Occupational Health Psychology and Management: Psychosocial Risk Management in the Oil and Gas Industry

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Abstract

International bodies and networks within occupational health and occupational health psychology have over the last years highlighted a pressing need to understand how research and best practices can be translated into sustainable business practice. To stimulate and support organisations in strengthening their psychosocial risk management there have been a number of initiatives, guidance and frameworks that focus on best practice principles for managing the psychosocial work environment (BSI, 2011; Leka, Jain, Cox & Kortum, 2011; WHO, 2010). An essential question is how the frameworks launched by international initiatives, frameworks and standards can be re-interpreted and adjusted to fit the language and systems of particular business contexts, such as that of the petroleum industry. To explore this issue, this research has looked at how an oil and gas company has integrated a sustainable and comprehensive system for managing psychosocial risk.

This research has two aims. First, it explores how the oil and gas industry can develop and implement a psychosocial risk management system by applying research and best practice in a Norwegian oil and gas company, in order to raise awareness of how psychosocial risk management practices can be integrated into a company's internal management system. Secondly, it aims at raising awareness and stimulate to the application and use of established knowledge at organisational and national levels in this area. In this sense, the ultimate aim of this research is to inform policy makers about what it takes to actually implement and integrate policy into company context and at the same time to promote a comprehensive approach to worker protection and the promotion of their health.

In all, four studies describe aspects of how this integration process has evolved. The first study explored the development and testing of a performance indicator for psychosocial risk in the oil and gas industry (Bergh, Hinna, Leka, & Jain, 2014b). This resulted in the establishment of a proactive exposure psychosocial risk indicator automatically published in the internal organisational performance management system of the organisation. The second study assessed the relationship between the psychosocial risk indicator (PRI) and objective measures, such as installation weight, age and leakage sources, of health and major accident potential, such as hydrocarbon leaks (Bergh, Ringstad, Leka & Zwetsloot, 2014c). Results from the analysis showed that only the psychosocial risk indicator significantly accounted for variation in hydrocarbon leaks. Only partial support was found for the relationship between technical factors and hydrocarbon leaks on the basis of correlation analysis. The third study describes the development of an internal audit tool of the psychosocial work environment in

the oil and gas industry, focusing on offshore units (Bergh, Hinna, Leka & Zwetsloot, 2016). Psychosocial risk auditing is a proactive method for monitoring the status of psychosocial factors influencing the risk of stress and ill-health. The last study considered available quantitative and qualitative risk data collected through the PRIMA method over the last 8 years in the organisation to explore specific and common psychosocial risks in the petroleum industry in particular (Bergh, Leka, Zwetsloot, 2017). The results from the analyses confirmed the hypotheses proposed in the study that there was a significant correlation between job resources, job demands and symptoms of work-related stress and that there were differences in psychosocial risk factors and symptoms of work-related stress onshore and offshore.

Future research should focus on testing the methods and tools developed in this company. Moreover, research should explore how other companies can incorporate and implement established knowledge on psychosocial risk management.

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1 Chapter: New challenges in the modern workplace: Psychosocial risk in the oil and gas industry

1.1 Changing nature of work

Over the years' significant changes have taken place in the modern workplace. In particular, there are three major forces that have led to significant changes in the world of work in industrialized countries over the past decades; increased level of demographic shifts, increased economic globalization, and rapid technological change (EU-OSHA, 2002, 2007, 2014b; Karoly & Panis, 2004; Kompier & Cooper, 1999; Van den Bossche, Taris, Houtman, Smulders & Kompier, 2013). Technological changes and fluctuations in market dynamics have caused demands for cost reductions, organisational restructuring and downsizing (ILO, 2013). As a result, companies are initiating changes as attempts to both increase the organisation's profits while at the same time decrease costs in order to remain competitive. These changes in the modern world of work have led to, besides physical, biological and chemical risks, emerging psychosocial risks (EU-OSHA, 2014a, 2014b; ILO, 2013). Psychosocial risks[1] relate to the way work is designed, organized and managed, as well as the economic and social contexts of work (EU-OSHA, 2014b; Leka & Jain, 2010).

The changes that are occurring have also impacted the workplace and have led to an increasing ageing workforce, the development of new forms of employment contracts, increased job insecurity, higher work intensification, and increased utilization of irregular and flexible working time (EU-OSHA, 2014b; ILO, 2013). For example, a report published by the European Agency for Safety and Health at Work (2007), highlights job insecurity, also thought of as a psychosocial risk factor, as a particular area of concern. Job insecurity is often described as an overall concern about the continued existence of the job in the future, and also as a perceived threat to various job features such as position within an organisation or career opportunities (Burgard, Brand & House, 2009; EU-OSHA, 2007). This phenomenon is especially observed in the context of organisational changes that include re-organisation, outsourcing, mergers and acquisitions, and often redundancies as a way of tackling increased competitiveness. As such, repeated downsizing, expanding of organisations and re-organizing, have become very common in organisations and are related to established negative health effects among workers and employees (Ferrie et al., 2007; Theorell et al., 2003; Westerlund et al., 2004), including poorer physical and mental health. The main theoretical base to explain the negative health effects of job insecurity are, for many researchers, stress theories.

[1] Psychosocial risks will be discussed further in section 1.3

Another psychosocial risk factor that has been highlighted by experts is job intensification. In the report published by EU-OSHA (2007), job intensification is described as high workload and work pressure resulting from the changes at the workplace and the growing amount of information to handle at work as a result of the introduction of new information and communication technologies into the workplace. Today employees are often met with higher workloads where there are increased demands shared between fewer employees. Furthermore, employees in this situation may also fear being more assessed with regards to their efficiency and deliverables at work, and hence tend to work longer working hours in order to finish their tasks, sometimes without receiving adequate compensation and social support. If employees experience this type of situation, this may lead to work-related stress which again may affect their health and safety at work (Datta, Guthrie, Basuil, & Pandey, 2010; EU-OSHA, 2010a; Joling, 2002; Joling & Kraan, 2008; Mathisen & Bergh, 2016; Zwetsloot, Drupsteen, & de Vroome, 2014).

In order to compete in an increasingly challenging market, companies actively introduce new technologies such as video collaboration, smart phones and cloud-delivered services. These technologies are the driving forces behind a whole new paradigm for communication that affects the way people work together and collaborate. The implementation of new communication technologies into many workplaces has introduced new challenges related to home-work balance (Chesley, Moen, & Shore, 2003). For example, the expanded access to e-mail, cell phones, smart phones and other communication devices often enhance flexibility and enable remote work, but also contribute to employees being available around the clock which again may cause strain (Batt & Valcour, 2003; Chesley, 2005). Tools such as email and smart phones introduce work patterns and practices that are not part of the more traditional ways of organizing daily work tasks. The use of such communication technologies has increased the likelihood of the line between work and home becoming more blurred. (Boswell & Olson-Buchanan, 2007; Valcour & Hunter, 2005). As such, Schieman and Young (2013) found that those workers who frequently send and received work communications, such as email through smart phones, outside of regular work hours tended to report more stress and sleep problems.

Consequences related to the changes in the modern workplace have also been confirmed by the scientific literature which shows that psychosocial risks are a growing challenge for occupational health and safety within companies and for society at large (EU-OSHA, 2007, 2014b; Leka & Jain, 2010). Stress-related health consequences due to exposure to psychosocial risks have been associated with symptoms such as anxiety and depression (Bin Nordin, Bin Abdin & Naing, 2008; Gherardi-Donato, Cardoso, Teixeira, Pereira &

Reisdorfer, 2015; Havranek, Bolliger, Roos, Pryce, Quendnow & Seifritz, 2015; Park, Min, Chang, Kim, & Min, 2008).

Today depression is one of the most common mental disorders found in the general community and in the workplace. Depression can be expressed as physical symptoms, such as headache, back pain, stomach problems, or angina and experience shows that it is difficult to diagnose. Current predictions indicate that by 2030 depression will be the leading cause of disease burden globally. When only the disability component is taken into consideration in the calculation of the burden of disease, mental disorders account for 25.3% and 33.5% of all years lived with a disability in low- and middle-income countries, respectively (WHO, 2016). The WHO confirms that in Europe mental health problems and stress-related disorders are the biggest overall cause of early death (Leka & Jain, 2010). WHO further stresses that the prevalence of depression, suicide and other stress-related conditions together with destructive life-styles and psychosomatic diseases, cause immense suffering to people and their families beyond Europe. Experience has also shown that workplace interventions can reduce the level of depression symptoms among workers (Tan, Wang, Modini, Joyce, Mykletun, Christensen & Harvey, 2015). As such, one of the reports from the European Agency for Safety and Health at Work (2014) argues that the research and experience over the years show that there is a strong 'business case' for organisations to establish practices in order to prevent stress and psychosocial risks at work. This also includes industries such as the oil and gas industry (Chan, 2011; Clark, 2010; Esquirol et al., 2011; EU-OSHA, 2009; ILO, 2013).

Gradual changes in what people do for a living, and how they do it along with changes in the make-up of the workforce have also had an effect on working environment challenges in countries such as Norway. New jobs have been created, and the nature of existing jobs is constantly changing (Aagestad et al., 2015). This thesis focuses on the psychosocial work environment in Norway and in the oil and gas sector in particular. Before we look at this in detail, it is imperative that we first examine key definitions, concepts and theoretical models in relation to the psychosocial work environment.

1.2 Psychosocial work environment

The psychosocial work environment is often referred to as work-related psychological and social influences on health and safety. Examples of this can be time pressure, monotonous work, social reciprocity, job control and autonomy, fairness, work demands and job security, as well as social contact with co-workers and supervisors (Cox & Griffiths, 2005; EU-OSHA, 2014b).

The International Labour Organisation (ILO) (1986) refers to psychosocial hazards as: "interactions among job content, work organisation and management, and other environmental and organisational conditions, on the one hand, and employees' competencies and needs on the other. Psychosocial hazards are relevant to the imbalance in the psychosocial arena and refer to those interactions that prove to have a hazardous influence on employees' health through their perceptions and experience" (ILO, 1986, p.7). Cox and Griffiths (2005) described psychosocial hazards in perhaps a simpler way by defining them as those aspects of the design and management of work, and its social and organisational contexts that have the potential for causing psychological or physical harm (Leka, Cox & Zwetsloot, 2008).

Literature often distinguishes between psychosocial hazards, psychosocial factors and psychosocial risks. According to the PAS 1010:2011 – Guidance on the management of psychosocial risk in the workplace, psychosocial factors are defined in terms of the "interaction among job content, work organisation and management, and other environmental and organisational conditions, and the employees' competencies and needs" BSI, 2011, p. 2). Psychosocial factors are not negative concepts per se. Whether they will have a negative effect will depend on how they are managed in the work environment (Leka, & Jain, 2016). In this case, they are referred to as psychosocial hazards. Furthermore, psychosocial risk is the "likelihood that psychosocial factors have a hazardous influence on employees' health through their perceptions and experience and the severity of ill health that can be caused by exposure to them" (BSI, 2011, p. 2).

