

Integrated Operations:
Change Management in the Norwegian Oil and Gas Industry

Tom Rosendahl,
BI Norwegian School of Management

Asbjørn Egir
Astra North, Norway

Lars Kristian Due Sørensen, Hans Jørgen Ulsund
BI Norwegian School of Management

This is the authors' final, accepted and refereed manuscript to the article published in
Beta, Vol 26, Iss.1, 2012, pp. 40 - 63

Copyright policy of *Universitetsforlaget*, the publisher of this journal:

Authors retain the right to publish the final author version of their article in the institutional repository of their university.

Integrated Operations: Change Management in the Norwegian Oil and Gas Industry

Tom Rosendahl

BI Norwegian Business School, Norway

Asbjørn Egir

Astra North, Norway

Lars Kristian Due-Sørensen

BI Norwegian Business School, Norway

Hans Jørgen Ulsund

BI Norwegian Business School, Norway

This paper investigates various factors that have been prominent in driving or restraining the implementation of Integrated Operations within the Norwegian oil industry – from a change management perspective. We have conducted a cross-sectional case study where data have been gathered from 15 in-depth interviews as well as relevant documents from actors in the industry. Findings reveal that multiple forces have affected the implementation of Integrated Operations to various extents. In this paper we will focus in three of them: Understanding the rationale of IO; Establishing support for change; and Technological solutions. As no study on trends in implementing Integrated Operations across companies on the Norwegian Continental Shelf has previously been conducted, findings based on data gathered across multiple organizations in the Norwegian oil industry should have a great potential to improve the future development and implementation of Integrated Operations.

Key words: Change Management, Integrated Operations, Resistance to Change, Employee Commitment

Purpose

The purpose of our study was to investigate how IO and its work processes have been implemented within organizations operating on the NCS. Different IO-related initiatives have been introduced in the industry over the past ten years, and, as a consequence, we wish to assess implementation during this period of time. To do so, we want to map the different driving and restraining forces effecting change. We look into the major IO initiatives undertaken within the industry, what the intended effects have been, and to what extent the overall implementation has been successful. To do so, we utilized a modified version of Kurt Lewin's Force field analysis (Buchanan & Huczynski 2010; Burns 2009; Cummings & Worley 2009; Green 2007). By combining this tool with the central aspects of IO implementation, we attempt to get an overview of how change has been managed. Further, by mapping these forces, we attempt to gain a deeper understanding of how IO-related initiatives have been implemented with regards to employee commitment and potential resistance to change, since these concepts have been shown to have a significant influence on the outcome of change (Buchanan & Huczynski 2010; Ford, Ford & D'Amelio 2008; Beer & Nohira 2000; Piderit 2000).

The oil industry's great significance for the Norwegian economy underlines the need for a study that assesses potential success criteria for the IO implementation (SSB.no a; b). Our research evaluates implementation across company boundaries, and we hope our findings will be of some value to the Norwegian oil industry as a whole. In a more general perspective, we also hope this study may contribute to the large base of change management literature since it involves research on employee commitment and resistance to change.

Brief Background

Since oil first was found and extracted on the Norwegian continental shelf (NCS) in the early 1970s, the industry has served as the main contributor to the rise of Norwegian economy and welfare. Numbers presented by Statistics Norway in 2009 stated that 47 000 persons were employed in the Norwegian oil and gas industry (SSB.no a). In addition, in 2010 the industry was attributed 22 % of Norway's total GDP, demonstrating its central position in the Norwegian economy (SSB.no b).

As with companies in any industry, the operators on the NCS compete for profits and competitive advantage. By the turn of the millennium, a new way of organizing work that is heavily based on utilization of new technology was introduced in the industry. By taking advantage of real-time data, multidisciplinary teams and increased decision accuracy, Integrated Operations (IO) was expected to enhance the effectiveness and efficiency of work processes in the sector (OLF 2007). However, since this is a new way of organizing work, there is a certain risk that issues will arise in relation to the implementation.

Integrated Operations

Integrated Operations is only one of multiple terms referring to the combination of people, technology, and work processes within the industry. Some related initiatives among suppliers and operators are referred to as Smart Operations (Petoro), eOperations (Hydro), Smart Fields (Shell), Field of the future (BP), Real Time Operations (Halliburton), Smart Wells (Schlumberger) and i-fields (Chevron) (Henriquez 2008). The term Integrated Operations has primarily been used in Statoil and OLF (The Norwegian Oil Industry Association), and today there seems to be a shared understanding of what it means within the industry. Consequently, we will use the term Integrated Operations (IO) when we refer to the new technology and related work processes throughout this article.

Within the petroleum industry, Integrated Operations (IO) basically refers to work processes that allow for a tighter integration of offshore and onshore personnel, as well as operator and service companies (Skarholt et al. 2009). This integration is made possible by modern information and communications technology (ICT), and high bandwidth fiber optic networks that allow real-time data sharing among remote locations (Gulbrandsøy et al. 2004). Experts from different disciplines can collaborate more closely, which facilitates a more rapid response and decision making (Rosendahl & Egir 2008). The Norwegian Ministry of Petroleum and Energy (St.meld no. 38) defines IO as: "Use of information technology to change work processes to achieve improved decisions, remote control of processes and equipment, and to relocate functions and personnel to a remote installation or an onshore facility."

The fundament from which IO has developed

The first attempts were by Superior Oil (Booth & Hebert 1989), which established drilling data centers, providing real-time log and "measurement while drilling" data to shore based teams (Wahlen et al. 2002). These early attempts of improving the procedures for critical drilling projects established the path for the future development of IO within the industry. The idea was based on multidisciplinary teams sharing information in a concurrent manner, using

high-tech instruments to ensure a sufficient flow of information. This way of working was expected to increase the cooperation between different fields of expertise, thus improving decision accuracy in addition to cutting costs.

In relation to the Norwegian oil industry, the first implementation of IO took place around the turn of the millennium. In 1997, Baker Hughes INTEQ started planning a project in cooperation with Norsk Hydro and BP, which was supposed to facilitate the relocation of people from offshore installations to an Operations Service Centre onshore. In 2000 the project launched with a center capable of supporting five offshore rigs simultaneously (Wahlen et al. 2002). ConocoPhillips went in the same direction, and developed an onshore drilling centre established at Tananger in 1999 (Herbert, Pedersen & Pedersen 2003).

Components of Integrated Operations

Today, most major companies in the Norwegian oil industry utilize what we refer to as IO initiatives, and the NCS is regarded by many as the world's most advanced basin in terms of developing such initiatives (Henriquez et al. 2008). The new IO work processes represent a parallel way of cooperating, which contrasts with the traditional, sequential way of performing work (OLF 2007). Various professionals with multidisciplinary backgrounds are now able to analyze real-time data in collaboration, speeding up decision making and corrective actions to optimize rig site production rapidly. In addition, such collaborations are no longer dependent on one physical location because the new technology allows for the onshore assembling of people with the needed competencies (Rosendahl & Egir 2008; OLF 2007).

