enlighten the personnel if there are situations when sincere incidents were not reported or took too long time. According to the management it is important to look at which areas the knowledge or competence are lacking (Inf.1). Dialog is used as a key measure, both when things go wrong or good. The operative informants agree, and explain that different forms of reprisals are not a tradition in the facility and understand what is unacceptable. Likewise, inf.4 elaborated:

“It is pretty sincere in the first place not to report an incident. We acknowledge this (...) I feel all the time that you shall report, and if you are uncertain you go in dialog” (Inf.4).

4.4.3 Opinions of the safety information system

There are mixed opinions about the different reporting schemes among management and the operative personnel. One informant from the management considered the reporting block to be a relatively practicable measure, because one can easily have

them in pockets and instantly write down what happened (Inf.1). On the contrary, a different informant from the management experienced the block to be more clustered, because it is also used to report technical issues (Inf.2). An operative informant also experienced the reporting block as bewildering and focused more upon writing down what happened instead of trying to report properly (Inf.6). The rest of the three operative informants perceived the reporting scheme to be good, since the reporting blocks are easily available for everyone and there is a low threshold for delivering them. Anonymous reporting was perceived as a positive option among the operative personnel, but not usually done and considered necessary. As Inf.4 highlighted:

“This is not what it is about, it is about setting a focus on the problem without going after that person” (Inf.4).

To be able to obtain direct information about reported incidents and conditions, the operative personnel must seek the information themselves in the SAP system (SIS) (Inf.1). Given that the operative personnel do not report anonymously, they consider the overall feedback as decent. Feedback is not necessarily something they seek in every report depending on what they report on. For instance, minor finger injuries that they know the consequences of and basically report just to notify and systematize it in SAP (Inf.3). Other times reported incidents will be discussed in the monthly HSE meetings mentioned previously, depending on status of total amount of incidents or severity of them (Inf.4). However, the management had a different point of view, and believed that if one has 100 reports, one might get feedback on only 40 of them (Inf. 2). Inf.7 further elaborated on this:

“What we are struggling with now is that the ones who report incidents, they feel that they never hear something, so therefore they do not bother to report anymore (...) which is a truth with modifications” (Inf.7).

The HSE department can give guidance, but is not entitled nor have the resources to inform the personnel about every single report and the status of it (Inf. 7). The HSE department’s lack of resources was identified by several of the informants (Inf.2; Inf.3; Inf.4; Inf.7). It was pointed out that lack of resources might have caused delayed in the feedback from time to time (Inf.5). According to the management there

are lots of old and new Quality Notification - reports in SAP that have not been closed yet (Inf.2.). The operative personnel underlined similar previous, related challenges. Multiple times it was mentioned that previous conditions and reports had been a long time in SAP and/or were closed without anything happening. For instance, trucks that polluted the workshops had been in the system for years while the management have been finding half-hearted substitutes in the mean time (Inf.5; Inf.6).

Most of the operative informants have not paid attention to accessibility in the SAP system of the different things they report. Still, some acknowledged that the availability was vague and limited (Inf.5). This is partially a result of the supervisors' role. There are several supervisors within each workshop department in the facility. The supervisors often report on behalf of other operative personnel (Inf.3). In this manner, the supervisors have easier access to the status of reports in SAP than the others. A different factor is the operative personnel's limited training to enter and follow HSE-cases in SAP (Inf.1). The management are working on probably starting to use the monthly HSE meetings to give the operative personnel better understanding on how to use the SAP system to follow their reports (Inf.7).

4.4.4 Trust between the management and operative personnel

The management wants to have a mutual dialog and openness among them and the employees (Inf.2). As Inf.2 appointed:

“People need to talk together, it is a prerequisite. One shall not have any restrictions on these things at all. It needs to be openness all the way” (Inf.2).

The operative personnel have several different channels that they can bring up concerns or potential rooms for improvements in the daily work. For instance, talk with safety delegates in the different workshops, talking to the different supervisors and/or senior supervisor, and through reporting. All the informants shared the understanding of being able to speak to nearest supervisors and having this openness. There are little barriers for the personnel to raise concerns or discuss potential issues:

“You can enter a problem, you can write it down, but you can also go and explain yourself. The door is always open, which I think is good” (Inf.4).

The management tries to find solutions and adapt to the personnel’s concerns. For instance, based upon incoming reports they may change suppliers due to poor personal protective equipment (Inf.6). In other situations, the personnel can go directly to the senior supervisor. For instance, regarding wishes to adjust the environmental waste management system they have in the workshops (Inf.5).

The personnel feel comfortable to take the time to work safely, because this is something the management expects. Both parties acknowledge that stress can cause potential hazardous situations (Inf.6). The operative personnel are regularly working on or using heavy equipment and there have been incidents for instance between colliding of cranes. Still, there is an impression according to the operative informants that no one is directly blamed or hanged out, which they appreciate. The aim is to prevent it from happening again. If incidents occur, depending on a certain degree of level of severity, the personnel often know what they did wrong (Inf.4).

4.4.5 Using the operative personnel’s expertise

The HSE department tries to keep a frequent dialog with involved parties who report in the workshops. HSE engineers regularly ask follow-up questions to get a more accurate picture and understanding of the consequence potential. The follow-up questions try to use the operative personnel’s experience, asking them about what could have happened under slightly different circumstances; what could have been the most likely consequences and chance of happening etc. (Inf.7). Such follow-up questions can be seen as minor “investigations” which are emphasized in the daily work, exceeding the procedures of establishing formal investigation groups (after severe incidents). The findings can then later be updated in the initial registered Quality Notification report in SAP (Inf.7).

In general, all the operative informants feel they are listened to and taken seriously both in advance and aftermath of incidents. However, there have been occasions according to the operative personnel where they could be listened to more. One of the operative informants comprehensively referred to several different cases where the

focus areas were perceived as strange and that safety in one way not always comes before costs (Inf.3). For instance chemicals they store inside cabinets that have been lacking ventilation for several months. This is something that has been reported and communicated to the management, but apparently prices are collected and things take time. Paradoxically, the management sometimes focus on spray cans left outside, instead of locked up in these cabinets (Inf.3). There seemed to be some gap between management's expectation of implementing corrective measures and making them work in practice:

“Theory and practice are two different things. How much they have worked with it and how much time they have spent on it when they are already apparently a little overworked. Maybe they sometimes could have come to us and asked if it is a good idea” (Inf.3).

A different situation was a previous episode regarding exchanging copper sledgehammers in the workshops. The management believed they were hazardous and worn out. In this example the operative personnel had the material-knowledge and tried to explain that the hammers were supposed to falter when they get softer over time. Still, the management thought the operative personnel could get hit by splinters and had to throw perfectly functioning sledgehammers (Inf.6). Another example was a new prohibition of wrenches in the workshops, due to an incident in a different facility while using this tool. The prohibition was perceived as bizarre to some and seen as a result of not listening properly to the personnel (Inf.6). The supervisors in the workshops need to adapt and find solutions, which is not necessarily an easy thing since there are not always equally good substitutes (Inf.3)

4.4.6 Focus on learning from previous incidents

The management explain that they want to continuously monitor incoming reports, and not only act upon the trend analyses conducted each third month. Depending on the severity of the situation, they will not always wait until they see a negative trend in SAP before acting upon the information and implement corrective measures (Inf.7). This is especially important if personnel injuries are involved according to inf.7:

“We had a period where several ones got things in their eyes. If we have two such incidents, then we have two too much and need to do something about it. Then we do not wait until we see a trend” (Inf.7).

However, the internal transfer of experience was appointed to be lacking between the workshops within the current facility (Inf.5). For instance, HSE- measures may be focused upon and implemented in one workshop but not necessarily in the others as well (Inf.7). Apparently the operative personnel know little about what is reported elsewhere and how solutions are implemented according to the reported problem. As inf.5 highlighted:

“It is like small units reinventing the wheel all the time and doing their own experiences, find their own solutions which may be different. Therefore it would be nice to gather everything at one place, all reporting (...) at least for safety delegates who can have an overview of what comes from all the workshops” (Inf.5).