The psychosocial factors that may prove harmful to employees' health if not managed responsibly are summarized in Table 1.1.

Table 1-1: Psychosocial work environment dimensions and hazards

Job content	Lack of variety or short work cycles, fragmented or meaningless work, under use of skills, high uncertainty, continuous exposure to people through work
Workload & work pace	Work overload or under load, machine pacing, high levels of time pressure, continually subject to deadlines
Work schedule	Shift working, night shifts, inflexible work schedules, unpredictable hours, long or unsociable hours
Control	Low participation in decision making, lack of control over workload, pacing, shift working, etc.
Environment & equipment	Inadequate equipment availability, suitability or maintenance; poor environmental conditions such as lack of space, poor lighting, excessive noise
Organisational culture & function	Poor communication, low levels of support for problem solving and personal development, lack of definition of, or agreement on, organisational objectives
Interpersonal relationships at work	Social or physical isolation, poor relationships with superiors, interpersonal conflict, lack of social support, violence, harassment, bullying
Role in organisation	Role ambiguity, role conflict, and responsibility for people
Career development	Career stagnation and uncertainty, under promotion or over promotion, poor pay, job insecurity, low social value to work
Home-work interface	Conflicting demands of work and home, low support at home, dual career problems

Source: Adapted from Leka & Jain (2010)

Today there is a high degree of agreement among researchers with regards to how psychosocial hazards impact health (e.g. Lie et al, 2014; Leka & Jain, 2010; Mackay et al., 2012; Rossi, Meurs & Perrewe, 2014). Furthermore, this research also highlights the link to such workplace problems as work-related stress and bullying (Leka & Jain, 2010).

Work-related stress has been defined as "the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope" (Leka & Jain, 2010, p.4). Many definitions of stress exist depending on research disciplines and countries. Although there may not be an accepted universal definition of stress, there is broad consensus that it involves an imbalance between perceived demands and the resources to cope with them. At European level, the 2004 EU social partners' agreement describes stress as: "Stress is a state, which is accompanied

by physical, psychological or social complaints or dysfunctions and which results from individuals feeling unable to bridge a gap with the requirements or expectations placed on them."(p.43). Furthermore, in the guidance on work-related stress prepared by the European Commission, stress is defined as: "the emotional, cognitive, behavioural and psychological reaction to aversive and noxious aspects of work, work environments and work organisations. It is a state characterized by high levels of arousal and distress and often by feelings of not coping." (EU-OSHA, 2002, p.3)

The European Agency for Safety and Heath at Work web page on the definition and symptoms of stress states that: "People experience stress when they perceive that there is an imbalance between the demands made of them and the resources they have available to cope with those demands. Although the experience of stress is psychological, stress also affects people's physical health. Reactions to the same circumstances vary between individuals. Some people can cope better with high demands than others. It is the individual's subjective evaluation of their situation that is important. It is not possible to determine from the situation alone the amount of stress it may cause. Short-term stress – for instance when meeting a deadline – isn't usually a problem: indeed, it can help people perform to the best of their ability. Stress becomes a risk to safety and health when it is protracted."

In the literature, the experience of stress has also been explained as part of the hazard-risk-harm concept (Cox, 1993). Over the years, research has shown that negative impact on health may be mediated by at least two pathways: in the first pathway the design and management of work directly may harm employee health; and in the second and indirect pathway, the experience of stress leads to a negative impact on employee health (see Figure 1.1) (Cox, Griffiths & Rial-González, 2000a). It has also been noted that these pathways can have additive and synergistic interactions (Cox, Griffiths & Rial-González, 2000). It is important to highlight that research and experience over the years shows that there can be a direct pathway from psychosocial hazards to harm (Leka & Jain, 2010).

Work-related stress has been reported to be the second most prevalent work-related health problem affecting 22% of workers in the European Union (EU) (EU-OSHA, 2009). Furthermore, work-related stress is also believed to be a major cost to companies and countries in a wider sense, as it affects productivity, notably through absenteeism and presenteeism (that is, the practice of attending work even when employees feel too ill to be able to work effectively). For example, in a report published by the European Agency for Safety and Health at Work (EU-OSHA, 2009) it is reported that in France stress-related illnesses cost the society between €830 and €1,656 million per year. Furthermore, systematic reviews and

studies indicates that work-related stress is linked with serious outcomes such as heart disease, depression, and musculoskeletal disorders (MSDs), thereby leading to further strain on public spending for increased costs on healthcare (Leka & Jain, 2010).

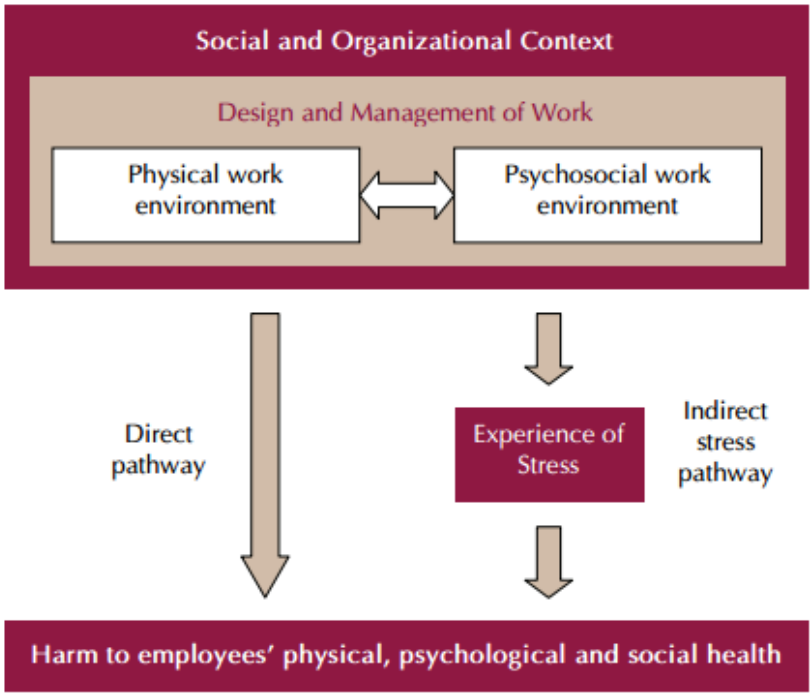


Figure 1.1: Hazard, risk and harm

Source: Adopted from Cox, Griffiths & Rial-Gonzalez (2000)

It should be noted that in the literature, work-related violence, harassment and bullying are conceptualized as both psychosocial risks and as outcomes of exposure to psychosocial risks (Leka & Cox, 2008; Leka, Cox, & Zwetsloot, 2008). As such, bullying at work (sometimes referred to as mobbing, harassment, psychological violence or mistreatment) involves repeated negative, unfriendly or offensive behaviour, actions and practices (e.g. tormenting, undermining, socially excluding) that are directed at one or more employees. The behaviour is unwelcome to the target and carried out in circumstances where the targets have difficulty in defending themselves (Einarsen, Hoel, Zapf, & Cooper, 2003). Work-related violence refers to incidents where persons are abused, threatened or assaulted in circumstances related to their work, involving an explicit or implicit challenge to their safety, well-being and health (adopted by the European Commission in 1995). Third party violence or violence by other people relates to violence from clients, customers, patients and pupils. Third party violence can be threats and assaults that are both physical and psychological in nature (Di Martino, Hoel, & Cooper, 2003).

Over the past years, we can observe that bullying has been seen and documented as a serious and extensive issue for the workplace. Those who experience bullying are very likely to experience serious impact on their health. Organisations also suffer because bullying may create a deconstructive working environment, reduce productivity, prevent goal attainment and limit financial gain. Furthermore, bullying may also have an impact on the larger society by being a burden on the health system, weakened national production and reduced competitiveness (Di Martino, Hoel & Cooper, 2003).

The knowledge on psychosocial risk factors and their effect on health and safety does not just draw attention to the contribution of the person as opposed to the work environment, in creating work-related stress, but also to the way that the demands of an encounter are appraised. Capturing the meaning individuals give to stressful encounters cannot, of course, be separated from theories. As such, the next section will explore some of the most prominent theories on work-related stress.

1.3 Theoretical perspectives

Research on psychosocial factors has as a main rule been theoretically anchored to various stress models and it has often studied the relationship between psychosocial factors and stress. In this chapter we will therefore take a closer look at some of the most influential models of psychosocial factors and work-related stress.

The earliest research to describe and investigate psychosocial work conditions in relation to health-related outcomes seems to have been conducted from two main perspectives (Aronsson, 1987; Karasek, 1979; Karasek & Theorell, 1990). One of these perspectives was primarily concerned with psychosocial working conditions as stressors, and stemmed from the early focus on physical hazards and prevention of physical injuries. There was, for instance, an initial emphasis on work pace (how fast one has to work) and workload (how much work one has to do). Later in the 1960s and 1970s, other work-related stressors were included, such as role conflicts (when people have incompatible expectations of what or how an individual's work tasks should be carried out), role ambiguity (when an individual does not know which work tasks he/she is expected to perform), and role overload (when an individual has too many work tasks (House & Rizzo, 1972; Kahn et al, 1964).

The second perspective focused on work redesign to increase job satisfaction and productivity (Aronsson, 1987; Karasek, 1979; Karasek & Theorell, 1990). Here the focus was rather on job enrichment, such as level of qualifications and degree of freedom in performing one's work (i.e. work discretion). Research on psychosocial working conditions was undertaken within these two perspectives, but they rarely influenced each other. In 1979, these

two perspectives were combined in the Job Demands–Control model (Karasek, 1979). More specifically, the model combined job demands (summary of stressors) with decision latitude at work (summary of resources) to describe four different work situations.

1.3.1 The Job Demands-Control (JDC) model

The basic proposition of the Job-Demand-Control (JDC) model (Figure 1.2) is that stress-inducing work conditions are not detrimental if they are paired with coping-assisting work conditions (resources). Thus, according to the model, the healthiest jobs are those in which decision latitude is high. The model is one of the most established models in occupational health research, and has gained considerable support in relation to various health-related outcomes (Belkic, Landsbergis, Schnall, & Baker, 2004; Karasek & Theorell, 1990; Stansfeld & Candy, 2006). The focus of the model was on how work is designed, and how this predicts health. However, it was criticized for leaving out certain relevant aspects, such as social relations in the workplace (Johnson & Hall, 1988). A third dimension, social support, was therefore added to the model and this is referred to as the Job Demands-Control-Support model (JDCS) (Johnson & Hall, 1988; Karasek & Theorell, 1990).