One of the key components of IO is the establishment of onshore support centers, enabling companies to move work tasks from offshore platforms to land. As employees are moved onshore, the need for virtual communication and collaboration between sea and land emerges. Virtuality can be defined as activities between parties that are in different geographical locations (Gulbrandsøy et al. 2004). Accordingly, a virtual organization consists of people working toward a shared goal across space, time and organizational boundaries made possible by webs of communication technologies (Buchanan & Huczynski 2010; Gulbrandsøy et al. 2004). The technological capabilities are realized in so-called collaboration rooms. Such rooms facilitate cooperation by utilizing videoconferencing, sharing of large data sets and remote control and monitoring (Hepsø 2009; Henriquez et al. 2008; Rosendahl & Egir 2008; Herbert, Pedersen & Pedersen 2003; Ursem et al. 2003). These rooms contain large screens facilitating the sharing of data and allowing for real-time data transmissions between land and sea, vendors and suppliers, and other departments deemed important.

Why implement IO?

In general, the rationale behind implementing IO is based on the belief that it will streamline operations and increase effectiveness, thus leading to a competitive advantage and increased profits (OLF 2007). Based on the definition of IO which was offered initially, it is anticipated that the organization, by integrating its operations, will improve its decisions, both with respect to time and accuracy. Further, the fact that technology provides the opportunity to control offshore processes and equipment from onshore locations implies more effective operations. The ability to assemble important functions on an onshore location will also include a reduced need for offshore personnel. Already in 2003 a study by OLF on a drilling pilot project found that on some platforms, a reduction of up to 70 % in personnel had been achieved without reduction in safety (in Gulbrandsøy et al. 2004).

In addition to the positive implications for increased effectiveness, implementation of IO is expected to have beneficial effects on Health, Safety and Environmental issues (HSE) in the industry (OLF 2007). Greater continuity and integration of activities will enhance the

integration of management offshore and onshore, and potentially improve HSE issues. Offshore management can spend more time on operational issues and less on administrative tasks, while performing the planning and work preparation onshore will increase the long-term focus on each asset, increase safety and reduce the risk of environmental hazards (Grøtan & Albrechtsen 2008; Henriquez et al 2008; Ringstad & Andersen 2006).

In a 2007 report, the OLF estimated that if the oil and gas companies in the Norwegian shelf were to integrate their operations quickly, revenues from the shelf could be increased by approximately 300 billion NOK (OLF 2007). The estimate provides a good incentive for companies within the industry to rapidly implement IO in their organizations. It also displays some of the belief that IO represents the future for the oil industry, and that the first companies to adapt to this way of working will gain an advantage. In response to this, the different operators in the Norwegian oil industry have undertaken various initiatives to integrate their operations. For example, Statoil has shown great belief in IO as a part of its future, something that the CEO of Statoil, Helge Lund, emphasized at the Intelligent Energy conference in Amsterdam late in February 2008. “Statoil(Hydro) aims to be a global leader within integrated operations. This is one of three selected focus areas across the organization. Real-time competence sharing is necessary in a complex and demanding industry. It is all about integrated operations and people in seamless collaboration, independent of organization, time and place” (OLF 2008).

Issues in implementing IO

IO as a concept taps into technological issues in the oil industry, as well as issues related to the organization, its people, and its work processes (Rosendahl & Egir 2008; Ringstad & Andersen 2006; Herbert, Pedersen & Pedersen 2003; Ursem et al. 2003). To capture these different aspects of the organization, literature has proposed the concept of Man-Technology-Organization (MTO) (Andersson & Rollenhagen 2002). If IO-related work processes are to be successfully implemented, it will require considering all three aspects of this system perspective. Although it appears in retrospect that the implementation of IO on the NCS has been relatively successful, severe challenges were faced regarding the development of new work practices and the management of change – the combined integration of people, processes and technology (Rosendahl & Egir 2008; Hepsø 2006; Ringstad & Andersen 2006).

According to Hepsø (2006), there was an over-optimistic belief in IO at the turn of the millennium as to how easy it would be to implement and gain results from it. To explain the challenges faced in relation to people and processes in the implementation of IO, in the following we make use of the field – of – change management theory. The implementation of IO involves the restructuring of work processes and the management of employees, undoubtedly two of the cornerstones of change. Different factors can drive change forwards, while at the same time, other factors may hinder change. As a consequence, being able to successfully manage change is of the utmost importance.

Change Management Theory

In a constantly evolving world, the need for organizations to anticipate change and reconfigure themselves is more important than ever (Lawler & Worley 2009). Buchanan & Huczynski (2010) propose that the evolving cycle of repeated change can be explained by three basic factors. First is the intense competition and stock market turbulence in the private sector along with consumerism and government pressure in the public sector. Second, the pace of technological innovations plays a major part, and third, increased knowledge-intensity, as organization design affects information flows. Beer and Nohria (2000) estimate that about two-thirds of change projects fail, a fact supported by Whittington and Mayer's (2002) research claiming that outcomes of major organizational change often are

disappointing. Evidently, to achieve successful change in an organization, there will be a fundamental need to devote sufficient attention to the management of change. We will, in the following, go through what we consider to be some of the most important literature in regards to the implementation of IO within organizations operating on the NCS.

Commitment to change

One of the most essential aspects related to successful change is the establishment of employee commitment (Buchanan & Huczynski 2010; Cummings & Worley 2009; Beer & Nohira 2000). Commitment is often described as an employee's attachment to an organization, but this association might also have other referents such as an organizational subunit, a supervisor, or even a particular program or event, for example, a change occurring within the organization (Herscovitch & Meyer 2002). For example, Fedor, Caldwell & Herold (2006) found evidence to suggest that the favorableness of an organizational change is positively related to perceptions of both change and organizational commitment. In other words it might be useful to distinguish between commitment toward the organization as a whole, and the change process itself.

Establishing commitment to the change process is imperative for an organization to harness the expected benefits of a change initiative. Such commitment can, in many ways, be defined as the willingness to exert effort on behalf of the change (Fedor, Caldwell, & Herold 2006). In addition, it is vital to separate commitment to change from mere compliance, since the long-term benefits occur when employees actively work to engender change and maintain or enhance their alignment with the organization's values and goals (Fedor, Caldwell & Herold 2006; Beer & Nohira 2000). Thus, when employees act on compliance and simply do as they are commanded, there will be a motivation deficit over time that might impair the effects of change. Employee commitment is important for organizations to take into account in order to manage change effectively. But how is such commitment established? In the following we review some theoretical concepts that are central in ensuring dedication and effort towards the implementation of change initiatives.

Employee involvement

According to Cummings & Worley (2009), employee involvement generally seeks to "increase members' input into decisions that affect organization performance and employee well-being" (p. 351). In a change-related context, Buchanan & Huczynski (2010) suggest that those who are being affected by the change should be involved in the planning and implementation of new initiatives to reduce opposition and ignite commitment. To gain and maintain such involvement is a continuous process that stretches over the lifetime of the change project. Beer, Eisenstat & Spector (1990) underline that even though members of top management often understand that there is a need for establishing employee commitment and involvement, they seldom realize that changing employee behavior takes more than introducing new formal structures and systems in the organization. In their study, they found that the greatest obstacle of organizational revitalization is that it comes about through companywide change programs. To achieve successful change, they claim that initiatives must develop from lower levels of the organization through the active involvement of employees focusing on how to solve actual work-related problems (Beer, Eisenstat & Spector 1990).