Chapter 5. Interpretation and discussion of empirical data

5.1 Introduction

In this chapter, I will discuss my empirical findings in relation to my research questions and theoretical framework. First the implementation of the facility’s safety information system (SIS) will be discussed. The characteristics of each phase are shortened to avoid repeating the broad descriptions already provided in the empirical chapter. Second, implemented safety measures and their contribution to the development of each of the four subcomponents of safety culture: reporting, justness, flexibility and learning are discussed. Third, each of latter subcomponents of safety culture is discussed to explain how they separately affect the SIS’ different phases. Thus, how safety culture affects the SIS’ performance. The four subcomponents are divided into subsections of facilitating factors, mixed factors (i.e. facilitating and inhibiting factors that overlaps with each other) and inhibiting factors. Some findings are discussed several places since the four subcomponents are closely related.

5.2 Implemented safety information system

According to Fernández-Muñiz, Montes-Peón and Vázquez-Ordás (2007) the SMS is a mean to comply with all of the relevant legislative requirements in a simpler manner. This is partially how the current facility sees it. The SIS is embedded in the SMS, and both of these are implemented in the electronic SAP system. SAP provides structure to the multitude of processes and documentation the facility is to comply with. Therefore, SAP (including the SIS) is used as an overall mean to comply with a large amount of requirements. These requirements include global headquarters' HSE policy and HSE goals, in addition to local customer demands of HSE performance and Norwegian legislation. Within the scope of reporting and documentation, the facility must as a minimum follow the Internal Control Regulations and The Norwegian Working Environment.

The facility has in a sense implemented and adopted its own, unique SIS that also has to function accordingly to its local activities. Naturally, these vary from facility to facility within the overall, global organization. In the same manner as the SIS continuously measures its HSE performance through its reports, the facility must continuously adapt to the strictest and changing requirements.

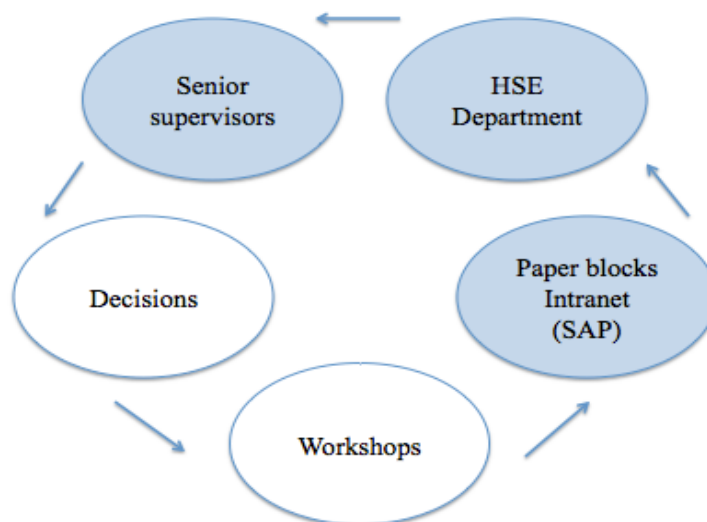


Figure 3. The facility's implemented safety information system

According to Kjellén (2000) the SIS consists of three dependent phases; data collection, processing and distribution to relevant decision-makers. At the facility, they have established and follow these phases seen in figure 3 above. In the first phase of the SIS, the operative personnel in the workshops will report health, safety and environmental (HSE) matters through its two main reporting schemes: paper blocks or electronic forms found on the facility's intranet. If the SAP system is being used to report directly into is more uncertain, since few acknowledged reporting this way. Depending on which method the employees choose, reports are either delivered to mailboxes in the workshops and collected by HSE engineers, and/or sent by e-mails to the HSE department.

There is a wish according to the management that there shall be no restrictions and all inputs are welcome. Reports can include everything from unsafe conditions, accidents, incidents, near-misses, environmental emissions, psychological conditions and/or improvement proposals. However, some inputs are considered more valuable than others. According to Reason (1997), near-misses are important because they provide proactive data which can be measured and used to improve safety. However, the facility regards near-misses more sceptically. They do not want near-misses at all, because only circumstantial coincidences did not lead to consequences. Thus, near-misses are perceived as already unfortunate reactive data. Instead, the management tries to raise awareness to look for and report potential hazardous conditions, since it gives an opportunity to implement corrective measures before near-misses and accidents are able to develop.

The HSE department represent the second phase of the SIS, data processing i.e. analysing the reported information from the previous phase. Kjellén (2000) has pointed out that the SIS is an important decision-makers tool that the different line-managers are dependent on in their daily work to be able to prevent new incidents. The SIS provides this function at the HSE department. HSE engineers at the HSE department have to take decisions daily when analysing the reports, including risk analysis and classification. In addition to deciding which other line-managers (senior supervisors) in the workshops that needs to proceed with the processed information to find appropriate corrective measures.

However, Kjellén (2000) highlights that a key factor that provides for decision-

making is continuous running of the SIS. The HSE engineers ensure this continuity by conducting weekly visits to collect reports as well as reading their work e-mails at the HSE department. The continuity of the SIS is also determined by the outcome of the risk analyses at the HSE department. When analysed in the SAP system, the report is given a risk classification that guides the time schedule for corrective measures to be implemented by the senior supervisors.

It may look strange that the most severe classified incidents (red) have the longest period to be fixed (3months). However, this can be seen in relation to the facility's procedure of investigations. Reasonably, the supervisors can follow up green incidents without requiring a lot of resources in the daily work. But when more severe incidents come up, the facility needs to establish investigation groups according to its procedures. The process of investigation requires thorough scrutiny varying from procedures to interviews with the employees. Investigations like this fits into Reason's (1997) description of the SIS, which focus is partially to use previous incidents to find the right conclusions. Dedicated members of the investigation group will in this manner seek to find out both what worked and potentially went wrong i.e. reactive measures.

Reason (1997) highlights that a SIS is a tool to perform regular, proactive checks on the different processes in the daily work. This is practiced at the HSE department. First of all, the department is proactive in their analysis, because they analyse potential risks and not only register incidents that have already occurred. Second, the HSE department is continuously having an oversight of collected reports and areas of problems that can be acted upon immediately or at a later point. For instance, total report statistics in the monthly updated Key Performance Indicators (KPIs).

The KPIs can be seen as part of the SIS' feedback control mechanism according to Aven et al. (2004), where the facility compares the current situation of total HSE-reports with its reporting goals of destination zero and/or 10% increase in 2015. The HSE department will observe certain reported problems (trending) over time and act upon them by developing measures such as campaigns. Campaigns aim at raising awareness and prevent similar incidents happening again. Thus, if they for instance observe that hand- and finger-injuries are decreasing as a result of a related campaign, they do not need to look at additional measures.

On the contrary, if campaigns do not have any effect, new measures must be looked into. However, campaigns may be a temporarily solution to the problem, illustrating the necessity of the SIS to continuously measure its incoming reports. The KPIs can also be seen as part of working towards an effective safety management. According to Reason (1997) this effectiveness requires regularly monitoring, measuring and improvements of organizational conditions as goal conflicts. In this manner, the facility regularly monitors the incoming reports and sufficiency of measures as campaigns, and compares them with potential goal conflicts. The KPIs provides a monthly status of the workshops' safety health.

The HSE department's ability to develop campaigns at illustrate that they have a certain role of decision-making, bringing a deviance to Kjellén's description. Kjellén (2000) explains that the decision-makers, in this case the senior supervisors in the workshops (third phase of the SIS), can develop campaigns as corrective measures. However, the HSE department is usually the one making the local campaigns, but they try to cooperate with the senior supervisors as well to make the campaigns more relevant. The senior supervisors are still in the daily work functioning as the primary decision-makers within their workshop units. The analysed information is distributed from the HSE department by creating tasks in SAP to the relevant senior supervisors. Latter function constitutes the third phase of the SIS, and it is up to the senior supervisors to find appropriate corrective measures. They will then implement these measures back in the workshops i.e. production system based upon the distributed information.