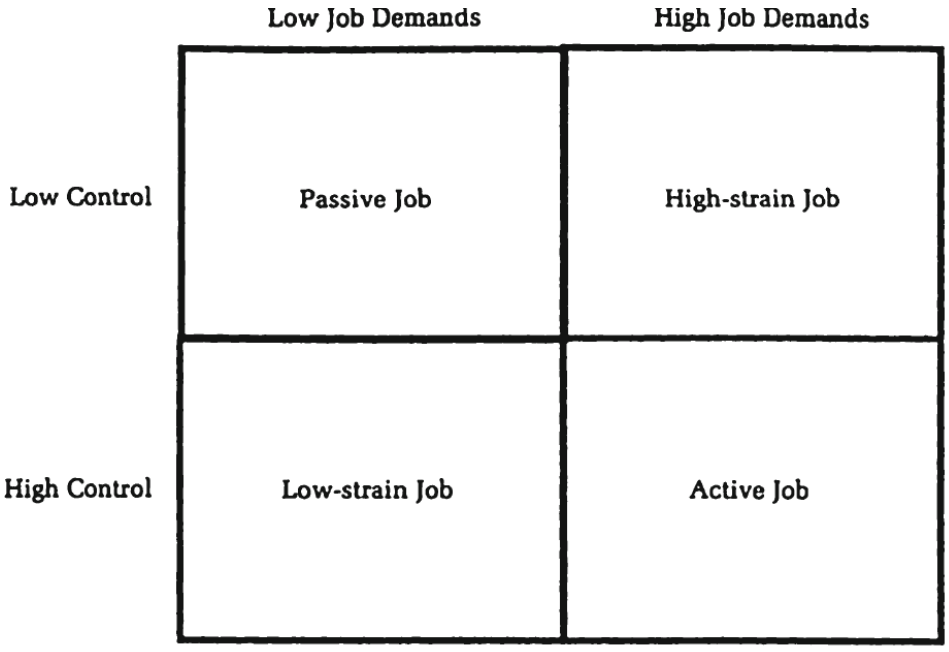


Figure 1.2: The Job demand Control Model

Source: Adapted from Dewe, O'Driscoll, & Cooper (2012)

In a review of empirical research using Karasek's model over 20 years, results show that high demand and low control work environments are associated with lower psychological wellbeing and job satisfaction, burnout and other forms of psychological distress (Van der Doef

& Maes, 1999). Furthermore, results confirmed that high demand and low control work environments significantly affect worker wellbeing (Noblet, 2003). In a study by Marshall, Barnett and Sayer (1997) it was found that job demands significantly affect workers' psychological distress for workers in 600 manufacturing and services industries in the United States. Other studies have assessed the main and additive effects of JDCS variables. In these studies, it was confirmed that job demands, job control and social support were statistically associated with health risk, wellbeing, job satisfaction and fatigue (Chambel & Curral, 2005; Macklin, Smith, & Dollard, 2006; Niedhammer, Chastang, & David, 2008; Pelfrene et al., 2002; Rodriguez, Bravo, Peiro, & Schaufeli, 2001; Van Yperen & Hagedoorn, 2003). Research has also shown that jobs requiring high psychological demands and low social support have a negative impact on employee mental health, vitality and burnout (Escriba-Aguir & Tenias-Burillo, 2004) and job satisfaction (Huda et al., 2004). At the same time these type jobs are also positively related with anxiety, stress and depression (Edimansyah, et al., 2008). Within research on hospital workers and non-permanent employees there are also valuable findings that confirm Karasek's model. In this research it has been found that involvement in high workload and psychological job demands, low decision authority and skill discretion (low job control) are related to minor psychiatric morbidity, self-reported health problems and higher absenteeism (Gimeno et al., 2004; Kivimäki et al., 2003).

Looking at the research over the years, the main effect of JDCS variables on well-being is substantially supported. Studies show that there is a clear relationship between those variables and outcomes measured. However, despite the wealth of research that show a main effect on health and well-being, the job demands x job control interaction is still inconclusive, receiving only modest support (Brough & Pears, 2004; Chay, 1993; Dormann & Zapf, 2002; Ibrahim, & Ohtsuka, 2012).

Other models have also been developed and received considerable attention over the years. One example is the Effort-Reward Imbalance model – this will be discussed next.

1.3.2 The Effort-Reward Imbalance model

The Effort-Reward Imbalance (ERI) model (Figure 1.3), originally proposed by Siegrist (1996), has become well-known within occupational health research. The attention the model has received is in large rooted in its predictive power for adverse health and well-being outcomes (Bache et al., 2012; Bellingrath & Kudielka, 2016; Feldt et al., 2016; Lee, Lee, Gillen, & Krause, 2014; Ndjaboué, Brisson, Vezina, Blanchette, & Bourbonnais, 2014). The ERI Model originated in medical sociology and highlights the importance of both the effort and the reward structure of work (Häusser, Mojzisch, Niesel & Schulz-Hardt, 2010).

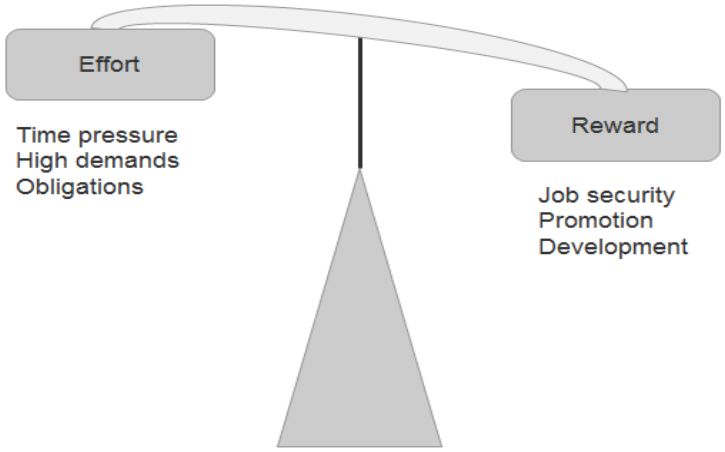


Figure 1.3: The Effort-Reward Imbalance (ERI) Model

Source: Adapted from Weyers et al. (2006)

According to the ERI model, work-related benefits depend upon a mutual relationship between efforts and rewards in the workplace. In the model, efforts represent job demands and/or obligations that are imposed on the employee. An example of this can be time pressure and working overtime. Furthermore, examples of occupational rewards can be money, esteem, and job security/career opportunities at work. As such, the ERI model states that work situations that include both high efforts and low rewards represent a reciprocity deficit between high costs and low gains, which could cause a negative outcome for exposed employees. Employees that work hard without receiving adequate appreciation or being treated fairly are an example of a stressful imbalance. Another assumption of the ERI model relates to the individual differences in the experience of effort-reward imbalance. According to this assumption, employees characterized by a motivational pattern of excessive job-related commitment and a high need for approval (overcommitment) will respond with more negative reactions (strain) to an effort-reward imbalance, in comparison to less overcommitted people. The ERI model suggests that strongest adverse health and well-being effects take place if work and personal conditions act simultaneously (Siegrist et al., 2004).

A review of 45 studies published from 1986 to 2003 concluded that a total of 25 studies assessed the ERI model in relation to physical health outcomes (Vegchel, Jonge, Bosma, & Schaufeli, 2005). The combination of high effort and low reward not only was demonstrated to have an explanatory power for the manifestation of cardiovascular disease (CDV), but also to be able to identify employees at risk at an earlier stage of CVD development (Hanson et al., 2000, 2001; Joksimovic et al., 2002; Kuper et al. 2002; Vrijkotte et al., 1999, 2000). Recent

publications on the ERI model also show the link between chronic stress in term of Effort-Reward-Imbalance and ill-health. A review of the main findings from various studies demonstrates effects of stressful work conditions on the autonomic nervous system, on the endocrine stress system, on the immune and blood coagulation system, and on cardiovascular responses (Bellingrath & Kudielka, 2016). Lau (2008) validated a Norwegian version of the Effort-Reward Imbalance Questionnaire (ERI-Q). As such, one thousand eight-hundred and three employees in a medium-sized Norwegian town replied to the ERI-Q, and health-related variables such as self-reported general health, psychological distress, musculoskeletal complaints, and work-related burnout were examined. Satisfactory psychometric properties were found for most of the latent factors in the ERI-Q.

ERI has also been linked to behavioural outcomes such as increased smoking, alcohol consumption and increased sickness absence (Peter et al., 1997) and measures of psychological well-being. In the study by Peter and Siegrist (1997) the relation between ERI and registered sickness absence in male middle managers was explored. In their study results showed that forced job change, indicating low reward, was significantly and positively correlated to sickness absence. Furthermore, working in a high effort–low-reward situation was not significantly correlated to a higher sickness absence (Peter & Siegrist, 1997). In studies, negative effects of a high effort–low-reward situation were found for both psychosomatic health symptoms and job-related well-being. Among the ERI studies emotional exhaustion, the main component of burnout, as well as job satisfaction, were the components most extensively included (Bakker et al., 2000; De Jong et al., 2000; Vegchel, Jonge, Bosma, & Schaufeli, 2005).

To summarize, the ERI model seems to be a good model for assessing the relationship between work factors and employee health. Generally, one could say that the ERI hypothesis has been intensively studied. The original version and the short version of the ERI questionnaire scales have been developed, validated and applied in 14 languages and despite methodological limitations the ERI questionnaire has contributed to an extensive amount of new knowledge with relevance to science and policy (Montano, Li & Siegrist, 2016).

1.3.3 The Job Demands-Resources model

The Job Demands-Resources (JD-R) model (Figure 1.4) was introduced as an alternative to other models of employee well-being (Bakker & Demerouti, 2007). Since its appearance in the wake of the twenty-first century, the JD-R model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) has gained high popularity among researchers (Schaufeli & Taris, 2014). Currently, the JD-R model is recognized as one of the leading job stress models,

along with Karasek's (1979) Job Demands Control (JD-C) model and Siegrist's (1996) Effort Reward Imbalance (ERI) model. The JD-R model assumes that whereas every occupation may have its own specific working characteristics, these characteristics can be classified in two general categories (i.e. job demands and job resources), thus constituting an overarching model that may be applied to various occupational settings, regardless of the particular demands and resources involved. The central assumption of the JD-R model is that job strain develops – regardless of the type of job or occupation – when (certain) job demands are high and when (certain) job resources are limited. In contrast, work engagement is most likely when job resources are high (also in the face of high job demands) (Bakker & Demerouti, 2007).