This quest for achieving successful change through employee involvement can be traced back to a more fundamental issue within change management theory. Should change be implemented from the top, or should it evolve from the bottom and move upward? In Beer & Nohria discuss these two seemingly contrasting perspectives in their book *Breaking the Code of Change* (2000). Conger (2000) speaks for a top-down approach to change, since senior

managers are in the best position to plan and coordinate organizational change. After all, top management possesses the advantage of breadth of perspective of the organization. However, Bennis (2000) claims that successful change only can occur by having willing and committed employees. Since top management is unable to fully understand the complexity of operational tasks in the different units, organizational change is not possible without the inclusion, initiative, and cooperation of the employees. As Beer & Nohria (2000) conclude, both approaches must be taken into account to achieve change successfully. Employee involvement and participation are both required to assist in the planning of change, as well as in the execution (Beer & Nohria 2000; Dunphy 2000).

Resistance to change

The human side of implementing the different aspects of IO can be a major challenge, since it affects the work situation of many of the employees in the organization. When confronted with a change, humans normally react in one of three possible ways regarding how to comprehend the change: by acceptance, by ambiguity, or by resistance (Ford, Ford & D'Amelio 2008). Therefore, when a company is undergoing change, it must be aware of the fact that some employees might resist. In fact, employee resistance has been cited as the main factor that derails change initiatives (Regar et al. 1994; Kotter 1995). Kurt Lewin defines resistance to change as “a restraining force moving in the direction of status quo” (Piderit 2000, p. 784) and it might be conceptualized as a cognitive state, an emotional state or as a behavior. We believe this could be an area likely to slow the implementation of IO and make it more difficult than first proposed by the OLF, constituting in consequence, a powerful restraining force to change.

Reasons for resistance

Since resistance to change can have such a detrimental effect, we will try to shed some light on the possible sources of this resistance. Because the concept is complex, it can be observed in various ways. Yukl (2010) describes some important, not mutually exclusive, reasons for resistance, and we will include in our analysis the four we perceive to be most applicable to the case in the Norwegian oil industry.

1) Belief that change is unnecessary. If the organization has been successful, and there is no visible trouble on the horizon, resistance is more likely to occur when change is introduced. Even when a problem is recognized, people usually confront it by trying to adjust previous strategies or to do more of the existing routines, instead of changing. The belief that change is unnecessary might be an issue in an industry – like the oil and gas industry – where profits are high and business is generally going well (SSB.no c).

2) Economic threats. Employees might fear that they will suffer personal loss of income, benefits and job security as a consequence of organizational change. Thus, economic threats might increase resistance, especially in situations where employees have painful experiences of downsizing and layoffs in the past. As IO brings about rationalization within the organizations, leading to a reduced need for off-shore staff, this source of resistance might be particularly relevant in our case.

3) Loss of status and power. Since changes often imply a shift in power and status for some teams or individuals, employees holding positions that most likely will be affected negatively might be more prone to oppose the change. In relation to IO, experts working in multidisciplinary teams might experience an increase in status and power, while those who stay put in their ordinary positions might experience a similar decrease.

4) Resentment of interference. Some employees simply do not like to feel controlled by others, and attempts at changing their job situation are likely to cause resistance. IO will for

some involve significant changes in their everyday work processes, and this might provoke a sense of being restricted.

Overcoming resistance to change

Cummings and Worley (2009) describe three major strategies for dealing with resistance to change. First is the notion of empathy and support. By being able to see the situation from another perspective and thus learn why people are resisting the change, it is possible to convince employees of its usefulness. Second, it is very important to have a high focus on effective communication, and always keep the employees informed about forthcoming changes and the likely result. Because of the vast amount of information already coming through existing channels, it is vital to deliver the information regarding change through new or different channels. The third, and maybe the strongest strategy, is using participation and involvement of the employees in the planning and implementation of change. This increases the likelihood of employees' interests and needs being accounted for, which will help raise commitment, because doing so will suit their interests and meet their needs (Cummings and Worley 2009).

Resistance to change – an asset?

While resistance to change can have damaging effects on the outcome of change, some research is challenging the idea that resistance merely should be regarded as an obstacle that needs to be eliminated. Piderit (2000) suggests that researchers have ignored the potential positive intentions that may motivate negative responses to change, and that a strategy of fostering ambivalence and resistance in the early stages of a change initiative actually can be fruitful to see the change process from different angles. The problem is, however, that managers often perceive resistance as purely negative, and that employees who resist change are seen as disobedient (Piderit 2000).

Ford, Ford & D'Amelio (2008) are concerned with the same issue in their study on alternative ways of perceiving resistance to change. They point to the fact that resistance to organizational change seldom is presented as a product of rational, coherent objectives and strategies, even though resistance to persuasion has been found to come as a result of thoughtful consideration (Ford, Ford & D'Amelio 2008). In addition, resistance to change is almost never portrayed as a potential contributor to effective change, even though authentic dissent has been shown to be useful in other areas of management. Thus, the authors propose that resistance to change actually might be utilized as an asset for organizations going through change (Ford, Ford & D'Amelio 2008). Since what is referred to as resistance to change is very common, and perhaps even inevitable, there is a need for organizations to address this issue the right way. Knowles & Linn (2004) support the arguments above and propose that if an organization can use resistance in a productive way, it might create value for the existence, engagement and strength of the change, and thus act as a resource instead of a restraint to change.

Now, how should organizations go about utilizing resistance as a resource for achieving successful change? First, Ford, Ford & D'Amelio (2008) propose that resistance might be utilized in keeping the conversation about change in existence, since it ignites debate and creates awareness. In this way, the idea of change will gradually take root within the organization. Second, resistance might be valuable in that it represents a possible form of engagement (Piderit 2000). Thus, in some cases, resistance may reflect a higher level of commitment than does mere acceptance. Third, since resistance is a form of conflict, and conflicts have been shown to improve the quality of decisions (Ford, Ford & D'Amelio 2008), resistance could actually improve the quality of change. By involving conflicting thoughts and ideas in the planning of change, different perspectives will shed light on which might bring

about a better final outcome. Further, as Piderit (2000) suggests, managers and change agents should utilize a new conceptualization of employee ambivalence to change, focusing on at least three multidimensional attitudes (emotional, cognitive and intentional). This will break down the traditional, simplified perception of resistance, and provide for a better understanding of employees' feelings, thoughts and intentions towards change.