5.2.1 Summary

The facility has implemented a SIS to comply with the multiple requirements given by global headquarters, Norwegian legislation, local customer demands and scope of activities. The SIS is embedded in the SMS, both found in the electronic SAP system. The SIS is distinguished by three specific phases: First, data collection through means of reporting blocks and electronic reporting forms found on the facility's intranet. Second, frequent risk analysis of collected HSE-reports at the HSE department conducted in SAP. At last, distribution of analysed information through SAP to senior supervisors in the workshops. The senior supervisors function as decision-makers for their own workshop units and must find appropriate, corrective measures to be

implemented to limit hazardous conditions.

The SIS can be seen as a decision-makers tool that the different line-managers depend on in the daily work. The HSE department needs information from the SIS to conduct risk-analysis, and the senior supervisors this analysed information to find appropriate, corrective measures that can be implemented in the workshops. The SIS also works as continuous feedback control mechanism. For instance, the HSE department regularly monitor its total HSE-reports that are updated in the facility's Key Performance Indicators and compared to overall reporting objectives. An evaluation is taken if further counter-measures must be implemented to limit specific hazardous issues. If measures are implemented, the HSE department will over time see if they have any effect or not. If not having the wanted effect new measures must be implemented.

5.3 Organizational measures' contribution to safety culture

The several identified safety measures at the facility are implemented organizational measures supposed to be practiced in the daily work. According to Reason (1997) such measures contribute to building up the four different subcomponents of safety culture. However, whether they actually lead to safety culture will depend on the degree of their institutionalization. As Uttal (1983) highlights, safety culture is about what the organizational members see as important, how things works and are practiced. This is further discussed below, and as seen, some of the measures overlap the subcomponents of safety culture.

5.3.1 Reporting culture

The monthly HSE meetings in the different workshop units serve several functions, and one of these is to provide a channel to bring up concerns or ask questions related to reporting. This function is appreciated by most of the operative personnel, and seen as a highly relevant measure. One of the explanations behind this positivity can be seen through management's previous practices. There have previously been challenges in the workshops related to filling out the reporting forms. The senior supervisors focus on helping the operative personnel to better understand how this is supposed to be done through these meetings. Therefore, possibly contributing to more reports in future situations since the personnel know how to report in the first place,

instead of seeing it as a complex burden. It was believed that HSE meetings could be perceived as repetitive by colleagues in the workshops. However, it is hard to believe that repetition contributes to the reporting culture negatively, but rather the opposite. After all, the personnel are reminded over time that they can bring up concerns through these meetings to better understand important prerequisites such as reporting.

Safety delegates who join the safety inspections in the workshops (see section 5.3.3) have the training and ability to share operative personnel's concerns, or report on their behalf to the HSE department. Several of the operative personnel perceive the safety delegate as a contact person in the daily work of HSE-matters. Therefore, the safety delegates sometimes function as a middleman and informal reporting mechanism. As pointed out by one of the operative personnel, the safety delegate was the one he talked to about HSE-matters in the workshop. Safety delegates might be considered a less restrained channel to bring up concerns in the daily work for some personnel.

Another safety measure used by the management to increase reporting within areas they want more attention is the campaigns. Regular campaigns seek to prevent incidents, and can be seen as frequent reminders of the responsibility the employees have to report. According to Reason (1997) it is not necessarily always intuitive what constitutes an incident, and this ability to interpret potential hazardous situations is essential within fostering reporting cultures. At this facility campaigns work as means to train its personnel's abilities. According to the management, campaigns are used so that the personnel can easier notice potential hazardous conditions. Despite of the uncertainty about how campaigns actually contribute to increased reporting among the operative personnel, the management have seen more reports within certain areas after campaigns have been implemented. This indicates that campaigns are actually having a positive effect among employees when it comes to propensity to report.

5.3.2 Just culture

Campaigns can be seen as contributors to developing just culture as well. This is because these two subcomponents of safety culture are linked. As Reason (1997) highlights, a mutual trust is essential to achieve just culture. This further affects the reporting culture. Previous campaigns have focused on the stop policy, and the stop policy is understood as an accepted and practiced measure among most of the

operative personnel. Therefore, the campaigns contribute to the mutual trust that the stop policy seemed to facilitate between the operative personnel and management. As the management highlights, it is a continuous process to build trust and comfort to stop operations involving colleagues or even supervisors. At present, most of the operative personnel see it as their duty to stop potential hazardous situations and know that these situations shall subsequently be reported. Therefore, the facility has managed to establish trust through campaigns and the stop policy, contributing to its just culture that facilitates the reporting culture.

However, campaigns bring along some trust issues at management level. Lack of communication and resources between the global headquarters and local HSE department occasionally causes demotivation and frustration within the facility. This is seen in situations where the HSE department has to wait with or abandon its own campaigns when global ones are on the way. Hypothetically, the current facility may have a lot of hand- and – finger injuries, but the global ones focuses on dropping objects. It will therefore be unfortunate if the facility has to abandon more relevant campaigns for the benefit of the global ones. This is because the facility's SIS will provide more relevant data on reported issues that can be used in local campaigns. Therefore, the employees can look for and report potential hazardous conditions that are relevant locally, instead of focusing on areas that are already safe. This section illustrates that organizational measures induced at the global headquarters from time to time contradict the needs at the local level.

The universal business driver of Safety, Quality, Delivery and Cost (SQDC) seems to be institutionalized among the operative personnel. One of the reasons behind this might be that the management uses SQDC in regular courses. SQDC can be seen as a measure of trust, because operative personnel know that they can refer to it in disagreements and people listen and accept it. At present, half of the operative feel that safety shall and comes first in the daily work. However, these numbers are possibly higher since all informants gave the impression of HSE being most important.

5.3.3 Flexible culture

According to Reason (1997) one of the key pillars characterizing flexible cultures, is to acknowledge and include personnel. The personnel's expertise and skills must be appreciated for an organization to perform better. Likewise, the facility's safety inspections contribute to discuss potential issues and find solutions together, including a supervisor and a safety delegate working in the relevant workshop. Corrective measures can then be implemented based upon several points of view, since the inspections lead to a report that must be followed up by (senior) supervisors in the workshop.

However, there is apparently a bias between the opinions of the management and operative personnel. The management sees these regular safety inspections as positive opportunities to get better insight in the dynamics in the workshops. On the contrary, part of the operative personnel wanted to be included more than they are today. There have been previous episodes of limited dialog, which also seems to inhibit their trust to the HSE engineers taking these rounds. More specifically, the HSE engineers (representing the HSE department) can ask more questions related to equipment, since the operative personnel elaborated that they possess the knowledge needed.

Management inspection is another safety measure used by the upper-management a couple of times per year to speak with the ones in the workshops. As most of the management elaborated; these inspections are important to enhance understanding between the management and the operative personnel. In addition, the inspections aim at showing that the upper-management cares about the conditions and opinions of the operative personnel. However, there are some contradictions within the facility. There is a wish among the operative personnel that the management open its eyes more and acknowledge all the good things going on in the workshops. Previous inspections have been rather disappointing, because the management are mostly obsessed with things that shall be improved. This is not to say that all operative personnel see these inspections the same way. There were also personnel that saw them as positive opportunities to obtain different impressions of HSE-matters. A possible explanation of this discrepancy might be the multiple workshops established in the facility. Practices and what is seen as important may vary internally between each of them, exceeding the informants interviewed for this study.

5.3.4 Learning culture

Reason (1997) highlights that learning culture depends on the (top) management's encouragement, willingness and ability to interpret and act upon previous reported incidents. The monthly HSE meetings can be seen as means to facilitate commitment among the management. HSE meetings were previously discussed above as a mean to enhance the understanding of how to report within the reporting culture. In addition, the meetings can also be seen as a mean to create awareness around potential hazardous conditions to prevent it from happening again. The HSE department cooperates with the senior supervisors in the workshops to make these meetings as relevant as possible, for instance by using incidents that have happened locally or in other facilities part of the overall organization. As one of the operative personnel emphasized; presenting status of work-related injuries as Lost Time Injuries (LTIs) is positive, because the employees gets to see what actually happened illustrated by pictures and work as a transfer of experience.