The JD-R incorporates a wide range of working conditions into the analysis of organisations and employees and instead of focusing solely on negative outcome variables (e.g., burnout, stress, ill health, and repetitive strain), the JD-R model includes both negative and positive indicators and outcomes of employee well-being (Bakker, Schaufeli, Leiter, & Taris, 2008). Over the last years, research has clearly shown a wealth of theoretical and empirical evidence to suggest that psychosocial variables are important factors in the relationship described in the JD-R model. The first studies on the JD-R model were conducted in the Netherlands with call-center employees (Bakker, Demerouti, & Schaufeli, 2005), industrial workers (Bakker, Demerouti, de Boer, & Schaufeli, 2003), and healthcare staff and white collar workers (Schaufeli & Bakker, 2004) and provided strong evidence for the assumptions of the model. Similar findings could also be seen in other countries, cultures and occupational groups, including Finnish teachers (Hakanen, Bakker, & Schaufeli, 2006), Australian volunteers (Lewig, Xanthopoulou, Bakker, Dollard, & Metzer, 2007), Austrian blue-collar and white-collar workers (Korunka, Kubicek, Schaufeli, & Hoonakker, 2009), Belgian blue-collar and white-collar workers (Hansez & Chmiel, 2010), Chinese blue-collar workers and health professionals (Hu, Schaufeli, & Taris, 2011), and Chinese family-owned business workers (Hu & Schaufeli, 2011). Furthermore, longitudinal studies have also shown promising results. A 3-year follow-up study among Finnish dentists (Hakanen, Schaufeli, & Ahola, 2008) supported both the motivational process and the health impairment process. In this study job resources influenced future work engagement, which, in turn, predicted organisational commitment; job demands predicted burnout over time, which in turn predicted future depression. A similar study conducted on Dutch managers showed that an increase in job demands and decrease in job resources predicted burnout across a 1-year period, whereas increases in resources predicted work engagement (Schaufeli, Bakker, & van Rhenen, 2000).

Furthermore, Vassos, Nankervis, Skerry and Lante (2013) explored job engagement and burnout in 258 disability support workers across Australia. Results from their study showed

that demands and role ambiguity were significantly associated with measurements of vigour, dedication, and absorption, all three being aspects of engagement. Furthermore, results showed that demands, and role ambiguity were significantly associated with the three burnout facets; emotional exhaustion; depersonalization; and personal accomplishment. Another study showed that quantitative demands and the following resources: influence at work, opportunities for development, degree of freedom at work, sense of community, feedback, quality of leadership and social support were significant predictors for work engagement. Interestingly the study also found a high correlation between work engagement and job satisfaction. This may suggest that the two are closely linked and improving on work engagement would impact positively on job satisfaction (Mache, Vitzthum, Klapp & Danzer, 2014). Mauno, Kinnunen and Ruokolainen (2007) analyzed a survey from 409 healthcare personnel over two years. In their study they explored job demands and resources as precursors to work engagement. Results showed that job resources predicted work engagement better than job demands. Other studies on Norwegian populations have also been performed, where findings indicate that engagement mediates the effects of control and social support on the level of depression (Torp, Grimsmo, Hagen, Duran and Gudbergsson, 2013). In a recent Norwegian study the role of job engagement, well-being and health complaints on action errors and rule violations was tested at offshore oil rigs. Results showed that job engagement was associated with fewer reports of action errors and violations. Furthermore, findings indicated that job engagement mediated the relationship between well-being and reports of action errors and violations (Mathisen & Bergh, 2016).

Measurement tools for job engagement have also been tested on Norwegian populations. For example, in a study by Nerstad, Richardsen and Martinussen (2010) the factorial validity of the Utrecht Work Engagement Scale (UWES) was tested among 1266 participants from ten different occupational groups. Results indicated factorial invariance and acceptable internal consistencies. In the paper it is concluded that the Norwegian short version may be recommended.

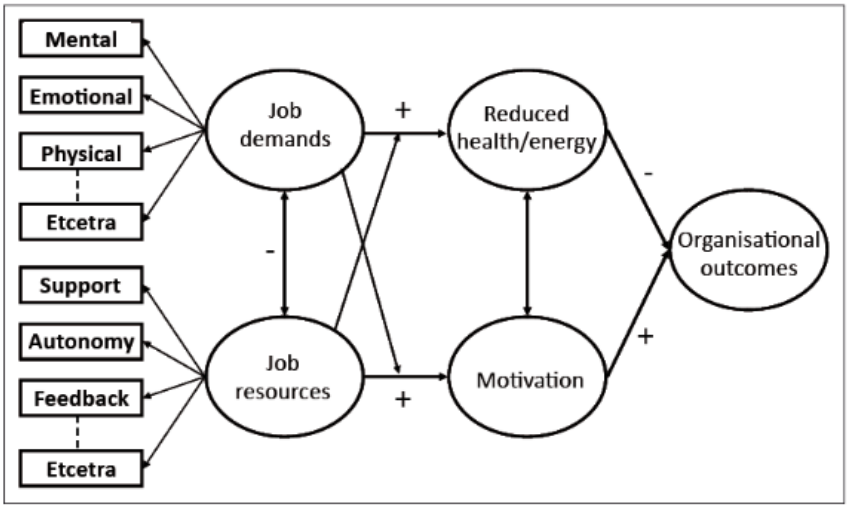


Figure 1.4: The Job Demand-Resources (JD-R) Model

Source: Adapted from Bakker & Demerouti (2007)

1.3.3 Transactional models

Most transactional models of stress focus on the cognitive processes and emotional reactions underpinning individuals' interactions with their environment. Stress is seen as the internal representation of particular and problematic transactions between individuals and their environment (Cox, 1993; Lazarus, 1995).

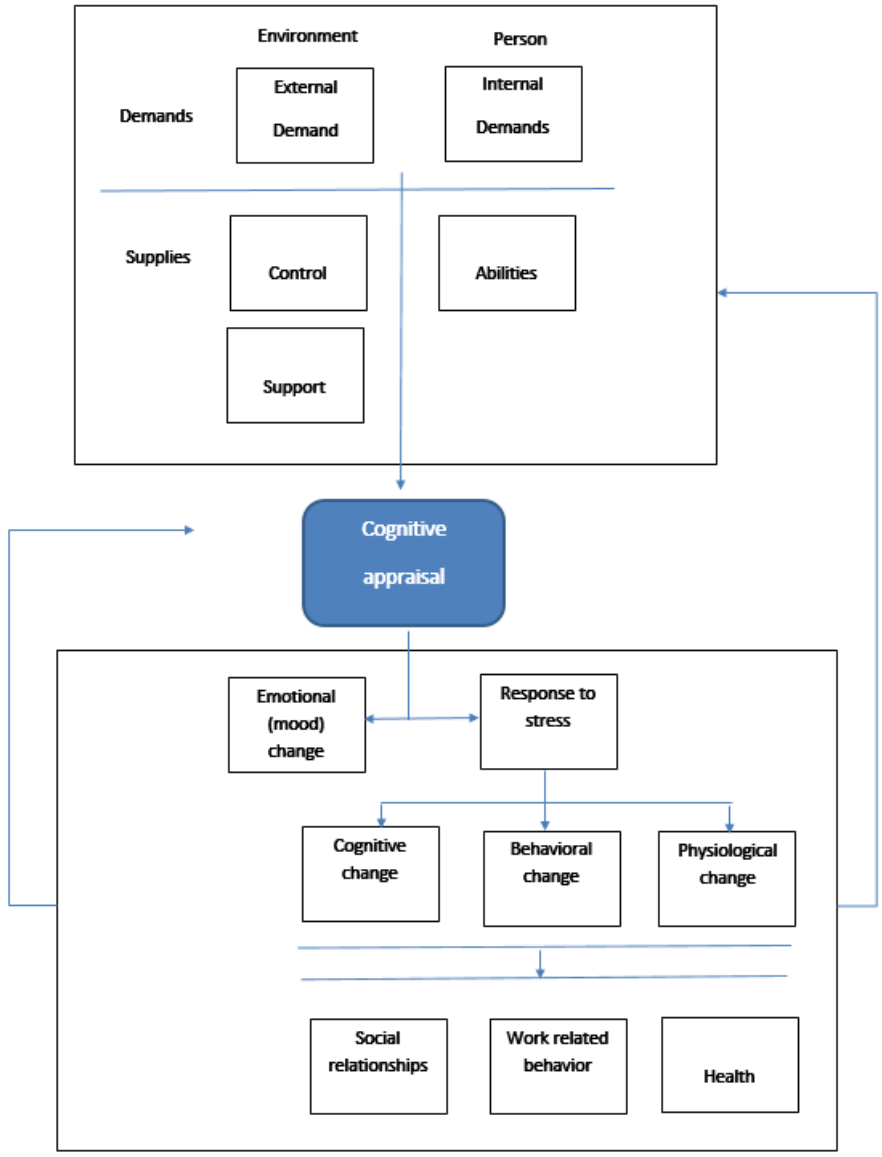


Figure 1.5: Transactional model of work stress

Source: Adapted from Cox & Mackay (1981)

In Cox's transactional model of work stress (Figure 1.5) (Cox, 1990; Cox et al., 2000; Cox & Mackay, 1981) the process is described in terms of a five-stage model. The first stage represents the sources of demand faced by the person and is part of their environment. The next stage is called primary appraisal and involves the person's perception of the demands in relation to their ability to cope. Stress is here described as the psychological state that arises when there is an imbalance between the person's perceptions of the demands on them and their perceived ability to cope with those demands. The third stage is the psychological and physiological changes which are associated with the recognition of such a stress state, and

which include coping. In this model emotional changes are an important part of the stress state and tend to be negative in nature. The consequence of coping is defined as the fourth stage in the model and the fifth stage is the general feedback that happens in relation to all other stages of the model (Cox & Griffiths, 2010). A person's perception of control and social support has been highlighted as an important aspect in the appraisal process. There has also been some debate of the problem of measuring stress based on this approach (Cox, 1990). However, the experience of stress in this context is described as the exposure to particular conditions of work, both physical and psychosocial, and the worker's realization that they are having difficulty in coping with important aspects of their work situation. The experience of stress is usually accompanied by attempts to deal with the underlying problem (coping) and by changes in cognition, behaviour and physiological function. Even though the person may be able to adapt in the short-term, long-term effects may developed due to these changes.

While the transactional stress viewpoint has been widely used in work stress research, several researchers have argued that there are difficulties with this model. Firstly, there is some concern in the literature about the dichotomy of coping (emotion- vs. problem-focused). Furthermore, it has been claimed that certain work environment conditions have profound effects on employees, or might adversely affect the well-being of most workers, irrespective of appraisal processes (Brief & George, 1995; Harris, 1995). The third issue has been the difficulty to measure the multitude of concepts included in the model (Cox & Griffiths, 2010). Even though there have been difficulties with the model, there are many researchers who have used the transactional approach in their studies. An example is Locke and Taylor's (1991) study of how the meaning of work relates to the experience of stress. Furthermore, researchers have looked at how the appraisal process affects workers' coping with stress (Dewe, 1991, 1992a, 1992b). Other topics that have been studied over the years are: job-related coping across multiple stressors and samples (Smith, 1995); coping effectiveness and wellbeing (Patterson, 1999); temporal stability of workplace stress and coping among female managers (Long & Schutz, 1995); the mediating role of coping in the work stressors-employee interaction (Harris, 1991); point/counterpoints regarding the usefulness of transactional approach in work settings (Barone, 1995; Harris, 1995; Lazarus, 1991, 1995).