The Force Field Analysis

As mentioned earlier, Kurt Lewin defined resistance to change as “a restraining force moving in the direction of *status quo*” (Piderit 2000, p. 784). According to Lewin, the nature and pace of change depend on the balance between the driving and restraining forces within a field. A field's progression is never static, Lewin claimed, but always in a continuous state of adaptation (Burnes 2009). Therefore he used the term quasi-stationary equilibrium to indicate that “whilst there might be a rhythm and pattern to the behavior and processes of a group, these tended to fluctuate constantly owing to changes in the forces or circumstances that impinge on the group” (Burnes 2004, p. 981). A technique for assessing the balance of the mentioned factors that push or movement toward or hold it back from the desired target situation was developed and named the Force Field Analysis (Buchanan & Huczynski 2010; Burns 2009; Cummings & Worley 2009; Green 2007). The rationale behind it is basically to identify all forces within a field (organization or group) that will effect change to some extent.

As part of the analysis in this article, we will utilize a slightly modified version of the Force Field Analysis, where we – based on the empirical evidence gathered – map the most important driving and restraining factors in the implementation of IO in the Norwegian oil industry. In order to do so we need to clarify some of the assumptions on which this analytical tool is based.

Modifications

Following Ford, Ford & D'Amelio (2008) , we believe that resistance to change is a natural human reaction that does not necessarily impair the progression of planned change in an organization. Rather, resistance should be seen as a phenomenon that refines the organization's new way of doing things. Accordingly, it is necessary for us to make certain modifications to Lewin's original Force Field Analysis. First, we would like to clarify that we do not expect forces to exclusively drive or restrain overall change. A force can be multidimensional in that it affects an organization in different ways; it can, for example, drive change in terms of speed/time while restraining change in terms of lack in quality. Second, in order to make our analysis more comprehensible, we divide the force field into three dimensions based on the concept of Man-Technology-Organization (MTO), as presented by Andersson & Rollenhagen (2002). This will allow us to consider the different aspects of change in relation to the driving and restraining forces. Third, Lewin originally developed this analysis for use in individual, group, or organizational settings (Cummings & Worley 2009). In our research we apply the tool when we investigate multiple organizations in the Norwegian oil industry.

Methodology

The purpose of our study is to investigate how IO and its work processes have been implemented within organizations operating on the NCS. As previously mentioned, the different IO-related initiatives have occurred gradually over the past ten years, and, as a consequence, we wish to assess the implementation during this period of time. To do so, we identify the different driving and restraining forces affecting change. We look into the specific IO initiatives undertaken by the industry, their intended effects, and level of implementation success. The aim of this study is to answer the following research question:

How has Integrated Operations been implemented within the Norwegian oil industry, and what factors have been prominent in driving or restraining the implementation?

Further, in mapping these forces we attempt to gain a deeper understanding of how IO-related initiatives have been implemented with regard to employee commitment and potential resistance to change. To investigate the phenomena of IO implementation and change management, we utilize a qualitative methodological approach, since it allows us to assess “the meanings, concepts, definitions, characteristics, metaphors, symbols and descriptions of things” (Berg 2009, p. 3).

Research design

To investigate our research question, we conducted a case study and we utilized what is referred to as a single-case design. This basically means that a single case is used to address the research question (Yin 2009). In order to strengthen our findings, we gathered data from multiple organizations operating on the NCS. This is referred to as a cross-sectional design (or embedded case study), implying that our focus is on a sample of events rather than a specific situation (Yin 2009; Bryman & Bell 2011). The fact that we have conducted our study in multiple organizations allows us to compare and contrast the findings across different organizations. This provides us with the opportunity to map out trends and consider those factors that are common for the entire industry (Berg 2009).

Sources of evidence

Based on Yin (2009), we prioritized three important sources of evidence – interviews, archival records and documentation to achieve what Bryman and Bell (2011) refer to as triangulation. These sources have their strengths and weaknesses, and should therefore be viewed as complementary. The goal of our interviews was to extract a coherent explanation, while acknowledging that each of the participants might have their own way of understanding the phenomenon, and hence their own explanation (Rubin & Rubin 2005). To achieve quality and accuracy during our interviews, we utilized a semi-structured interview (Bryman and Bell 2011).

Sample

We conducted our research in some of the largest companies operating in the Norwegian oil industry, namely Statoil, ConocoPhillips, BP, Shell and Halliburton. We also interviewed people representing OLF, Petoro and different labor unions. In order to conduct our in-depth, expert interviews, we required contact with people with extensive experience of IO and its implementation. It was important for us to gain insight into both the leader/change agent perspective, as well as the employee perceptions. Thus, we made sure that both viewpoints were taken into consideration when selecting respondents for our study. This gave us a deeper insight into the different layers within each organization. We felt that perceptions might differ between senior top management figures and lower level employees.

Pilot: In-depth interview

By performing a pilot test, we had an opportunity to refine the structure and content of our interview guide and, according to Bryman & Bell (2011), helped us ensure that the interview questions were satisfactory and the research instrument, as a whole, functioned properly. To capture different dimensions of the IO implementation, we choose to use Kotter’s 8-stage model as assistance in structuring our interview questions (Kotter 1996). The

model is widely recognized for explaining crucial aspects of large-scale change (Buchanan & Huczynski 2010; Burns 2009; Cummings & Worley 2009).

Scientific Value

We took particular care to establish construct validity, external validity, and reliability of our study. In relation to construct validity we 1) used several sources of evidence; 2) structured the study based on a logical progression; and 3) had a key informant review the case study report (Yin 2009). To ensure external validity of our study, we attempted to interview experts from a wide selection of the most important operators in the industry. The rationale was that broad and equal inclusion would allow our findings to say something about the industry as a whole (Yin 2009). As the respondent list indicates, we paid more attention to one of the organizations, Statoil, since it is the operator in charge of about 60 % of the total production on the Norwegian Continental Shelf (Henriquez 2008). To ensure the reliability of our study, we kept detailed records of our own progression, documenting when, how, and from whom data were gathered. In addition, we recorded and stored all of our interviews, and kept the data files so we could go back at any time if something proved unclear (Yin 2009).

Analysis

The following analysis is based on about 50 000 words of transcribed interviews with 15 respondents, as well as relevant documents gathered from within the industry. The analytical structure is informed by the driving and restraining forces we discovered in our force field analysis. In the following analysis, the different forces we identified are written in italics. We present three bulks of factors that we found most important. In addition to these we also found evidence to suggest the following relevant bulks of factors related to the implementation of IO: Experimentation and local creativity; Stakeholder involvement; Collaboration rooms; Training; and Communication.

Understanding the rationale of change

As described earlier in this paper, the Norwegian oil industry is a lucrative and profitable undertaking (SSB.no c). The implementation of IO-related initiatives has had the purpose of ensuring this profitability by increasing the effectiveness, production and safety in the industry (OLF 2008). Intuitively, we would assume that organizations operating on the NCS might face challenges in establishing an understanding for the implementation of new work processes – after all, the previous ways of performing work was apparently working well. So, did managers feel a particular need to encourage a sense for urgency in employees, and convince of the value of embracing IO? Our respondents unanimously reported that that the vast majority of employees in the different organizations understood the need for IO and accepted the rationale behind change. First of all, there seemed to be a common understanding of the purpose/rationale for change. The fact that IO-related work processes actually helped make the involved people's working day less complicated created a desire to take part in the development. Perceiving the implementation of IO as a “win-win” situation seemed to motivate employees while building commitment and even enthusiasm.