According to the management, incidents are not a tradition in the facility, but the organization has a universal alert system that notifies about incidents happening elsewhere. The function of the alert system is to provide two main mechanisms for the operative personnel. First, distributing HSE-alerts to the employees within 48 hours after a severe incident has occurred facilitates an awareness to look after specific potential hazardous conditions. Compared to the monthly HSE-meetings that might include incidents happening elsewhere as well, this is much more rapid information that can be acted upon. Second, this awareness can facilitate the personnel's ability to subsequently report these potential hazards if they know what to look for in the first place.

The management see the alert system as another possibility to transfer of experience, as a learning mechanism to avoid meeting similar, unwanted situations. The alert system provides a proactive function through frequent reminders (HSE-alerts) that are sent on the employees' e-mails. However, according to the operative personnel the value of these alerts might vary based upon personal interests in the workshops. If the operative personnel actually read these alerts and to what degree they create awareness is more vague. As elaborated by the operative personnel, there could be a better focus.

5.3.5 Summary

Organizational measures directed at safety are illustrated by the implemented safety measures at the facility. These measures contribute both positively and negatively to the development of the four subcomponents of safety culture. Thus, development of safety culture in total. Safety measures that seem to enhance reporting culture are the monthly HSE meetings, safety delegates and campaigns. HSE meetings facilitate the operative personnel's understanding of how to report properly, while campaigns help operative personnel to better interpret potential hazardous conditions that shall be reported. In addition, safety delegates provide and are used as an informal reporting mechanism of HSE-matters in the daily work.

Campaigns also contribute positively to just culture, reflected by a mutual trust established between the management and operative personnel. Operative personnel see it as their duty to stop potential hazardous conditions, working as a prerequisite of reporting them afterwards. Therefore, just culture also enhances the reporting culture. The business driver of SQDC can be seen to facilitate trust as well within just culture, since it is institutionalized that safety and particularly HSE is the most important thing according to all informants. However, campaigns induced at global headquarters occasionally contradict the needs at this facility's levels, and potentially inhibits the relevance for the local operative personnel that have to follow the global campaigns.

Safety and management inspections have the potential to contribute positively to flexible culture. This is because inspections like these offer the opportunity to implement corrective measures in the workshops based upon several points of view. However, operative personnel want to be included more in matters related to equipment in the safety inspections. In addition, the management inspections are not always seen as positive contributions due to tendencies of picking on issues and not the good things in the workshops.

HSE meetings are also seen as a positive measure within the learning culture, creating awareness for operative personnel and providing transfer of experience from incidents happening at other facilities. The alert system's contribution to learning culture is more vague, since how many that read and appreciate these alerts is more uncertain. However, this system has the potential to increase operational awareness much faster than the HSE meetings that are conducted on a monthly basis.

Chapter 5.3 above and its summary has so far illustrated how organizational (safety) measures are understood and practiced, contributing with both impairing and enhancing factors to the development of safety culture. Safety measures clearly contribute the most in a positive way to the reporting and just culture, constituting the primary subcomponents of informed culture i.e. safety culture according to Reason (1998). Further, a discussion of this developed safety culture and its affect on the SIS' performance is presented.

5.4 Safety culture's affect on the safety information system

5.4.1 Reporting culture

Reporting culture is one out of four subcomponents of safety culture affecting the performance of the facility's SIS. According to Reason (1997), developing a reporting culture requires the personnel's willingness to report, including their own mistakes. This makes it a challenging task to develop such culture in an organization. However, within current facility this did not seem to be an issue. Every informant acknowledged reporting as a mandatory and expected aspect of his or her daily work. Both the management and operative personnel regularly reported, which seems to be the result of different causes, further illustrated and discussed below.

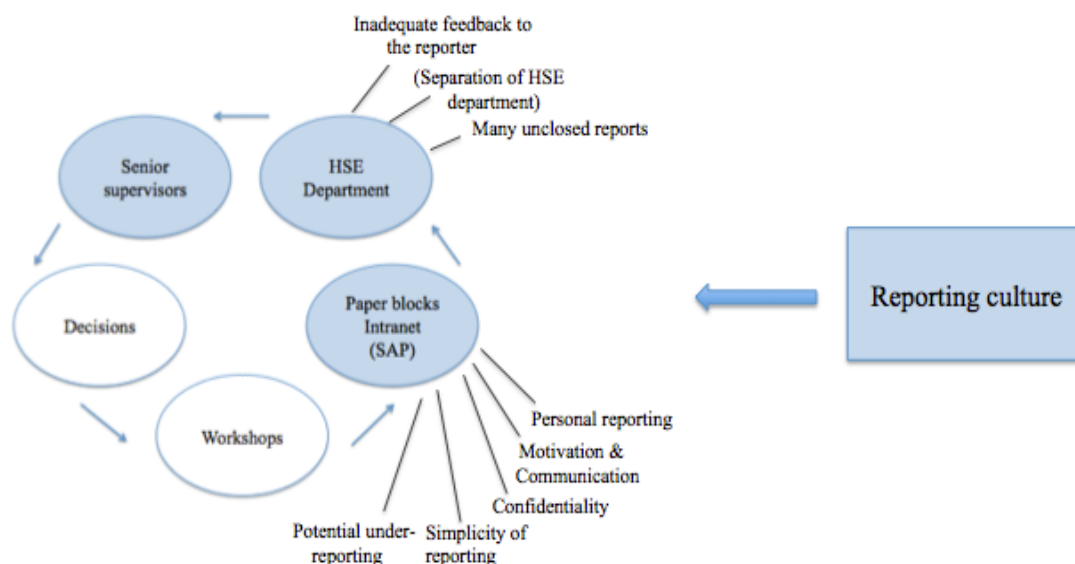


Figure 4. Reporting culture's affect on the SIS

Figure 4. Illustrates how the reporting culture as a subcomponent of safety culture affects the relevant phases i.e. performance of the SIS. As illustrated, not every phase is affected according to empirical findings.

5.4.1.1 Facilitating factors

Motivation & Communication

One of the five success factors promoted by Reason (1997) (Based upon O’Leary and Chappell’s Aviation Studies from 1997) to enhance reporting is to provide an assurance to the employees against unnecessary disciplinary actions. This assurance is seen through the management’s emphasis on motivation and communication at the facility. The management do not have a wish to go after individuals, which the operative personnel are aware of when reporting. This attitude is also focused upon if the management believes there is under-reporting. The important thing for the management is to find the root causes of why employees fail to comply with their routines and procedures in the first place. For instance, the management may look at its ways of distributing information; if the information is not properly understood among the personnel and why, and/or gaps in routines and procedures.

Confidentiality

The possibility of reporting anonymously constitutes the second requirement appointed by Reason (1997). The current facility’s reporting schemes, both electronically and the paper blocks, offer the possibility to report anonymously. However, this does not have any affect on the operatives’ propensity to report, but they acknowledge it as a positive option established. The operative personnel know that the important thing is to make the issues visible for the management, so they can be acted upon. Aforementioned motivation combined with this awareness makes them add their names in the reports without any further hesitations.

Separation of the HSE department

In this case, the HSE department are the ones responsible for collecting and analysing reported information. As a third requirement, Reason (1997) highlights that the ones who practice latter function needs to be separated from the ones with authority to take

disciplinary actions, which they are. An assumption would be that the separation of the HSE department work as an underlying, influencing factor to the operative personnel's propensity to report. This is because the different workshops follow certain responsibility of line management. Senior supervisors will typically act within their own workshop units when disciplinary actions need to be handled and not the HSE department. A practice like this probably enhances the credibility among the operative personnel, since the supervisors in the workshops are one of them in the daily work, compared to the HSE department that is more distanced.

5.4.1.2 Mixed factors

An easy way to send and complete reports

A fourth factor highlighted by Reason (1997) is an easy way for the employees to send reports and closing of them. At present, the facility's reporting schemes has both advantages and disadvantages when sending the reports. In total, the employees are more positive than negative. This positivity is a result of the practicability of having small paper blocks, easily available at multiple places in the different workshops and a low threshold for delivering them. However, different sections that need to be filled in are also partially perceived as complex by some. The complexity is explained as a result of combining technical – and HSE – issues to be reported on the same blocks (or electronically for that matter). As a consequence of this complexity, some operative personnel do not take their time to fill in every section in the report – causing inadequate reports.