Research related to the development of the various stress models has shown that a poor psychosocial working environment, characterized by unclear roles and responsibilities, high workload and / or low support, can affect performance both a negative way. These various types of impact will be considered in more detail in section 1.6. The following section will now focus on the changing nature of work in Norway and on the oil and gas sector in particular.

1.4 Working conditions in Norway

A recent report published by the National Institute of Occupational Health (STAMI) provides information about the status quo and current trends in respect to a number of work environmental hazards documented to have an impact on health. As such, this report shows that a total of 2.7 million people were in work in Norway in 2013. The proportion of the working age population in the labour force is among the highest in the OECD area, and it has increased from 61 percent in 1972 to 71 percent in 2013. Norwegian employees are generally satisfied with their jobs and motivated at work. Nevertheless, high scores on job satisfaction and motivation do not necessarily imply that everyone has a fully healthy environment at work in terms of absence of real or perceived work environmental hazards (Aagestad et al., 2015).

Norway has a welfare model with universal health care and a comprehensive social security system. It also enjoys one of the highest standards of living in the world, in large part due to the discovery in the late 1960s of offshore oil and gas deposits. The petroleum industry accounts for around a quarter of the country's gross domestic product (Statistics Norway, 2007).

Recent global economic and financial crises have placed considerable strain on enterprises worldwide. For example, in Norway statistics show that three in four people now work in what is often referred to as the services sector. The emergence of the ICT sector and the use of new technology both in the business environment have caused extensive changes in several industries in Norway. As a result, some service industries have seen a fall in employment, such as the postal services and distribution sector which has lost almost half its workforce over the last 20 years (Aagestad et al., 2015). From a working environment perspective, these changes in the employment structure have interesting implications. For example, the increase in employment in the services sector means that fewer workers are exposed to hazardous chemicals and hard physical labour. However, this also means that an increasing number of employees work in situations where they need to be in direct contact with customers and users, putting higher expectations on employee personal characteristics and social skills. At the same time, employees are increasingly expected to perform, show commitment and be involved. Even though several indicators on an overall level suggest that the working environment for Norwegian employees is changing for the better, work environmental challenges and threats to health are still present in certain professions and sectors (Aagestad et al., 2015).

The impact of the financial crisis has also had an impact on the oil and gas industry in Norway. Pressure to cut jobs and business infrastructure costs has been considerable and many companies have “descaled” and reprioritized business functions. The Labour Force Survey 2015 shows a decrease of 13,000 employed persons in mining and quarrying; an industry dominated by oil and gas extraction. This corresponds to a decrease of 17 per cent in one year, from 2014 to 2015. In total for all industries, the Labour Force Survey 2015 shows an increase of 20,000 employed persons last year. Retail trade was the industry that accounted for most of the growth.

The working conditions in the oil and gas industry in the North Sea have also changed considerably over the years where sick leave and early retirement due to disability have increased (Bakke, Olsen, & Mikkelsen, 2004; Ringstad et al., 2002). On the Norwegian Continental Shelf there are few employees older than 60 years, and the risk of early retirement is considered to be high (Ringstad et al., 2002). With the oil and gas industry there also seems to be indication that organisational change processes may cause job insecurity and have a negative impact on work-related sick leave. Based on data collected through the annual survey by the Petroleum Safety Authority Norway of the risk scenario in petroleum activities – RNNP 2014, a study found that there is a clear correlation between restructuring and downsizing processes and increased risk of occupational accidents involving personal injury (PSA, 2014b).

In 2015 there were 127,000 unemployed persons according to the Labour Force Survey, 2015. The increase in unemployment among men was significant both among youths (aged 15-24) and those in the next age group (25-54) from 2014 to 2015. The share of long-term unemployed persons decreased from 32 to 27 per cent during this period. The long-term unemployed are persons who have been unemployed for more than 26 weeks. Due to a relatively high inflow of new unemployed people during the last six months, the average duration of job searches decreased from 26.7 to 25.4 weeks (Labour Force Survey, 2015).

Over the past 20 years, working hours in Norway decreased by an average of 0.9 hours a week - men work a little less than this average while women a little more. The proportion of people working long work weeks (45 hours or more) decreased from 14 to 12 percent and is much more common among men than women (17% vs. 6%). Long work weeks are common in leaders. There has been a steady increase in shift work arrangement and almost 25 percent worked shifts in 2013 while night work has declined to around 15 percent of the workforce. Shift work is somewhat more common among women and is most common in the following professions: ship officer / pilot, nursing and care worker, nurse, police / guard and waiter professions. Night work is more prevalent among men than women (21% versus 13%).

Developments in the Norwegian labour market where many more jobs are in service industries and in particular within healthcare accounts for much of the increase in shift work (Aagestad et al., 2015).

Findings from the Level of Living Survey: Working Conditions (2009) showed that psychological exhaustion is the highest reported work-related health problem (17%) among Norwegian workers. Other reports also show that the share of disabled pensioners related to psychological risk has increased over the last 15 years and there is an increase in people who seek treatment due to psychological illnesses (Norwegian Institute of Public Health, 2011). Furthermore, a study by Ljoså, Tyssen and Lau (2011) on mental distress among shift workers in the Norwegian offshore industry found that psychosocial work factors such as quantitative demands, support, and shift work-home interference were independently associated with mental distress.

For Norway "The Factbook 2015" published by the Norwegian institute of Occupational Health (STAMI) provides an overview of the current status related to psychosocial risk factors and health (Aagestad et al., 2015). Mental health is a key factor for participation in working life. In STAMI's "The Factbbook" 2015 it is reported that in 2012 people with mental health conditions accounted for 28 per cent of all new disability pension recipients, and 20 per cent of all doctor-reported sickness absence in 2014 was caused by mental health conditions (Aagetstad et al., 2015). Furthermore, they argue that there is nothing to suggest that the prevalence of mental health issues and conditions has increased or decreased in Norway in the last few decades. Newer research in Norway has shown that around one quarter of all cases of mental problems amongst the working population is linked to psychosocial and organisational risk factors at work. Factors that are particularly important are low levels of decision latitude, role conflicts, high emotional demands, bullying/harassment and lack of job security (Aagestad et al., 2015).

It is interesting to note that even though the awareness level with regards to psychosocial risks is increasing among companies there is still widespread lack of systematic management of this type of risk. This is confirmed in the results from the latest European Survey of Enterprises on New and Emerging Risks (ESENER, 2013). A similar argument is also presented by other experts (Leka, Jain, Zwetsloot & Cox; 2010; Leka, Jain, Iavicoli & Di Tecco, 2015). They concluded that although a common policy context in the area of psychosocial risk management has developed in the EU, there still exists great variation in the translation of these initiatives into practice in different EU member states. Furthermore, they highlight that evaluation in this area is sporadic, even though it could inform the way forward

as it concerns both policy and practice developments. Furthermore, the ESENER (2013) report highlights the fact that contextual factors, i.e. characteristics of the environment in which a company operates, are particularly important and have a strong influence on the extent to which firms take action on psychosocial risks and offer a potential route for improving psychosocial risk management across Europe.

In this regard, it is interesting to note that over the last year there seems to be a positive development with regards to the psychosocial working conditions at the workplace in Norway compared with the EU (National Institute of Occupational Health, 2015). More than nine out of ten in Norway and eight out of ten in EU are satisfied with the working conditions at work. Generally, Norway shares several similarities with the other Nordic countries and the Netherlands with regards to the psychosocial work environment. Sweden, Finland, Denmark and Norway are among the countries with the highest incidence of organisational changes, including the introduction of new processes and new technologies. Furthermore, Norwegian workers are also among those who are most likely to experience that they are involved and participate in the development of the organisation they work in. However, it should be noted that Norwegian workers are less likely to have been hit by the global financial crisis than many EU countries (National Institute of Occupational Health, 2015). Unlike several southern and eastern European countries, the share of people who work has increased in Norway and unemployment has remained stable during the five year period from 2005 to 2010. Compared to the EU with an average of 16% of workers experiencing job insecurity, only 10% of Norwegian workers experience job insecurity (National Institute of Occupational Health, 2015).

To provide more specific information about the oil and gas industry the next section will focus on this area specifically.

1.5 Oil and gas industry in Norway

The oil and gas industry in its current status as the key component of politics, society, and technology has its roots in the early 20th century. The oil and gas industry includes the global processes of exploration, extraction, refining, transporting (often by oil tankers and pipelines), and marketing oil and gas products. The largest volume products of the industry are fuel oil and gasoline (petrol). Oil is also the raw material for many chemical products, including pharmaceuticals, solvents, fertilizers, pesticides, and plastics. The industry is usually divided into three major value chains; upstream, midstream and downstream (Gundersen & Lundberg, 2014; The Norwegian Petroleum Directorate, 2016).

The midstream sector involves the transportation (by pipeline, rail, barge, oil tanker or truck), storage, and wholesale marketing of crude or refined petroleum products. The upstream

oil sector is also commonly known as the exploration and production (E&P) sector. Furthermore, the upstream sector includes the searching for potential underground or underwater crude oil and natural gas fields, drilling of exploratory wells, and subsequently drilling and operating the wells that recover and bring the crude oil and/or raw natural gas to the surface. The downstream sector touches consumers through products such as gasoline or petrol, kerosene, jet fuel, diesel oil, heating oil, fuel oils, lubricants, waxes, asphalt, natural gas, and liquefied petroleum gas (LPG) as well as hundreds of petrochemicals. Midstream operations are often included in the downstream category and considered to be a part of the downstream sector (Gundersen & Lundberg, 2014).

Oil is vital to many industries, and is of importance to the maintenance of industrial civilization in its current configuration, and thus is a critical concern for many nations, such as Norway. Oil accounts for a large percentage of the world's energy consumption, ranging from a low of 32% for Europe and Asia, to a high of 53% for the Middle East (Gundersen & Lundberg, 2014).

Before the discovery of gas at Groningen in the Netherlands in the late 1950s, very few people believed that the Norwegian continental shelf (NCS) might conceal rich oil and gas deposits. The discovery in the Netherlands led to enthusiasm where energy consumption to a large extent was based on coal and imported oil. As part of this development, the attention was drawn to the North Sea. In 1963, the Norwegian government proclaimed sovereignty over the NCS. New regulations determined that the State owns any natural resources on the NCS. The same year, companies got the possibility to carry out exploration. The licenses included rights to perform seismic surveys, but not drilling. Even though Norway had proclaimed sovereignty of large offshore areas, some important clarifications remained on how to divide the continental shelf, primarily with Denmark and the UK. Agreements with Denmark and UK regarding the division of the continental shelf in accordance with the median line principle were reached in 1965 (The Norwegian Petroleum Directorate, 2013).