Second, organizations that were perceived by our respondents to be permeated by a “there is always room for improvement” mentality experienced less employee resistance in the implementation of IO. When the organizational culture was characterized by a high degree of openness to change, new initiatives were met with less negativity and skepticism. This is what Holt et al. (2007 a) refer to as “readiness for organizational change” – where readiness arguably is considered one of the most important factors involved in the employees' initial support for change initiatives. Based on the data gathered in our interviews, we found an organizational culture embracing change to be an important driver for large-scale

implementation of IO within the Norwegian oil industry. This implementation can be defined as a continuous change process that has been evolving over the past 10 years (Beer & Nohria 2000). The initial visions were somewhat “hairy” since no organization knew precisely where the development was headed. In retrospect, our respondents informed us, the path appeared as they walked it; erecting long-term goals for the IO implementation plan was perceived as impractical.

Thus, developing a vision for IO that made sure the organization moved in one direction and allowed for gradual adjustments has been an important driver for implementing IO. A clear vision also assists in establishing a shared understanding of purpose, as described in the section above.

Even though the implementation of IO as a whole can be seen as a continuous change process, it does consist of multiple cycles of episodic initiatives. We found that for each and every IO initiative there was a profound need to develop of specific, short-term goals. Our interviewees reported that such specific goal setting had only been completed to a varying extent within the industry, depending on the organization. While some were eager to for their initiatives to achieve specific ends, others applied a more loosely planned approach. There was, however, consensus among our respondents of the importance of establishing tangible goals and having a thorough evaluation of the initiatives. To evaluate the effect, there is a need to measure the effect of IO initiatives. Such measurement can be performed in relation to a vast array of parameters, the most usual being significant KPIs (Key Performance Indicators), operational uptime offshore, production volume, as well as financial results. In addition, IO has, to some extent, been used as one of the criteria on which leaders are evaluated. The measurement of different initiatives can function as a driver for change as it documents the (potential) effectiveness of IO activities. Such results can be used in convincing various stakeholders of the value of IO.

When short-term goals were visualized and reached, our respondents agreed on the driving effect of celebrating the short-term wins. Collecting the “low-hanging fruits” along the way contributed to keeping momentum during implementation, signaling to employees that the change was headed in the right direction, and increasing the likelihood of eventually reaching the vision’s objectives.

Establishing support for change

Our respondents were pretty clear on the importance of establishing a guiding team or coalition. These teams could consist of leaders at different levels, hired professional change agents and coaches, experts in the areas involved and other key personnel deemed important to the change. The main responsibility of the team is to guide and support the implementation process and make sure changes were supported and carried out by employees. For the IO initiatives to be implemented successfully, comprehensive support from the senior management was absolutely indispensable. By wholeheartedly showing its belief in change, providing the required resources and being active participants in the process, senior management can demonstrate the importance of the change initiatives (Burns 2009; Kotter & Cohen 2002; Kotter 1996). In this manner, employees might get the feeling of the actual worth and significance the organization places on IO, and, in consequence, feel more inclined to commit to change.

Some of our respondents also highlighted the importance of identifying individuals who strongly support or object to change, and then utilizing positive, key personnel in driving change. When employees were presented with co-workers who strongly supported the IO initiatives and were able to understand the motivation behind their support, it acted as a strong driver for overall change. On the other hand, in cases without enthusiastic key personnel, enthusiasm and engagement were often weakened and IO implementation restrained. In these

situations the guiding coalition could attempt to find and change the skeptics. Our respondents reported that skeptics that were given attention and persuaded to change their views often became some of the most positive supporters of change, encouraging their co-workers to follow them. The fact that the skeptics were convinced after having been provided with informational evidence sent a powerful message to others that the change initiatives should be embraced by everyone.

Further, most of our respondents brought up the general mechanisms residing in human nature, explaining why change could prompt restraining effects due to the increased sense of uncertainty and fear among employees. Employees going through work-related change might develop a fear of change in routines/status, or even of becoming redundant and losing their jobs (Buchanan & Huczynski 2010; Burns 2009; Cummings & Worley 2009). We found that some of the offshore personnel felt, and still feel, that IO-related changes could threaten their job. The fact that the offshore installations, to an increasing extent, can be remotely operated and controlled by people onshore may create perceptions that positions offshore belong to the past rather than the future.

Additionally, since some employees were moved from offshore installations to onshore working environments, some of the remaining offshore employees started worrying. As with their colleagues, a lot of decision-making responsibilities had to be reorganized, to some extent creating a sense of insignificance among remaining personnel due to a reduction in decision making power offshore. In many instances this has meant that prior to making a decision, an offshore worker would need to consult with operations center onshore. This increased level of bureaucracy could have created negative feelings among the offshore employees affecting both their motivation to partake in the changes, as well as their general job satisfaction. Related to this comes the negative effects of loss of status. Since more and more decisions are being made onshore, some of our respondents reported a drop in perceived job importance, and thus status, among offshore personnel. Without proper management and focus, these negative aspects can damage the IO implementation process – as well as normal operations.

Employee involvement in planning is generally shown to have a positive effect on employee commitment (Buchanan & Huczynski 2010; Burnes 2009; Beer & Nohira 2000). In conducting our research, our respondents were generally aware of the necessity of involving employees in planning, execution and evaluation of the IO implementation process. This shared concern was based on their experiences of varying degrees of employee involvement in the respective organizations. In organizations with low employee involvement, we learned that commitment to change was replaced by mere compliance, and motivation was reported to be low. In the large bureaucratic organizations, IO activities functioned as standardized corporate initiatives. In accordance with change management theory, we learned from respondents that when employees perceived decision making and planning to be too heavily biased toward senior management, they felt no longer part of the change process; their competence and know-how were not utilized in the optimal way. This could create a sense of indifference which could undermine the implementation outcome. On the other hand, in organizations with high employee involvement, we found that commitment and motivation were high. Another interesting finding was that some of our respondents claimed better quality in the actual implementation process in cases where employees had been involved in the planning. In other words, the inclusion of employees is a valuable source of input in the development of new IO solutions.

Technological solutions

As is quite evident from the description of what IO is and how it affects the working environment of the employees, the technological aspect is an important one. Well-developed

network capabilities are provided by fiber-optic cables on the seabed, allowing for continuous streaming of data between the offshore and onshore installations. By studying what IO really constitutes, it is not difficult to understand that these network capabilities form the foundation on which IO is built, and our respondents recognized this fact. Real-time transmission of data, remote control of installations and communication across locations would not be possible without these technological capabilities. Communicating across locations in an IO manner also demands the use of cameras, projectors, high definition television screens and screen sharing – all facilitating people’s work and cooperation without even having to be in the same location.

Moreover, a comprehensible user interface on the technical solutions is essential in facilitating the transition of employees in using IO technology in day-to-day working activities. If solutions are too complicated, our respondents told us, it confused the less experienced users. Technological complexity acted, on a similar note, to slow the implementation process. In addition, technological dependence – the fact that one is dependent on technology in order to perform one’s work – was another restraining force in the implementation process. Whenever a breakdown or technical malfunction occurred, it generated a lot of resentment and anger since there were no other ways of performing the tasks. The respondents pointed to the significance of proper support and maintenance mechanisms to make sure that the technology worked as it was supposed to. This point also highlights the importance for organizations’ provision of proper training for employees in the use of new technologies.