It is a relatively easy task for a coordinator to close a report in SAP, but it presupposes an adequate follow-up of the initial Quality Notification analysed within it. All information fields must be filled in, and implementation and relevance of corrective measures must be documented in SAP. Despite of this, both the management and operative personnel revealed previous experiences that showed otherwise. For instance, the reported truck that had been polluting for years without adequate measures being implemented, perceived as a back and forth process by the operative personnel. In addition, the management who has an easier overview of total reports in SAP knew for sure that that there are too many unclosed reports in the system. It is natural to believe that the previous and current non-closed reports can affect future

reporting. For instance, the propensity to the rest of the facility's operative personnel that was not included here.

5.4.1.3 Inhibiting factors

Feedback on the reports

The possibility for operative personnel to follow their reports in the SAP system is connected to the last and fifth factor promoted by Reason (1997): feedback. In general the operative personnel see the feedback as all right, but without giving it any further elaboration. The facility is a large one and the reality might be more challenging. According to the management the operative personnel actually wants more feedback than identified, but at the same time does not have the resources nor is it an included part of their jobs to go after every single report and provide feedback. The management's view is more likely to be closer to the truth as they have a better overview over total reports, and estimated that personnel actually only gets feedback on 4 out of 10 reports.

According to Reason (1997) the feedback needs to be accessible, useful, intelligible and rapid. At present, the accessibility is limited for the operative personnel due to little training on how to open up and follow reports in the SAP system. In addition, the feedback mechanism that they use is primarily limited to the senior supervisors' monthly HSE meetings where generic cases are talked about. To be able to evaluate the feedback's usefulness and intelligibility, they first of all must establish a proper access. The feedback to the operative personnel is limited to a Quality Notification-number sent on their e-mails that can be entered in SAP, but rarely is. It is more common that the supervisors report on behalf of others within the different workshops, since they have usually better training with SAP. Thus, the operative personnel neither pay attention nor know what happens with their reports.

Potential under-reporting

Despite of everyone acknowledging that they report, everyone was also certain that under-reporting was happening. One reason may be that other operative personnel than the ones interviewed are the ones not reporting, or the informants were afraid of revealing this through the interviews.

The identified potential under-reporting has been illustrated at the first phase of the SIS in figure 3 since that is where reports shall be collected. However, in reality under-reporting inhibits all of the phases because every phase is dependent on the reports' information to act upon. The non-reported information creates potential hazards for the ones working at the workshops since no one are aware of the hazards in the first place.

Kjellén (2000) explains that the perception of the incident's severity influences the propensity to report. This was identified as one out of five factors that causes potential under-reporting. More specifically, minor injuries or minor oil spills on the workshop floors were identified as potential reporting deterrents. Other factors identified were the tendency of people writing reports together on the same incident, lack of computer -and - SAP knowledge, and little value of reporting things they fix themselves. The four aforementioned factors are closely related to the last identified one: a possible overwhelming reporting process. Particularly, follow-up questions by the HSE department can be perceived as annoying.

The personnel can to a certain degree prevent some of these follow-up questions. If they provide a good report in the first place, the HSE department may not need to ask a lot of questions. In addition, the reporter does not have to be "bothered" any further than necessary in the aftermath by spending his/her time to answer all of these questions. However, the HSE department will always depend on some dialog with the operative personnel after receiving their reports. The workshops operate a lot of equipment and evidently the HSE department cannot possess knowledge of all of the technical processes. They need to occasionally ask questions to be able to conduct meaningful and accurate analysis.

5.4.2 Just culture

Reason (1997) explains that just culture is closely related to the reporting culture. To achieve an effective reporting culture, requires a just culture of mutual trust. It is reasonable to believe that since all informants pointed out that the reported in the daily work, this may be a result of partially having a just culture. It is important to explain it as as partial, because having a completely just culture is more like a vision and hard to obtain. In addition, the selection of informants is not enough to generalize

for the total facility. However, both the management and operative personnel perceived a mutual trust being established within the facility. This is a step in the right direction of achieving such a culture according to Reason (Reason 1997).

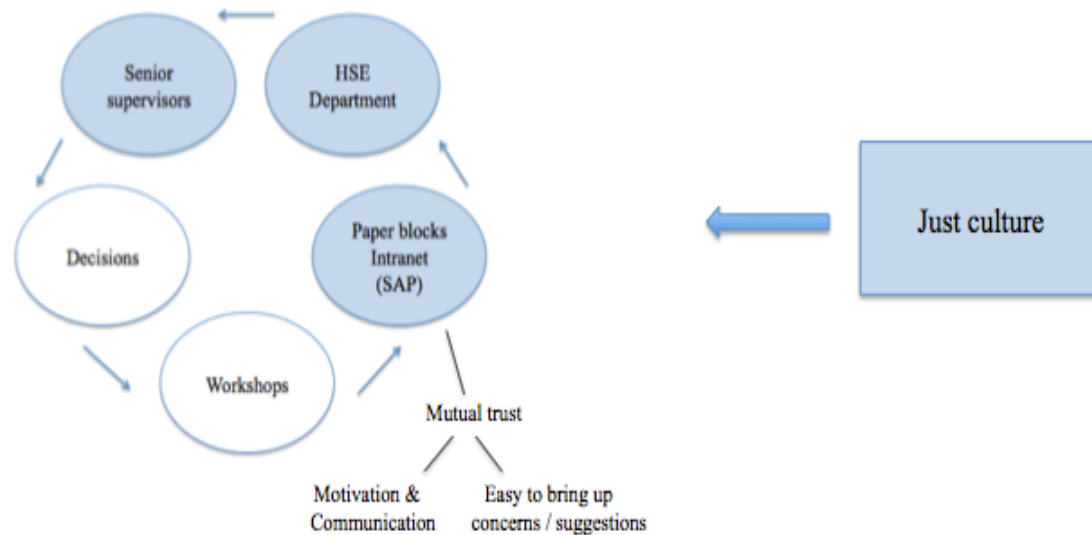


Figure 5. Just culture’s affect on the SIS

Figure 5 illustrates how the just culture as a subcomponent of safety culture affects the relevant phases i.e. performance of the SIS. As illustrated, not every phase is affected according to empirical findings. None direct inhibiting factors were identified.

5.4.2.1 Facilitating factors

Motivation & Communication

There are apparently several reasons why trust is perceived as mutual between the management and the operative personnel. A primary cause can be seen through the facility’s handling of punishment and blaming of the operative personnel. According to Reason (1997) the organization’s practice of punishments illustrates the trust within an organization. The management’s practice of reprisals (punishment) was discussed in chapter 5.4.1 above. Motivation and communication are seen as more important than distributing reprisals. The mindset is that that incidents happen, because the operative personnel are involved in a lot of different activities and operate with hazardous equipment. The main focus is to reveal why the incidents happens to

prevent it from happening again, instead of blaming and pointing fingers. Another cause of trust can be seen in the openness and low threshold of bringing up concerns and suggestions among the personnel. That the personnel in fact see results, for instance in matters of discomfort related to personal protective equipment or adjusting the waste management system in the workshops.

Every operative informant sees the HSE-work as priority number one, because this is what the management expects. In this manner the operative personnel understand what is considered unacceptable behaviour. Reason (1998) explains that this understanding is part of building just culture. In addition, there needs to be an understanding of when reprisals are needed or not. The operative personnel's established positive view on safety can then be explained as a result of why the management has not seen it as necessary to hand out reprisals so far.

However, it should be pointed out that a certain form of reprisals might not necessarily be a bad thing. According to Reason (1997) it is important to use a certain degree of punishment if people should work unsafely. This is because the management needs to show credibility to the rest of the employees. The management can potentially lose its credibility if unwanted situations happen repeatedly without leading to appropriate reprisals. This can be seen in relation to the previously discussed potential under-reporting. For instance, if the management always emphasizes motivation and communication when they believe people under-report, this can contribute to its sustainment rather than fixing it. After all, it is the colleagues of the irresponsible person who do not report a hazardous condition that will potentially at a later point be affected by the consequences of it.