With the Ekofisk discovery in 1969, a significant oil field was discovered on the NCS and as such the Norwegian oil adventure really began. Production from the field started on 15 June 1971, and in the following years a number of major discoveries were made. The shelf was gradually opened, and only a restricted number of blocks were awarded in each licensing round. In the initial phase foreign companies dominated the exploration of oil and gas in Norway, and they were responsible for developing the country's first oil and gas fields (Kvendseth, 1990). Statoil was created in 1972, and the principle of 50% state participation in each production license was established. However, this rule was later altered, which meant

that the Norwegian parliament can evaluate whether the level of state participation should be lower or higher, depending on circumstances (The Norwegian Petroleum Directorate, 2013).

Since the late 1960s a large-scale industry has emerged and oil and gas production is currently Norway's largest industry. As such, the petroleum activities have contributed significantly to economic growth in Norway, and to the financing of the Norwegian welfare state (Moen, 2004). In 2012, the petroleum sector accounted for 23 percent of value creation in the country. Norway's oil and gas resources belong to the Norwegian society and are managed for the maximum benefit of present and future generations (The Norwegian Petroleum Directorate, 2016). Today, about 50 Norwegian and foreign companies are active on the shelf. The current oil production and its importance for the Norwegian economy are immense. The petroleum sector is Norway's largest industry with 76 fields in production, 16 fields under development and 84 fields undergoing evaluation (Hansen & Rasen, 2012; The Norwegian Petroleum Directorate, 2016).

Companies operating on the Norwegian oil and gas industry (both offshore installations and onshore plants) are involved in a broad range of activities onshore, offshore and in projects (Norwegian Petroleum, 2016). The jobs in the oil and gas industry have both "white collar" and "blue collar" workers, with operations in both Norway and other countries across the globe. Due to the wide range of activities and involving many different types of jobs, the operations may involve several occupational hazards that can be stressful (Hellesøy, 1985). Most oil and gas companies that have employees working offshore at the installations also have employees working onshore at plants and/or in more classical office situations and in projects. Furthermore, the administration personnel supporting the offshore installations are also located onshore, together with specialists and suppliers. Production workers onshore at the plants have similar education and tasks as offshore employees; however, they normally work 8-hour shifts, and follow a rotation schedule.

The oil and gas installations related to the petroleum industry in Norway are located 40 to 185 miles from the coast. An offshore installation is not as other workplaces. The employees working on installations are transported to and from their workplace with a helicopter, where they stay for the duration of their shift or task to be performed. The activities on a platform are continuous for 24/7 – night and day. Employees usually work a 12-hour shift over a two-week period (Hellesøy, 1985). In practice this entails two weeks where they spend most of their time with their colleagues. As a result, people offshore usually form very tight bonds with their co-workers. The nature of work offshore, i.e. shift rotation, sets specific requirements to the organisation, management and design of work. There are also several professions needed on

an installation, such as industrial and automatic control mechanics, electricians, logistic personnel, crane operators, drillers, mud engineers, well-service crew and mechanics. In addition, there are also administrative personnel, service workers and cooks. The shift rotation requires manning with three crews which means that several employees offshore must report to more than one manager. The managers have the same schedule as the other offshore workers (2 weeks on, 4 weeks off work schedule), but because the crew alternates on different days, they may not be replaced at the same time (Bergh, et al. 2016).

Offshore oil installation activity involves a range of accident risks including fires, falling objects, hydrocarbon leakages and explosions. When errors are made in these workplaces, the consequences can be devastating (Deacon, Amyotte, Khan, & MacKinnon, 2013). Offshore workers are exposed to a number of physical and psychosocial stressors, including cramped physical environments, long work shifts, isolated location, noise, vessel motion, heavy physical work, hazardous work operations and lack of privacy (e.g. Chan, 2011; Gardner, 2003; Haward, Lewis, & Griffin, 2009; Hoffmann & Stetzer, 1996; Mearns, Flin, Gordon & Fleming 2001; Moen, 2004; Niven & McLeod, 2009; Parkes, 2012).

These rather challenging work environmental conditions have a potentially adverse influence on well-being and health. For example, researchers such as Flin, O'Connor and Crichton, (2008) have through their work demonstrated that stress can severely affect workers' performance in a negative way, both with respect to efficiency and with respect to accuracy. A recent report (Hansen et al., 2011) also points out that conflicts may influence job performance. They show how conflicts can affect interpersonal relationships at work, such as communication patterns between employees, which may be a threat to safety. Stress has also been associated with lower levels of work situation awareness for drilling personnel on oil and gas installations (Sneddon, Mearns & Flin, 2013). On the other hand, there are also several beneficial work environmental factors at offshore oil and gas installations. Personnel spend much time with co-workers with the potential for building social relationships. They have long periods off work and they often have several benefits such as good-quality food, good fitness facilities and movie theatres, and for many the work pace is moderate. In addition, the work can be perceived as meaningful as the personnel work at the sharp end, seeing the immediate connection between their effort and the result—obtaining the oil and gas from the reservoir. These aspects may positively influence well-being, engagement and health among workers.

We have now explored the Norwegian context where this research was conducted. The next section of this chapter will examine more closely the various types of impact of the

psychosocial work environment and will present studies from the oil and gas industry and Norway in particular where possible.

1.6 Impact of psychosocial risk factors

Psychosocial work environment research has grown considerably over recent decades. An extensive number of articles have been published on psychosocial risk and how it effects health (e.g. cardiovascular disease and musculoskeletal pain) (Bache, 2012; Bourbonnais & Mondor, 2001; Bugajska, Zolnierczyk & Jedryka-Goral, 2011; Neylon et al., 2013; Neupane et al., 2013; Pikhart & Pikhartova, 2015; Sterud, Johannessen & Tynes, 2014), mental disorders (e.g. depression and anxiety) (Adriaenssens, De Gucht & Maes, 2015; Bakker, Demerouti & Sanz-Vergel, 2014; Gherardi-Donato, Cardoso, Teixeira, Pereira & Reisdorfer, 2015; Havranek, Bolliger, Roos, Pryce, Quendnow & Seifritz, 2015; Park, Min, Chang, Kim, & Min, 2008), and behavioural health (e.g. smoking behaviour) (Slopen, Williams, Mujahid, Lewis, Bennett, Ryff, & Albert, 2012; Slopen, Kontos, Ryff, Ayanian, Albert & Williams, 2013). For review studies that cover all of these topics see Leka and Jain, 2010; Gilbert-ouimet, Trudel, Brisson, Milot and Vezina, 2014; and Landsbergis, Grzywacs and LaMontagne, 2014. We will now look at this impact in more detail focusing on specific psychosocial risk factors.

The psychosocial factor job content, which includes such areas as problem-solving, quality of work and learning new things, has the potential to be hazardous if not managed well. Employees who experience conflicting demands, low value of work and lack of opportunity to learn new things may experience work-related stress and/or ill-health (Cox, Griffiths & Rial-González, 2000; Leka & Jain, 2010). Research has shown that employees that reported imbalance between efforts and rewards had higher risk for developing emotional exhaustion, psychosomatic health problems, physical health problems and job dissatisfaction (de Jonge, et. al., 2000). Furthermore, Hoogendoorn et al. (2002) found that high qualitative demands and conflicts between the demands put on employees increased the risk of back pain.

In a workplace setting, dealing with workload and work pace can be stressful and can cause ill-health. There are three aspects of workload that can be stressful: 1) Quantitative workload or overload are situations where employees have more work to do than can be accomplished comfortably; 2) Qualitative workload entails conditions where work or tasks are too difficult; 3) Underload means being in a work situation where the worker's skills and abilities are not utilized (Cox, Griffiths, & Rial- González, 2000; Frankenhauser & Gardell, 1975; French & Caplan, 1970; Jones et al., 1998; Lundberg & Forsman, 1979). In the literature, workload has been linked to a number of problems, including anxiety, fatigue, backache, headache, cardiovascular and cerebrovascular disease (Cox, Griffiths, & Rial-González, 2000a; Jones et

al., 1998; Leka & Jain, 2010). In a recent publication by the Norwegian Institute of Occupational Health it is reported that around 16 percent, the equivalent of about 400,690 employees, report that they have a stressful work situation in terms of demanding jobs in combination with low job control. This is particularly prevalent in the health and social professions, and customer service occupations (Aagestad et al., 2015).

Workpace is the speed that work has to be done at including the control the employee has with regards to the pacing (Cox, Griffiths & Rial-González, 2000). Research has indicated that there is a strong link between machine- and systems paced work (particularly if of high rate) and health (Bradley, 1989). Schriber and Gutek (1987) have identified a number of temporal dimensions that can be measured in organisational settings. Often time urgency is seen as a property of the person. This view however may not be sufficient because it may in fact also be an issue linked to the job itself (Leka & Jain, 2010).

The possible effects on health due to various aspects of work schedules, including long work hours and shift work have been investigated for many years (Lie et al., 2014). Van der Hulst published in 2003 a literature review that concluded that there is a high likelihood that overtime (long working hours) is linked to reduced immune system capacity and reduced noradrenalin and increased blood sugar levels. The link between overtime and reduced sleep is also well documented (van der Hulst, 2003), particularly when work hours exceed 50 hours per week (Harma, 2003). Overtime is linked to reduced general well-being (Caruso et al., 2004; Chen, Verona, Chiu, & Ware, 2008; Kodz, 2003; Lie, et al., 2014; Taris, et al., 2008; Taris, et al., 2011).

Today there is good documentation of the correlation between overtime and heart attack (Caruso, et al., 2004; Kivimaki, et al., 2015; Leka & Jain, 2010; Spurgeon et al., 1997; van der Hulst, 2003; Virtanen, Heikkila & Jokela, 2015;). In the literature there are different definitions of what is considered overtime (Liu & Tanaka, 2002; Spurgeon et al., 1997; Sokejima & Kagamimori, 1998). For example, Liu and Tanaka defined overtime as >61 hours per week (Liu & Tanaka, 2002) while Spurgeon defined overtime as >50 hours per week (Spurgeon et al., 1997). In a recent systematic review and meta-analysis of published and unpublished data for 603,838 employees, it was found that employees who work long hours have a higher risk of stroke than those working standard hours. The cumulative effect of increased working hours is having an important effect on the lifestyle of a large number of people, which is likely to prove damaging to their mental well-being. A Mental Health Foundation survey found that one third of respondents feel unhappy or very unhappy about the time they devote to work and more than 40% of employees are neglecting other aspects of their life because of work, which may

increase their vulnerability to mental health problems. Furthermore, when working long hours, more than a quarter of employees feel depressed (27%), one third feel anxious (34%), and more than half feel irritable (58%) and the more hours you spend at work, the more hours outside of work you are likely to spend thinking or worrying about it (Mental Health Foundation, 2015). A Norwegian study on living conditions reported that above 60 percent experienced high job demands in the form of heavy workload and high tempo. In the same study women reported higher job requirements than men. High job demands were perceived particularly among those with higher education in the healthcare sector such as nurses and doctors and among leaders but also among several other professions (Aagestad et al., 2015). In recent years, job insecurity and the adverse effect on coronary health has also been studied. Ferrie et al. (2013) investigated the association between job insecurity and incident coronary heart disease. The results from the investigation suggested that job insecurity may adversely affect coronary health.