Some of our respondents reflected on an initial sense of overconfidence in new technology, particularly among engineers in the initial phases of IO development. IO planning and visions might have concentrated over much on the technological possibilities, neglecting – or at least not paying enough attention to – the human aspect of implementing new work processes. Some thought this overconfidence might have had a restraining effect on the implementation process.

Discussion

In the following we discuss our main findings in relation to theory. We start off by discussing two of the most essential issues of this article, namely resistance to change and employee commitment. Further, a shared understanding of the need for change and the maintenance of the different aspects of the MTO framework will be reviewed. The discussion ends with an outlook on the future development of IO.

Resistance to change?

Resistance to change is natural, and when change occurs it is in our human nature to want to stick to the past and preserve the *status quo* (Buchanan & Huczynski 2010; Burns 2009; Cummings & Worley 2009). Employee resistance to change should consequently count as a vital issue for managers and change agents presenting a new order of things. According to Ford, Ford & D’Amelio (2008), change agents have traditionally seen resistance as an obstacle that must be eliminated to achieve change successfully. By removing resistance, or the sources of resistance, the implementation of new programs, structures, systems, etc. is often assumed to progress more seamlessly (Ford, Ford & D’Amelio 2008). However, is it necessarily so that eliminating contrasting views will lead to the best results in a change process? By reviewing theory as well as the data gathered in this study, it is evident to us that rather than merely removing resistance to change, resistance should be utilized at all stages of implementation (Ford, Ford & D’Amelio 2008; Knowles & Linn 2004; Piderit 2000).

By including different perspectives and listening to different voices, we believe the quality of the change process can be enhanced. In much the same way as giving someone the

role of “devil’s advocate” on a team (Nemeth 1986) or actively searching disconfirmatory evidence in decision making (Kray & Galinsky 2003), we propose utilizing resistance to change as a way of getting multiple sources of input involved in the change process. Further, Ford, Ford & D’Amelio (2008) emphasize the danger of labeling resistance as something negative, since negative connotations might give employees the feeling of being perceived as disobedient by management. If employees feel their behavior is undesirable and are expected to be negative to change, it might become a self-fulfilling prophecy (Ford, Ford & D’Amelio 2008). By addressing these issues, it should be possible to understand of the entire process better, and improve in consequence the final result of the initiative to change.

The question is: How can managers in the Norwegian oil industry go about utilizing resistance to change as a positive input? We believe the involvement of employees in both planning and execution of IO-related initiatives is the best way to capitalize on potential resistance. Not only should employees be allowed to participate, but their thoughts and opinions should be taken into consideration. Burnes (2009) suggests two main activities to help establish and maintain high employee involvement in change procedures – communication and the process of getting people involved. Regular and effective communication processes reduce change-related uncertainty among employees, it is suggested, and ensure sufficient information about the change. Burnes (2009) further urges organizations to involve members and make them responsible for the process, instead of approaching them as objects, or even obstacles, to change. There are, of course, practical limitations to the extent to which employees can be involved in planning and execution. Thus, it is important to identify and engage those whose assistance is necessary and those who are crucial to making the change happen.

Considering our case, organizations operating on the NCS, it is difficult to say how far employees have been involved in the planning and execution of IO-related initiatives. More specifically, while there has been a high degree of involvement, we question the extent to which employees’ contributions have actually been taken into account. Among the change managers and agents, there is a shared perception that employees were involved from day one. From the union representatives, on the other hand, we learned that lower level employees felt partly sidelined in that their thoughts and ideas were not given a hearing. In general, when employees are sufficiently involved, it will facilitate a high degree of commitment to change (Buchanan & Huczynski 2010; Burnes 2009; Beer & Nohira 2000). This does not mean that change is impossible without employee involvement, but commitment might, in these cases, be replaced by mere compliance – creating an unenthusiastic “do as you are told” state of mind.

Understanding the need for change

As presented initially in this article, the companies operating on the NCS take part in a lucrative industry where profits are high and operations have been successful (SSB.no c). Thus, prior to our research, we intuitively assumed that the organizations would have faced problems in establishing a sense of urgency – a shared understanding of the need for change – among the employees. After all, why change a winning formula? As we interviewed our respondents, there seemed to emerge a mutual understanding, both among managers as well as employees, of the necessity for implementing IO-related initiatives. There are multiple factors we believe can explain this widespread acceptance of change.

First, visualizing and explaining that IO brings about a more effective way of performing work for the employees were instrumental in creating a broadly shared sense of acceptance. Second, there was a focus on providing sufficient information about the specifics of IO and its implementation. Such information flows were enabled by good communication procedures. Third, we believe a high degree of organizational readiness for change moderated

the need for establishing a sense of urgency, since such a culture is characterized by openness to new ideas. Fourth, we found that many of the managers utilized theoretical change management concepts such as, for example, the theories of John P. Kotter (1996). Finally, the implementation of IO is a continuous change process consisting of multiple episodic change initiatives. This gradual development helps to establish a common understanding of the rationale behind change.

Man – Technology – Organization

Despite the fact that no specific long-term goals were set for the implementation of IO, our respondents expected the adoption of IO principles to have come further than it has today. Also, OLF had more optimistic expectations than what have been realized (OLF 2007). The question is then why implementation has progressed slower than expected. To answer this question, we need to look at the initial aspirations people entertained on behalf of IO. The new ICT systems introduced in the industry at the turn of the millennium yielded enormous opportunities, and the engineers that were involved in the initial planning of IO might have displayed overconfidence in the effects of the technological possibilities (OLF 2007). This created a focus on the T aspect that might have been at the expense of the “softer” M and O perspectives. If it is true that the human and organizational dimensions have not been given sufficient attention, this might be one of the reasons why the implementation is slower than expected.

The high level of change management-focus within the industry today might be seen as evidence that the M and O aspects were, to some extent, undermined in the initial phase of implementation. This is supported by our respondents and industry-related documents. Successful implementation of IO is seemingly related to an equal interplay of all three dimensions of MTO (Rosendahl & Egir 2008; OLF 2007; Hepsø 2006; Ringstad & Andersen 2006).

Future development of IO

As OLF started working on issues related to IO, they divided it into two different stages, or “generations.” Generation one was integration of onshore and offshore installations and was expected to take place between 2005 and 2010 (Brochure Integrated Operations). It was facilitated by the development of operation centers onshore able to interact with the offshore installations. The organizations would become more efficient because of greater competence and improved decision-making accuracy. The second generation of implementation is somewhat vaguely defined in terms of time perspective, starting in 2010 but with no specific end date. This stage of IO implementation will be more of an ongoing process that involves the integration of operators and supplier/vendor companies, using automation to transform the offshore installations into more intelligent facilities. Including so-called third parties in normal operations will allow for higher skills and faster decision making, since a larger number of relevant stakeholders will be involved. The Norwegian oil industry has already begun to integrate suppliers, and the trend will continue over the following years.