5.4.3 Flexible culture

Flexible culture is the third subcomponent of safety culture. According to Reason (1997) the facility must be able to use the operative personnel with the best expertise as leaders in critical/severe situations, and then go back to its ordinary hierarchy of functioning when over. However, severe situations were not identified as a tradition in the facility. The facility has so far not needed to flatten its hierarchal structure to handle critical situations due to its scope of activities. In other facilities or industries this may be more relevant. Another reason is that on a daily basis and during potential

hazardous operations, it is the same operative personnel that conducts the operations and possess the already needed expertise. Therefore, the workshops are always flexible since it will not make a difference if someone replaces the personnel during shifting demands. However, the discussion below brings some indicators of the facility’s practice of flexibility in the daily work, considering that flexible culture is also about using the operative personnel’s’ experience and skills.

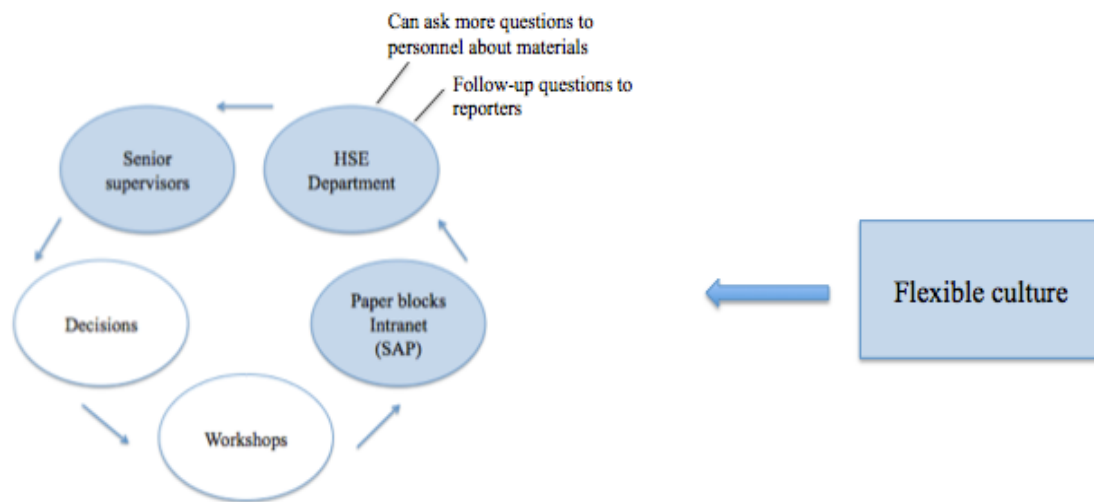


Figure 6. Flexible culture’s affect on the SIS

Figure 6 illustrates how the flexible culture as a subcomponent of safety culture affects the relevant phases i.e. performance of the SIS. As illustrated, not every phase is affected according to empirical findings.

5.4.3.1 Facilitating factors

Follow-up questions

An important aspect of the SIS is not only the HSE department’s function to analyse reports, but also its ability to have accurate analysis. This is because the senior supervisors need realistic and sufficient information to implement proper corrective measures, so the workshop becomes safer and not more dangerous than initially reported. To enhance the accuracy and understanding at the HSE department, they often conduct follow-up questions to the reporter, either by e-mail or stepping into the workshops and speak with the concerned ones. As the management highlighted, it can be seen as minor “investigations”, since they want to provide a broader identification

of the root causes. Such questions provide beneficial understanding of what happened in the workshops, compared to the more limited amount of information that is possible to provide in the standard reporting-blocks. The operative personnel have the relevant competence of equipment used in operations, and they directly observe what happens or could have happened based upon their previous experiences.

5.4.3.2 Inhibiting factors

Use the personnel's expertise more

However, this is not to say that there are no room for improvements. It was emphasized several times that the management could ask more questions in matters that affects the ones in the workshops. The operative personnel feel from time to time that the management lacks an understanding and knowledge of certain equipment. For instance, material-knowledge about copper sledgehammers that sometimes has to be thrown without being worn out or posing a danger. In a larger perspective, outside the HSE department, there have also been challenges related to implementation of prohibitions. Prohibitions may come globally, but at a local level these are not necessarily equally accepted. For instance the prohibition of wrenches, where the operative personnel feel bypassed and find it hard to find equally good substitutes.

5.4.4 Learning culture

The learning culture at the facility is the fourth and last subcomponent of safety culture.

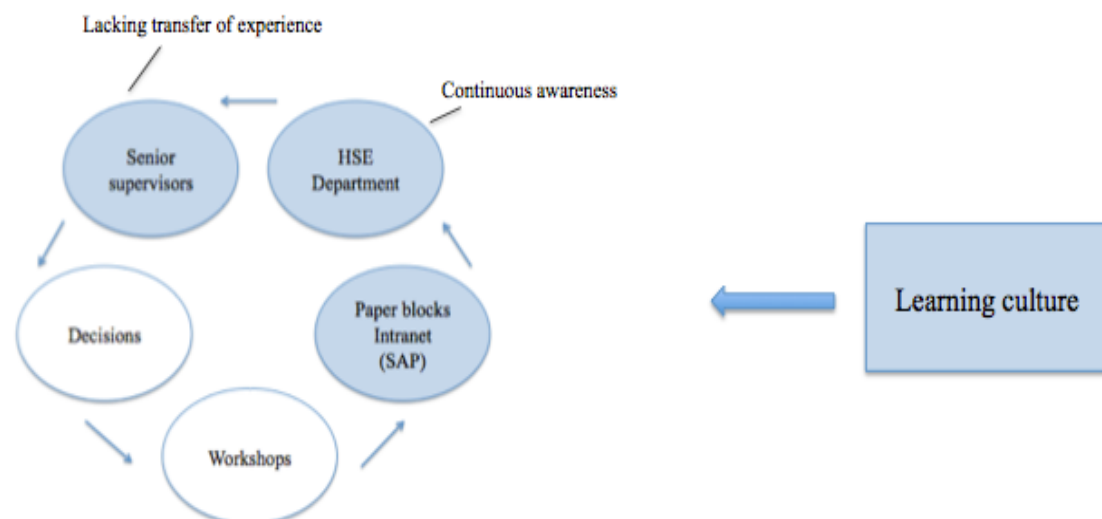


Figure 7. Learning culture's affect on the SIS

Figure 7 illustrates how the learning culture as a subcomponent of safety culture affects relevant phases i.e. performance of the SIS. As illustrated, not every phase is affected according to empirical findings.

5.4.4.1 Facilitating factors

Continuous awareness

Reason (1997) explains that learning culture depends on the (top) management's encouragement, willingness and ability to interpret and act upon the information in the SIS. In the current facility the management's commitment is seen in the daily monitoring and awareness at the HSE department. The HSE department does not always want to wait until they see trends, such as in the quarterly conducted trend analyses, before acting upon the reports in SIS and find solutions. As the management highlighted, two personnel injuries are two too many. In this manner, the employees' health and safety comes first and must be handled immediately, in form of contacting the workshops and find rapid, corrective measures.

5.4.4.2 Inhibiting factors

Lacking transfer of experience

However, there seem to be challenges in the third phase of the SIS regarding the distribution of information from the HSE department to relevant decision-makers. The different workshops tend to find different solutions to the reported and analysed problems, but these solutions are not properly shared with the other workshops. The different workshops appear to re-invent the wheel from time to time instead of sharing their experiences. There is a wish among the operative personnel to make the already working corrective measures more transparent, so that other workshop units can use them as well. Everyone can in theory find the reports in SAP, but not in practice. This requires additional knowledge among operative personnel that does not seem to be present. In addition, the workload of finding a specific solution in SAP can be overwhelming, since SAP contains reports of almost everything.

According to Reason (1997) one of the learning culture's greatest challenges is to

have management that prioritizes the important issues over the lesser ones. In the current facility safety is not necessarily always coming first and there have been tendencies of picking on the wrong things. The operative ones have raised concerns about missing ventilation in one of the workshop's chemical cabinets, but the managers instead tend to focus on spray cans that are not locked inside them. It was pointed out that this is a result of costs coming before safety, resulting in a slow handling of finding appropriate, corrective measures. This occasional bias of wrong focus is not directly inhibiting the phases of the SIS, but can be seen as necessary to improve within the learning culture. In a larger perspective, it is up to the top-management to prioritize necessary resources at the senior-supervisor phase in SIS so proper, corrective measures can be implemented.