These findings suggest that more attention should be paid to the management of vascular risk factors in individuals who work long hours (Kivimaki et al., 2015). Even though several studies have found that high job strain seem to increase the risk of cardiovascular mortality it should be noted that some studies have also been able to demonstrate a positive association (e.g., Belkic et al., 2004; Kivimäki et al., 2012; Schnall et al., 2000).

Research also indicates a potential link between job demands, work-related stress and musculoskeletal disorders (Burgajska, Zolnierczyk & Jedryka-Goral, 2011; Neupane, et al., 2013; Sterud, Johannessen & Tynes, 2014). For example, high quantitative demands may increase the risk of neck pain (Andersen et al., 2008; Hannan et al., 2005). Furthermore, Sterud and Tynes (2014) explored work-related psychosocial and mechanical risk factors for low back pain in a 3-year follow-up study of the general working population in Norway and found that highly demanding jobs, prolonged standing and awkward lifting appear as the most consistent and important predictors of low back pain. Another study found that reducing time pressure had a significant positive effect on employees' arm and hand pain, whereas using a keyboard and mouse had no effect (Lassen et al., 2005).

Control is usually divided into two dimensions: 1) autonomy, and 2) involvement and participation. Autonomy includes employees' control over their own work tasks. In the literature this is also called "decision latitude" (Karasek & Theorell, 1990; Leka & Jain, 2010; Sauter et al., 1989; Terry & Jimmieson, 1999). Involvement and participation include the possibility to participate in decisions that are important for one's own work situation or tasks (Leka & Jain, 2010). Eriksen et al. (1999) showed that low control over the work situation increases the risk

of neck pain. Results from the Whitehall II study found that low control in the work environment is associated with an increased risk of future coronary heart disease among men and women employed in government offices. The cumulative effect of low job control assessed on two occasions indicated that giving employees more variety in tasks and a stronger say in decisions about work may decrease the risk of coronary heart disease (Bosma, et al., 1997; Steptoe & Willemsen, 2004). Berthelesen, Pallesen, Bjorvatn and Knardahl (2015) found that job control was associated with mental distress for employees onshore and offshore. There is strong evidence that lack of control with regards to time pressure is very important to both psychological and physical health (Bond & Bunce, 2003; Bond & Flaxman, 2006; Choi, et al., 2011; Joensuu, et al., 2010; Rugulies et al., 2006; Smith, 1995; Vaananen, et al., 2008).

In a report recently published by the Norwegian Institute of Occupational Health it was reported that low job control is a risk factor for back pain, psychological distress and ill-health (Aagestad et al., 2015). Results showed that 25 percent report that they experience low control in terms of limited possibility to influence their own work pace, how the job tasks will be executed and which tasks to be performed. Low control was reported more frequently by women than men (32% vs 19%) and particularly in the service industry (waiter, customer service professionals), health care personnel, and professional drivers. On the opposite side of the scale it seems that managers have a high degree of decision latitude. It is especially the combination of high job demands and low control that represent a health risk. This unfortunate combination is particularly found in healthcare professions and within the service industry (Aagestad et al., 2015).

Foss et al. (2011) explored the impact of workplace risk factors on long-term musculoskeletal sickness absence: a registry-based 5-year follow-up from the Oslo health study and found that there is a significant relationship between musculoskeletal sickness absences and heavy physical work, low job control, low support from superior, and having shift/night work. Research has also shown that tasks perceived as meaningful and challenging in a positive manner may reduce the risk of sick leave due to neck and back pain (Bergström et al., 2009). Furthermore, a study by Ariens et al. (2002) demonstrated that both low and medium control (decision authority) triples the risk of neck-related sick leave. The combination of high quantitative demands and low control may increase the risk of neck-shoulder pain (Andersen et al., 2008; Hannan et al., 2005).

Psychosocial workplace factors, such as job demands, job control, and social support also have an impact on organisational performance indicators such as sickness presenteeism. Situations where employees, in spite of being sick, attend work is in the literature commonly

referred to as sickness presenteeism (Aronsson & Gustafsson, 2005; Caverley, Cunningham, & MacGregor, 2007; Johns, 2010). Over the recent years there has been a growing attention to this phenomenon in occupational health research. Furthermore, a growing body of literature suggests that sickness presenteeism can impair employee health, leading to outcomes such as poor general health (Aronsson, Gustafsson, & Mellner, 2011; Gustafsson & Marklund, 2011), increased risk of heart disease (Kivimäki et al., 2015), and future sickness absenteeism (Bergström, et al., 2009; Hansen & Andersen, 2009). Research results have shown that job demands such as a high level of responsibility (Gosselin, Lemyre, & Corneil, 2013), job stress (Elstad & Vabø, 2008), time pressure (Hansen & Andersen, 2008), and organisational change (Saksvik, 1996) are linked to sickness presenteeism. Studies also suggest that perception of low control and limited support from colleagues are related to sickness presenteeism (Gosselin, Lemyre, & Corneil, 2013; Leineweber et al., 2011). A recent study by Rostad et al. (2015) explored how psychosocial workplace factors in the workplace impact sickness presenteeism, sickness absenteeism, and long-term health. Results from the study confirmed that all dependent variables were associated with attendance pressure in the form of censure pressure. Furthermore, sickness absenteeism and long-term health were also related to moral pressure.

Social interactions include amount and quality of the interactions with others in the organisation. The behaviour of people in the workplace is greatly affected by their social interactions. As such, social support refers to interactions with colleagues and managers and it comprises having meaningful and constructive support or promise of support (Beehr & Newman, 1978; Danna & Griffin, 1999; Davidson & Cooper, 1981; Leka & Jain, 2010; Warr, 1992). Reviews have identified support from co-workers as a potential positive factor for health (Stansfield, 2006) and studies have shown that those with lower levels of social support have higher rates of different diseases (Cox, Griffiths, & Rial-González, 2000a; Leka & Jain, 2010). A Swedish study found that high social support reduced the risk of sleep problems (Åkerstedt et al., 2002). Another study conducted by a European research group showed that workers that experience both high job demands and low control at work have 23% higher risk of developing cardiovascular disease (Kivimäki et al., 2012). Furthermore, Berthelesen, Pallesen, Bjorvatn and Knardahl (2015) found that support from co-workers and immediate superiors were associated with mental distress for employees onshore and offshore. Interpersonal relationship issues also cover issues such as bullying and harassment. A Japanese study of 1161 male office workers found that sleep problems were associated with a high conflict level at the workplace, and low job satisfaction (Nakata et al., 2004).

Indeed, as previously discussed, an increased number of empirical evidence over the last years shows that interpersonal problems such as bullying and harassment at the workplace is an important problem, affecting not only the ones being bullied, but also the organisation and society at large. A recent study by Vignoli, Guglielmi, Balducci and Bonfiglioli (2015) looked at workplace bullying as a risk factor for musculoskeletal disorders and the mediating role of job-related psychological strain and found that work-related strain mediates the relationship between bullying and musculoskeletal disorders considered (low back, upper back, and neck) except for musculoskeletal disorders of the shoulders. Results from newer prospective research in Norway showed that bullying has a clear effect on psychological health (Glambek, Skogstad, & Einarsen, 2015). A Norwegian study from 2013 measured the factors bullying, sexual harassment, threats and violence. Results showed that 3 percent reported being bullied. Professionals working within the service industry, healthcare industry and the police experienced somewhat more bullying than average. 47 percent reported that they were subjected to unwanted sexual attention once a month or more with high incidence in service industry, including healthcare workers. 7.5 percent report that they have been subjected to violence or threats of violence. It is particularly occupational groups such as social workers, police and healthcare workers and nurses who are exposed (Aagestad et al., 2015).

Within research related to burnout, researchers have explored the determinants and prevalence of burnout in nurses and found that job demands, job control, social support and exposure to traumatic events are determinants of burnout, as well as several organisational variables (Adriaenssens, De Gucht & Maes, 2015). Burnout can be defined as a state of physical, emotional and mental exhaustion that results from long-term involvement in work situations that are emotionally demanding (Schaufeli & Greenglass, 2001). In 2013 it was reported that 16 per cent, i.e. approximately 406,700 employees in Norway, experience high emotional demands at work. Emotional demands are far more prevalent among women (23%) than men (10%) and especially among women aged 25-34. More than 40 per cent in the health care professions and police, experience a high degree of emotional demands of the job (Aagestad et al., 2015).

Maslach and Jackson (1981) described burnout as the result of chronic stress (at the workplace) which has not been successfully dealt with. This state is characterized by exhaustion and depersonalization (negativism/cynicism) and was found mostly in health services professions, such as social workers, teachers, nurses, doctors, dentists. Over the years many articles have been published on stress and burnout and how they correlate with ill-health (Adriaenssens, De Gucht & Maes, 2015; Bakker, Demerouti & Sanz-Vergel, 2014;

Cox et al., 2000; Leka & Jain, 2010; Maslach, Schaufali & Leiter, 2001; Schaufeli & Enzmann, 1998).

Role in the organisation is also an important factor with regards to employee health and well-being. It relates to the social interplay and interactions between employees in an organisation (Leka & Jain, 2010). Role conflict is incompatibility of different tasks in the same role, often arising when the priorities of one system come in conflict with the priorities of the other systems. Role conflicts usually come from incompatible demands made by people who have a stake in the role, incompatible pressures arising from the employee's membership in multiple groups, opposing pressures from different role senders, and a conflict between personal values and prescribed role behaviour (French & Caplan, 1970; Kahn et al., 1964; Lund et al., 2005). Studies in Norway have shown that role conflict at work is a risk factor for musculoskeletal disorders, mental illness and sick leave (Aagestad et al., 2015). For example, a study in 2013 showed that nearly 9 percent, i.e. approximately 223,170 employees, experienced high levels of role conflict at work (Aagestad et al., 2015).

Role ambiguity is lack of clarity on one's job profile. This means that the employee is confused about his or her role or tasks. Role ambiguity can be caused by various aspects. Some examples are: lack of information regarding employee's job tasks, lack of or poor communication of available information; or being exposed to contradictory messages regarding the employee's role profile (French & Caplan, 1970; Ingersoll et al., 1999; Jackson & Schuler, 1985). Furthermore, over the years researchers have identified other aspects of role that can have a negative impact of workers health. Examples of this are aspects such as role overload and role insufficiency (Leka & Jain, 2010). In a report by the National Institute of Occupational Health in Norway results showed that role conflict, emotional demands and low management support impact the company's sickness absence levels (over 40 days). These factors explained a total of almost 15 per cent of long-term absence. In their studies role conflict occurs when employees have conflicting requirements from two or more people, when employees do not have the resources to perform the task, or when employees must solve a task differently then they themselves might think is right (National Institute of Occupational Health, 2015).