Further, as the NCS relies increasingly on technology and automation, the second generation of IO will have to involve a better integration of data from different systems (OLF 2008). Operation centers are monitoring a vast array of sensors and parameters on the offshore platforms, and different installations are using different technological systems from different manufacturers and time periods (TU.no b). This is of great concern with regards to interpreting the diversity data and there is a need for systems capable of converting the data into understandable information. This is a challenge that will require considerable effort.

Practical implications

The findings we have presented in this article have various practical implications for managers, change agents and organizations – not only within the oil industry, but also for managing large-scale change in other industries. First, the specific forces we discovered through our analysis should be of particular interest to companies operating on the NCS. Since data were gathered across multiple organizations in the industry, there should be a great potential for valuable learning by reviewing the experiences of the industry as a whole. Second, companies in the Norwegian oil industry are leading the development of IO on a world basis (Henriquez et al. 2008). Thus, the driving and restraining forces affecting change here should be very useful for other oil industries where the implementation of IO is at an earlier stage.

Further, we believe our findings have implications for major change processes in other industries as well. Increasing globalization of business has led to more and more organizations having departmental units in different geographical locations in order to gain a competitive edge (Buchanan & Huczynski 2010). As the different units of an organization are positioned in distant locations, a new and somewhat different demand for communication emerges that, for example, might include a more virtual structuring (Buchanan & Huczynski 2010). Thus, we assume that many companies would benefit greatly from making use of high-tech ICT systems in order to collaborate effectively across physical boundaries. The findings we have presented that are related to communication and use of information technology should be particularly relevant in overcoming the challenges of such an operation.

Finally, many of our findings speak to change management practices on a more general level. Overcoming what have seen referred to as ‘resistance to change’ has been shown to be a more complex process than many might intuitively think, and there is a need for organizations to define and approach resistance in a sophisticated manner. Also, the establishment of employee commitment to change is indeed a multifaceted process that organizations will have to pay closer attention to – regardless of the type of industry.

Concluding remarks

A few limitations associated with our study should be noted and discussed. First and foremost, as with most qualitative case studies, there are challenges related to the operationalization of the specific concepts (Yin 2009). The challenge of developing an operational set of measures might easily lead to subjective judgments impairing the construct validity of the study (Yin 2009). Second, the wide scope of the study might be seen as a limitation since not all of the specific concepts are defined and investigated in a sufficiently thorough manner. However, it has been the aim of this study from the beginning to map the different driving and restraining forces in the implementation of IO, and this task necessarily demanded a certain breadth of perspective. We nonetheless acknowledge that the width of scope has come at the expense of detail.

Third, the fact that IO-related initiatives have been implemented over a longer period of time speaks to the appropriateness of a longitudinal study. To measure a continuous change process based on interviews conducted at a specific moment in time might have limitations with regard to the respondents’ ability to correctly reflect the past. The documents we have utilized as an additional source of evidence have, to some extent, helped us allay some of this weakness, since they were written over different time periods. Finally, questions can be asked whether the findings of our research are applicable to a larger population –in our case, the organizations operating on the NCS. We have attempted to ensure generalisability by including respondents from different organizations, and we believe this has increased the external validity of this study. However, research on change management has a general lack of consistency in explaining why so many change efforts fail, and thus we are cautious in

claiming validity and generalisability for our findings. In addition it should be mentioned that there are potential short-comings related to Kotter's model of change. Critique centers around the possible oversimplification of step-by-step recipes (Langley & Denis 2006) as well as the neglect of organizational cultures' importance (Bate, Kahn & Pye 2000). We personally perceive Kotter's model to be based on a somewhat mechanical foundation, assuming that employee behavior can be altered by managers through organizational design.

Throughout this study we have attempted to investigate how change is managed in terms of implementing Integrated Operations within organizations operating on the Norwegian Continental Shelf. In doing so, we mapped what we found to be important factors driving and restraining the implementation of change. Our findings suggest certain specific areas of change management that apply to the Norwegian oil industry in particular, elaborating on previous, current, and future issues related to the implementation of IO initiatives.

We would like to note that even though there seems to have been some initial overconfidence in the effects of IO, we acknowledge that the overall implementation today is relatively successful. As time has gone by and lessons have been learned, an increasing emphasis on the "softer" aspects of change has come into play. However, this does not mean that the oil companies can allow themselves to rest on their laurels. The success of the development of IO demands a strong emphasis on different change management issues in order for the Norwegian oil industry to gain competitive advantage and stay ahead of the other oil industries. The findings of this study illuminate some of the concerns that will have to be taken into account.

References

- Andersson, O., & Rollenhagen, C. (2002). *The MTO Concept and Organizational Learning at Forsmark NPP, Sweden*. Presentation held at the IAEA International Conference on Safety Culture in Nuclear Installations, Rio de Janeiro, Brazil, 2–6 December 2002.
- Bate, P., R. Kahn & A. Pye (2000). Towards a culturally sensitive approach to organizational structuring: Where organization design meets organization development. *Organization Science*, 11: 197–211.
- Beer, M. & Nohria N. (Eds.) (2000). *Breaking the code of change*. Boston, MA: Harvard Business Press Books.
- Beer, M., Eisenstat, R., A. & Spector, B. (1990). Why Change Programs Don't Produce Change. *Harvard Business Review*. November 1990.
- Bennis, W. (2000). Leadership of Change. In M. Beer & N. Nohria (Eds.), *Breaking the Code of Change*. Boston, MA: Harvard Business School Press.
- Berg, Bruce, L. (2009). *Qualitative Research Methods for the Social Sciences*. (7th edition). Boston, MA: Pearson Education.
- Bolman, L. G. & Deal, T. E. (2003) *Reframing Organizations: Artistry, Choice, and Leadership*. 3rd edition. San Francisco, CA: Jossey-Bass.
- Booth, J.E., Hebert II, J.W. (1989). Support of Drilling Operations Using a Central Computer and Communications Facility With Real-Time MWD Capability and Networked Personal Computers. Petroleum Computer Conference, 26–28 June 1989, San Antonio, Texas.
- Bryman, Alan & Bell, E. (2011). *Business Research Methods*. Oxford: Oxford University Press.
- Buchanan, D & Huczynski, A. (2010). *Organizational Behaviour: An Introductory Text*, 7th edition. New York: Prentice Hall.