5.4.5 Final thoughts

The four investigated subcomponents of safety culture is not the final product itself, but work as stepping-stones in the direction of being a safety culture. As Reason (1997) highlights, safety culture is not something you can 'have', but something an organization 'is'. The identified facilitating and inhibiting factors in this study make it possible to say something about the state of safety culture developed at the facility. This is because in order to be a safety culture, the facility must first of all have the four subcomponents.

First of all, they do have established the four subcomponents. The facilitating factors exceed the inhibiting ones particularly within the reporting and just culture. It is important to remind that the reporting and just culture constitutes the main foundation of the safety culture, and as illustrated above there is a great deal of focus on both of them within the facility. However, the four subcomponents also have room for improvement when inhibiting and mixed factors are taken in consideration. Within the reporting culture the partially complex reporting forms, postponement of closing reports and lacking feedback were perceived as inadequate. Still, these are factors that can be corrected without requiring an overwhelming amount of resources. The management are aware of them and have already taken action directed at improving the feedback. It was mentioned that the personnel's training to follow reports in SAP might be included in the monthly HSE meetings in future.

The just culture is already well established among the operative personnel and management. However, some considerations have to be made in relation to the fact that everyone was so certain that under-reporting happened. As previously discussed, it can be a matter of losing credibility in the long run if reprisals are not used. Compared to the reporting culture, this is not a matter of directly improving already established measures and practices, but rather changes in the way of thinking. Campaigns were previously discussed as positive contributors to reporting and just culture (within section 5.3.1 and 5.3.2). The management can then highlight under-reporting more through means as campaigns, or in form of some sort of reprisals as Reason (1997) highlights as necessary in some situations. Under-reporting is not necessarily a huge problem in itself if the minor issues are the only ones not reported. However, the reality may be more challenging, especially if the operative personnel also neglect reporting more severe incidents that put themselves and colleagues in danger.

The sometimes lack of including operative personnel's expertise within the flexible culture does not only require little changes in the way of thinking, but it also offers an opportunity to save money on expenses within the facility if improved. Safety shall be the most essential thing, but throwing out equipment that is still safe to use do not improve the level of safety. Asking the operative personnel more about equipment that is safe to use or not, might save resources that can instead be redirected and invested in the inadequacies found in the other subcomponents.

Within the learning culture there is lacking transfer of experience between the different workshops. By making the already implemented and functioning corrective measures more transparent, much can probably be gained. The workshops can in this manner "anticipate" the incidents before experiencing themselves and have similar measures already implemented to prevent and/or counteract them if developing. According to Reason (1997) the SIS provides a valuable ability to sustain an intelligent awareness in the absence of frequent hazardous incidents. Thus, if the workshops can easily find previous incidents and related measures registered in the SIS, they will be proactively aware.

If the aforementioned inhibiting factors are improved they can in the next instance contribute to the effectiveness of the SIS. However, in the same moment as

improvements are implemented, new weaknesses may be developing. This illustrates the necessity of constantly monitoring the different conditions in the facility through means as SISs. Safety culture and SISs are similar this way: as an organization you never reach the finish line, but keep going towards it.

Reason (1998) highlights that informed cultures i.e. safety cultures are characterized by cautious personnel within all of an organization's levels that look for potential hazards. It is rather difficult due to the scope of this thesis to speak about the facility in total, however the informants in this thesis were working at the facility's different levels (operative personnel, line-management, management). All the informants had it in the back of their heads that the preventive safety work was first priority. These attitudes have therefore to some degree reflected the established cautiousness within the facility: First facilitated by safety measures (section 5.3) leading to thinking and believing, affecting the SIS both positively and negatively (section 5.4).

Chapter 6. Conclusion

In this chapter conclusions are provided for each research question, before presenting issues for future research.

With the help of theories related to safety information systems and safety culture I have been able to analyse data collected through seven qualitative interviews and the facility's system management documents. Based upon my findings, the following conclusions can be made:

6.1 How is the safety information system implemented at the facility?

The facility's SIS is implemented and adapted to the multiple requirements given by global headquarters, Norwegian legislation, local customer demands and scope of activities. Thus, the SIS can be seen as a uniquely implemented system compared to the rest of the organization's facilities. The facility's SIS is characterized by three specific phases. First, the data collection phase primarily through means of reporting-blocks placed in the workshops where the operative personnel work. In addition, electronic reporting forms found on the facility's intranet that are sent on work e-mails to the HSE department. Second, data processing phase, including filtration and risk analysis of the collected reports in the electronic SAP system at the HSE department. Third, the distribution of processed information phase from the HSE department to the senior-supervisors in the workshops. This distribution happens through the SAP system. The senior supervisors function as decision-makers for their own units and need to find appropriate, corrective measures based upon the distributed information. Thus, measures can be implemented back to the workshops where the initial incident was reported.

The SIS function as a decision-makers tool that the different line-management at the facility depends on and use in the daily work. First, HSE engineers from the HSE department regularly collect reports so that risk-analysis can be conducted. Second the senior supervisors need an accurate as possible information to find appropriate, corrective measures that can be implemented in the workshops. Therefore, the SIS continuously runs to provide a status of the conditions in the workshops, forming the basis for decision-making and in next instance making it possibly to improve the safety level. Moreover, SIS provides a continuous feedback control mechanism: total

HSE-reports are regularly updated in the facility's Key Performance Indicators and compared to overall reporting objectives. Based upon an evaluation of these total HSE-statistics, counter-measures may be implemented to limit specific hazardous issues. If measures are implemented, the HSE department will over time monitor if they have any effect or not. Given that the measures do not provide the wanted effect, new measures must be implemented.

6.2 How organizational measures contribute to development of safety culture?

Several organizational measures directed at enhancing safety have been implemented by the facility. A majority of the safety measures were seen to contribute towards the development of safety culture's subcomponents of reporting and just culture. Monthly HSE meetings at the workshops enhance the operative personnel's ability to report properly. Safety delegates are understood and used as an informal reporting mechanism of HSE-matters in the daily work. In addition, regular campaigns help the operative personnel to interpret potential hazardous conditions that shall be reported. Moreover, campaigns have also over time managed to build a mutual trust between the management and operative personnel, which is essential for the development of just culture. This trust can be seen as a result of previous campaigns' focus on the stop policy, which has made the personnel comfortable enough to stop potential hazardous conditions and report them. The universal business driver of Safety, Quality, Cost, and Delivery (SQDC) is institutionalized as a measure of trust as well, since most informants sees safety (HSE) as the most important. Monthly HSE meetings also contribute positively to the learning culture, creating awareness and functioning as transfer of experience from incidents happening at other facilities.

However, some safety measures' contribution to safety culture is more negative, particularly seen in relation to the development of flexible culture. Safety and management inspections have the potential to include operative personnel's expertise, but at present the operative personnel feel that they are not asked enough about decisions related to equipment. In addition, the management inspections tend to lack an agenda and focusing too much on negative things happening in the workshops. The organizational alert system can contribute with transfer of experience within learning culture. However, to what degree distributed HSE-alerts from the system are actually practiced is more uncertain.

6.3 How does safety culture affects the performance of the safety information system?

Safety culture both facilitates and inhibits the SIS. The subcomponents of reporting and just culture particularly facilitate the data collection phase of the SIS. There is a low threshold for delivering reports and every informant acknowledged it. The operative personnel have no problem to include their names in the reports, since they know that the management do not have a wish to go after individuals. However, few informants also perceive the reporting forms as complex, causing inadequate reports. The operative personnel receive limited feedback from the HSE department, since the operative personnel lack training to read their reports in the SAP system. However, the HSE department is neither entitled nor has the resources to provide sufficient feedback. Another inhibiting factor that affects the HSE department, are the numerous of unclosed reports in the SIS (SAP system). At present, there is a strong belief that under-reporting happens within the facility. This may potentially inhibit all of the phases in the SIS and create potential hazards that the operative personnel may not be aware of in the workshops.