- Burnes, B. (2004). Kurt Lewin and the planned approach to change: A re-appraisal. *Journal of Management Studies*, 41: 977–1002.
- Burns, Bernard. (2009). *Managing Change*. Harlow: Financial Times/Prentice Hall.
- Conger, Jay. (2000). “Effective change begins at the top”. In M. Beer & N. Nohria (Eds.), *Breaking the Code of Change*. Boston, MA: Harvard Business School Press.
- Cummings, T. & Worley, C. (2009). *Organization development & change*. Mason, Ohio: South-Western Cengage Learning.
- Dunphy, D. (2000). Top-Down versus participative management of organizational change. In M. Beer & N. Nohria (Eds.), *Breaking the Code of Change*. Boston, MA: Harvard Business School Press.
- Fedor, D. B., Caldwell, S. & Herold, D. M. (2006). The effects of organizational changes on employee commitment: A multilevel investigation. *Personnel Psychology*. Vol. 59. No. 1.
- Ford, J., D., Ford, L. W. & D’Amelio, A. (2008). Resistance to Change: The Rest of the Story. *Academy of Management Review*. Vol. 33, No. 2.
- Green, M. (2007). *Change Management Masterclass: A Step by Step Guide to Successful Change Management*. London: Kogan Page.
- Grøtan, T. O. & Albrechtsen, E. (2008). Risikokartlegging og analyse av Integreerte Operasjoner (IO) med fokus på å synliggjøre kritiske MTO-aspekter – SINTEF rapport.
- Gulbrandsøy, K., Andersen, T. M., Hepsø, V. & Sjong, D. (2004). *Integrated operations and e-fields in maintenance and operation: The third efficiency leap facing the Norwegian oil and gas industry*. Paper presented at the MARCONI conference.
- Henriquez, A. (Statoil), Fjærtøft, I. (Statoil), Yttredal, O. (StepChange), Johnsen, C. (Statoil). (2008) *Enablers for the successful implementation of Intelligent Energy: The Statoil case*. Intelligent Energy Conference and Exhibition. 25–27 February. Amsterdam, The Netherlands.
- Hepsø, V. (2006). *When are we going to address organizational robustness and collaboration as something other than a residual factor?* SPE Intelligent Energy Conference and Exhibition. 11–13 April. Amsterdam, The Netherlands.
- Hepsø, V. (2009). Common Information Spaces in Knowledge-Intensive Work: Representation and Negotiation of Meaning in Computer-Supported Collaboration Rooms. In Jemielniak, D., J. Kociatkiewicz (Eds.). 2009. *Handbook of Research on Knowledge-Intensive Organizations*, p.279–294. IGI Global.
- Herbert, M., Pedersen, J., & Pedersen T. (2003). *A Step Change in Collaborative Decision Making – Onshore Drilling Center as the New Work Space*. SPE Annual Technical Conference and Exhibition, 5–8 Oct. 2003, Colorado, US.
- Herscovitch L. & Meyer J. P. (2002). Commitment to organizational change: Extension of a three-component model. *Journal of Applied Psychology*, 87, 474–487.
- Holt, D. T., Armenakis, A. A., Field, H. S., & Harris, S. G. (2007). Readiness for Organizational Change. *Journal of Applied Behavioral Science* 43 (2): 232–255.
- Knowles, E. S., & Linn, J. A. (2004). The importance of resistance to persuasion. In E. S. Knowles & J. A. Linn (Eds.), *Resistance and persuasion*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Kotter, J. P. (1995). *The New Rules: How to Succeed in Today's Post-corporate World*. New York: Free Press.
- Kotter, J. P. & Cohen, D. S. (2002). *The hearth of change*. Boston MA: Harvard University Press.
- Kotter, J. P. (1996). *Leading Change*. Boston, MA: Harvard Business School Press

- Kray, L. J., & Galinsky, A. D. (2003). The debiasing effect of counterfactual mind-sets: increasing the search for disconfirmatory information in group decisions. *Organizational Behavior and Human Decision Processes*, 91, 69–81.
- Langley, A., & Denis, J. L. (2006). Neglected dimensions of organizational change: Towards a Situated View. In R. Lines, I. G. Stensaker, & A. Langley (Eds.), *New perspectives on organizational change and learning*. Bergen: Fagbokforlaget
- Lawler, E. & Worley, C. (2009). Designing Organizations that are built to change. In F. Hesselbein, & M. Goldsmith. *The organization of the future*. San Fransisco, CA: Jossey-Bass.
- Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, 93, 23–32.
- OLF 2007: Retrieved from <http://www.ptil.no/getfile.php/PDF/IO%20og%20HMS-%20OLF-rapport.pdf>. Accessed 19 August 2011.
- OLF 2008: Retrieved from http://www.ncesubsea.no/publish_files/Jan_Krokeide_OLF.pdf. Accessed 19 August 2011.
- Piderit, S. K. (2000). Rethinking Resistance and Recognizing Ambivalence: A Multidimensional View of Attitudes toward an Organizational Change. *The Academy of Management Review*. Vol. 25, no. 4.
- Regar, R. K., Mullane, J. V., Gustafson, L.T. & DeMarie, S. M. (1994). Creating Earthquakes to Change Organizational Mindsets. *Academy of Management Executive*, 8: 4 (pp. 31–46).
- Ringstad, A. J. & Andersen, K. (2006). *Integrated operations and HSE – Major issues and strategies*. SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, 2– 4 April, 2006, Abu Dhabi, UAE.
- Rosendahl, T. & Egir, A. (2008). “Multidisiplinære team og oljeindustrien – hvordan implementere Concurrent Design i StatoilHydro?”. *Magma*, No. 6.
- Rubin, H. J. & Rubin, I. (1995). *Qualitative Interviewing: The art of hearing data*. Thousand Oaks, CA: Sage.
- Skarholt, K., Næsje, P., Hepsø, V. & Bye, A. S. (2009). Integrated operations and leadership – How virtual cooperation influences leadership practices. In Martorell et al. (Eds.) *Safety, Reliability and Risk Analysis: Theory, Methods and Applications*. London, UK: Taylor and Francis Group.
- SSB.no a – Annual statistics for oil and gas activity 2009. Retrieved from http://www.ssb.no/english/subjects/10/06/20/oljev_en/. Accessed 27 August 2011.
- SSB.no b – National accounts. Retrieved from http://www.ssb.no/english/subjects/09/01/regnskap_en/. Accessed 26 August 2011.
- SSB.no c – Financial results on the Norwegian Continental Shelf 1989–2007. Retrieved from http://www.ssb.no/english/subjects/10/06/20/oljeregn_en/. Accessed 26 August 2011.
- St.meld nr 38: Retrieved from <http://www.regjeringen.no/nb/dep/oed/dok/regpubl/stmeld/20032004/Stmeld-nr-38-2003-2004-.html?id=404848>. Accessed 19 August 2011.
- Ursem, L.-J. Williams, J. H., Pellerin, N. M. & Kaminski, D. H. (2003). *Real Time Operations Centres; The people aspect of Drilling Decision Making*. SPE/IADC Drilling Conference, 19–21 Feb. Amsterdam, The Netherlands.
- Wahlen, M., Sawaryn, S., Smith, R., & Blaasmo, M. (2002). *Improving Team Capability and Efficiency by Moving Traditional Rig-Site Services Onshore*. European Petroleum Conference, 29–31 Oct. 2002, Aberdeen, Scotland.
- Whittington, R. & Mayer, M. (2002). *Organizing for success in the twenty-first century: A starting point for change*. London, UK: Chartered Institute of Personnel and Development.

Yin, Robert, K. (2009). *Case study research: design and methods*. Los Angeles CA: Sage.
Yukl, Gary. (2010). *Leadership in Organizations*. Upper Saddle River New Jersey: Pearso.