Just culture is closely related to reporting culture and can be seen as a contributing factor to the operative personnel's propensity to report. Mutual trust is established between the management and operative personnel. The management uses motivation and communication instead of reprisals, and there is openness and low threshold of bringing up concerns/suggestions. These together facilitate reporting and data collection in the SIS.

Flexible culture facilitates understanding and enhances accuracy of risk analysis conducted within the SIS. This is because the HSE department practice follow-up questions to the operative personnel/reporters on a regular basis. However, there are also inhibiting factors within flexible culture that affects the HSE department. There is need to use operative personnel's expertise more in cases when they possess the best knowledge.

Learning culture facilitates continuous awareness and monitoring of incoming reports at the HSE department. Therefore, the department will rapidly act upon reports (personnel injuries being first priority) so the senior supervisors in the workshops can in next instance implement corrective measures faster as well. However, there is

lacking transfer of experience between the workshops at the facility. This lacking transfer is seen as an inhibiting factor in the process of distributing information to senior supervisors in the SIS. There is need to make already implemented and functioning corrective measures available for other workshop units so they can be learned from.

Overall, the facility emphasizes and has established the four subcomponents of safety culture. These together provide a strong basis for effective performance of the SIS. However, if it is an effective system is more challenging to conclude with considering the multiple inhibiting factors that were identified. Continuous focus on the development of safety culture and addressing the inhibiting factors identified will undoubtedly lead to the improved performance of the SIS at the facility.

6.4 Issues for future research

This study has used empirical findings from qualitative interviews to analyse safety culture's role. An alternative approach in future research could be methodological triangulation. For instance, sending out questionnaires to most employees within a similar facility to identify a broader set of attitudes. Therefore, get a more holistic evaluation of facilitating and inhibiting factors to a SIS' performance. Another suggestion would be to examine flexible and learning culture to a larger degree than this study, and see if any additional factors influence the SIS. A formal assessment study of an implemented SIS' effectiveness in the oil and gas industry can also provide new knowledge. At last, it could be interesting to conduct comparative studies of both onshore and offshore safety cultures within the same organization and examine their affects on an implemented SIS.

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Appendix 1: Information letter

Reporting within a subsea organization:

A qualitative study of the safety information system's effectiveness

Background and purpose

I am currently a second year master student in Societal Safety at the University of Tromsø. This is my final thesis as a mean to graduate.

Internal reporting of health, safety, and environmental-matters into safety information systems (reporting systems) are acknowledged as essential parts of safety management systems across various industries. It is seen as a measure to systematically and continuously improve and prevent more hazardous events to develop: Through reporting of incidents, near-misses, unsafe conditions, accidents etc, its processing/analysis and further distribution to relevant decision-makers – all creating a foundation for corrective measures. However, such systems are also seen to have their challenges, and what is more diffuse is what characterises their effectiveness and can potentially impair this in the oil and gas industry.

The project will be based on a single case study of an organization belonging to this industry. By conducting this study I hope to get a better insight into how employees; both management and operative personnel perceive the system based upon how it is implemented and their experiences with it. This way, its potential weaknesses and strengths can be identified – contributing to further analysis if it is an effective system being used.

Interview:

The interview questions will be based upon the theme of the research project. The aim is to interview personnel at both a management- and operative level. Most of the interviews will be selected randomly at the latter one. It is preferable that the interviews are recorded on a Dictaphone, if the informants accept this. This is because it reduces the possibility of misinterpretation and enhances the reliability of the data collected. All information collected is considered a valuable input to this project, and there are no right or wrong answers.

What does participation in this study involve?

Participation in this study involves an interview with me, the researcher. The interview will approximately last between 30 minutes – 1 hour for operative personnel and 1,5 hour for management at a suitable and natural location within the organization.

What will happen with the information?

All personal information will be treated confidentially, where only my supervisor from the University and I will have access. The recordings of the interviews will be stored on a password-protected computer until they have been transcribed and deleted afterwards the final assessment of the project. The participants will not be recognizable in the final publication 1st of June 2015.

Voluntary participation

It is voluntary to participate in the study, and you may at any time withdraw your consent without giving any reason. If you withdraw, all the information about you will be deleted.

The contact information of the researcher:

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Appendix 2: Interview-guide management

Reporting within a subsea organization:

A qualitative study of the safety information system's effectiveness

Employees' background:

1. Experience?

In general:

2. Is reporting an important aspect of the organization's daily business, if yes/no why?
3. What kind of responsibilities has employees when it comes to reporting?
4. Do you personally report and, if yes/no why?

Safety management system:

5. How do you understand the concept of safety management?
6. What are the main components of your safety management system?

Safety information system:

7. When it comes to reporting, one can see a so called safety information system, as part of the safety management system. Where for instance unsafe conditions, accidents, near misses etc. are reported – so that information can be processed and further dispersed to relevant decision makers. How does this work within this organization?

Safety information system:

8. In your opinion what is an effective safety information (reporting) system?
9. Do you think the safety information system and its phases is understood and accepted by all employees including yourself. If yes/no, why?
10. Are there any reporting criteria? If yes, how do you think employees perceive these?
11. Do you experience any challenges regarding information that has been reported?
12. Do you feel that the reported information, covers the true safety conditions in the organization? Or do you think under-reporting occurs, and if yes, why?

13. Do you think some cases are more difficult to report than others, if, yes why and/or own examples?
14. Have you experienced that there can be too many reports as well, for instance where not everything is relevant?
15. How is it when it comes to availability, is the reported and processed information in the safety information system available at all time and for who?
16. Do you use some kind of safety indicators and performance goals? If yes, do you feel these work after their purpose?
17. In terms of resources (cost-efficiency), do you feel that the safety information system is a good option to reach safety-goals compared to other alternatives?
18. Do you use any measures to assess the safety information system's effectiveness from time to time?
19. Do you see any potential for improvement within this system?

Safety Culture:

20. Do you feel there is a shared understanding of what is important, how things work and the way things work regarding reporting and/or other safety matters?
21. Do you experience that there is a mutual established trust and two-way communication within the organization when safety-related matters arise?
22. Which rewards are used when rewarding good HSE-results?
23. Which reprisals are used if deficient or no-reporting occurs?
24. How does the organization use personnel's expertise and experience when safety-related issues arise or are being reported?
25. How does the organization use previous incidents, near-misses, accidents for future improvement and learning?

In the end:

Anything else you would like to add?

Appendix 3: Interview-guide operative personnel

Reporting within a subsea organization:

A qualitative study of the safety information system's effectiveness

Employees' background:

1. Experience?

In general:

2. Is reporting an important aspect of daily business, if yes/no why?
3. What kind of responsibility do you think you have when it comes to reporting?
4. Do you personally report, if yes/no why?

Reporting system

5. In your opinion what is an effective reporting system?
6. Do you feel that the reporting system and its phases is understood and accepted by all employees including yourself? If yes/no, why?
7. What do you think about the reporting process itself?
8. Are there any reporting criteria? If yes, how do you perceive these?
9. Do you experience any challenges when reporting information?
10. Do you feel that the reported information, covers the true safety conditions in the organization? Or do you think under-reporting occurs, and if yes, why?
11. Do you experience that some cases are more difficult to report than others, if, yes why, or own examples?
12. Have you experienced that there can be too many reports as well, for instance where not everything is relevant?
13. How is it when it comes to availability, is the reported and processed information available and easy to access for you?
14. Do you know about safety indicators and performance goals the organization uses? If yes, do you feel these works after their purpose?
15. In terms of resources (cost-efficiency), do you feel that the reporting system is a good option to reach safety-goals compared to other alternatives?

16. Do you see any potential for improvement within this system?

Safety Culture:

17. Do you feel there is a shared understanding of what is important, how things work and the way things work regarding reporting and/or other safety related matters?
18. Do you experience that there is a mutual established trust and two-way communication within the organization when safety-related matters arise?
19. Are rewards being used when good HSE-results are achieved?
20. Have you experienced reprisals being used if deficient or no- reporting occurs?
21. How does the organization uses personnel's expertise and experience when safety-related issues arises or are being reported?
22. Do you have any opinion/experience regarding reporting of previous incidents, near-misses, accidents:
 - For instance if this has had lead to certain corrective measures or nothing happened?

In the end:

Anything else you would like to add?