According to a report from the European Agency for Safety and Health at Work (2014), the issue of poor work–life balance is a growing concern affecting more and more workers. Changes in work organisation, such as a higher demand for flexibility, new work arrangements; higher demand for mobility in the labour market and intensification of work may lead to higher pressure on workers and to a spill-over into private life. In addition, changes in the

characteristics of the workforce, which includes more women at work, single parents and households with 'dual careers', with less family support and in some cases with more dependent older relatives, result in more workers for whom a good work–life balance is all the more important. Failure in achieving a decent work–life balance may lead to stress and other health consequences for workers (EU-OSHA, 2007, 2014b). In a recent report published by the Norwegian Institute of Occupational Health it is reported that it is more common to read and respond to work-related e-mail outside of business hours, and in fact 18 percent do this on a daily basis (22% among men and 13% among women). Sixteen percent keep updated on daily electronic information, such as blogs, social media, duty rosters and more. Far more employees find that they are being contacted outside working hours, or that they respond to their job via new technology in their spare time at least a few times a week. Nearly twice as many men feel that they are being contacted after office hours, and far more men than women answer emails or other work-related electronic information outside work hours. However, both men and women almost equally experience that job demands interfere with private life (Aagestad et al., 2015).

In today's society it is well known that obesity, smoking, and physical inactivity represent important and preventable health risks and they are often framed as the result of individual lifestyle choices. Typically, they are targeted through health promotion programmes that seek to motivate individual behaviour change. However, literature argues that working conditions themselves may also in fact contribute to individuals' unhealthy behaviours. For example, obesity has been linked with night work, long work hours, psychosocial job strain, and job insecurity (Lallukka, Lahelma, Rahkonen et al., 2008; Quist, et al., 2013). Physical inactivity during leisure hours has been associated with low decision latitude and frequent involuntary overtime (Brisson, et al., 2000; Choi, Schnall, & Yang, 2010). In some samples, smoking habits have been positively correlated with high job demands and job strain and negatively with resources at work, social support from co-workers and supervisors, and low social capital at work, a construct that overlaps with both social support and participation in decision-making (Albertsen, Borg, & Oldenburg, 2006). These previous findings were also confirmed in a recent study by Miranda, Gore, Boyer, Nobegra and Punnett (2015). In their study they found that workplace stressors were strongly associated with smoking, obesity, and physical inactivity, even among the lowest-status workers.

1.6.1 Impact of psychosocial risk factors in the oil and gas industry

Initiatives to improve safety and control hazards related to the oil and gas companies' overall risk picture have been evoked by large scale accidents and serious incidents. In the 1970's and early 1980's technological and safety challenges were the main focus. During this

period several serious accidents occurred; the most serious ones being the Alexander Kjelland breakdown (1980) where 123 people were killed and the Bravo Blowout (Ryggvik & Smith-Solbakken, 1997), which led to a high focus from both companies and authorities on health, safety and environment (HSE). This includes the prevention of ill-health due to the working environment as well as the prevention of major accidents. Knowledge about accident causation has resulted in the introduction of a whole string of risk management measures in order to promote health and safety. Actions to prevent accidents go hand in hand with making operations more reliable, which also have an impact on workers' health and well-being.

A survey by the Petroleum Safety Authority Norway of the risk scenario in petroleum activities – RNNP – shows that many health and safety indicators are moving in the right direction and points to improvements both offshore and onshore. In 2014, the major accident indicator was at its lowest level since the RNNP measurements began. Hydrocarbon leaks and well control incidents are among the main contributors to major accident risk (PSA, 2014b). Hydrocarbon (HC) leaks can be divided into three categories: gas leaks, liquid leaks or oil-gas leaks. Gas leaks have the highest potential for causing most damage due to spread of gas and the risk of explosion. HC leaks can have a great environmental impact causing damage to wildlife and ecosystems, and present a major risk for employees working on installations. In the Norwegian oil and gas industry, the number of leaks per year is documented by PSA in a yearly report called Trends in risk level in the Norwegian petroleum activity. Figure 1.6 presents the overall trends in the period 2000 -2015 (PSA, 2015). A reduction in the number of leaks is now being reported after a number of years of deliberate efforts within the industry (PSA, 2015).

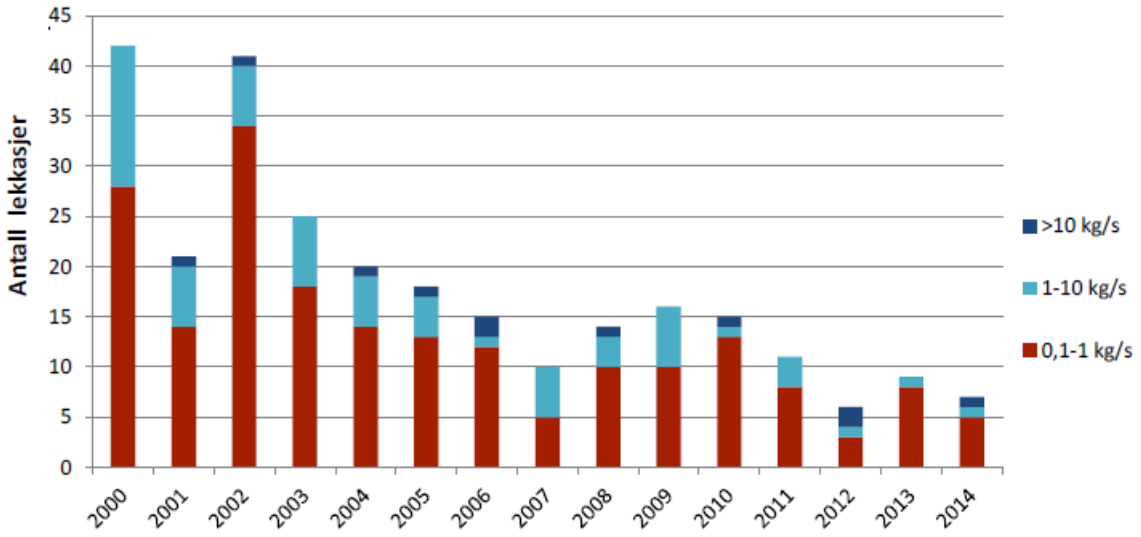


Figure 1.6: Overall trends for HC leaks (200-2014)

Source: Adapted from PSA (2015)

In 2014, seven hydrocarbon leaks were recorded on the Norwegian Continental Shelf and another seven onshore greater than 0.1 kg/s. This is the second lowest number recorded to date. None of the leaks had particularly major potential and, for the NCS, the risk contribution from hydrocarbon leaks was the lowest ever recorded.

With regards to serious personnel injuries, the Petroleum Safety Authority in Norway reports a downward trend in the frequency of serious personal injuries from 2006-2015. However, there was an increase in the injury rate in 2014 and 2015 (PSA, 2017). Furthermore, their reports also show that employees who have experienced reorganisations, including downsizing and restructuring, report higher risks of injury, health complaints and a poorer safety climate and psychosocial working environment. The analyses also indicate that the higher risk of injury reported by those affected by reorganisation in the petroleum industry as a whole may be related to a poorer safety climate and psychosocial risk (PSA, 2017).

Maintaining the present level of risk and achieving further improvements call for continuous commitment and attention. In order to improve, it is crucial that the industry is mindful to continuously develop its indicator models and implement new measures. Purposeful and continuous efforts are needed to achieve this aim (PSA, 2012, 2015).

There are a number of examples in the oil and gas industry where accidents are linked to underlying factors related to the organisation, design and management of work. One example is the loss of the Piper Alpha oil platform in 1988 with 167 deaths caused by poor

communication at shift handover compounded by leadership failures in 13 emergency responses (Cullen, 1990). Another more recent major accident is the explosion of the Deepwater Horizon drilling rig on April 20, 2010. The explosion killed 11 workers and injured 16 others. It caused the Deepwater Horizon to burn and sink, and started a massive offshore oil spill in the Gulf of Mexico (British Petroleum, 2010). Within the oil and gas industry the traditional way of approaching safety has been to focus on technical factors, such as the number of leakage sources (i.e. valves, flanges and various types of equipment), age, weight and overall technical condition of the platforms (Aven & Pitblado, 1998; Vinnem et al., 2006). The assumption is that the higher technical complexity of platform lay out and processing facility leads to increased risk of hydrocarbon leaks.

Over the last years a growing amount of research has explored the link between psychological factors, workers' stress and workers' injuries in oil and gas offshore work (Bergh et al., 2014c; Cricthon, 2005; Mathisen & Bergh, 2016; Mearns, Flin, Gordon & Fleming, 2001; OESI, 2016; Olsen, Næss & Høyland, 2015) and construction (Goldenhar et al., 2003; Omosefe, Craig, Laura & Fereydoun, 2009). As such, the knowledge on this topic is building on a broader tradition in high hazard industries/activities, especially from road and air transport, patient safety, and construction work, among others, where efforts have been made to link factors that are related to human performance with safety results (Bellamy & Geyer, 1988; Green et al., 1996; Helmreich & Foushee, 1993; Stanton, 1996). These factors span from macro level (e.g. organisational structures) to micro level aspects (e.g. design of control displays) (Stanton et al., 2005; Weick & Sutcliffe, 2007). During the last decade researchers have also found that changes in the work environment may contribute to a greater probability of occurrence of major accidents in major hazards plants affecting workers and the public, as well as the environment (Attwood, et al., 2006; Papadopoulos, et al., 2003; Georgiadou, 2001; Uth & Wiese, 2004; Zwetsloot et al., 2007).

Fatigue is an area that has provided important input in understanding the crucial role of psychosocial factors and stress on safety performance. For example, irregular working hours and over-time work may result in chronic fatigue. This again may be seen as a result of limited resting time between shifts and to work related stress (Caruso et al., 2006; Dong, 2005; Spurgeon, 2003). Furthermore, rotating shifts and, particularly night work cause sleep disorders (Rajaratnam & Arendt, 2001) leading to fatigue, decreased concentration and cognitive failure during work (Akerstedt et al., 2002; Boivin et al., 2007; OESI, 2016; Winwood et al., 2006). Research results have provided knowledge that have been important in establishing a link between the disruption of circadian rhythms, fatigue, sleep disorders, job insecurity and stress, which can lead to higher frequency of occupational accidents (Akerstedt

et al., 2002; Caruso et al., 2006; Kirschenbaum et al., 2000; Lilley et al., 2002; Nag & Patel, 1998; Rajaratnam & Arendt, 2001). For example, Folkard and Lombardi (2006) suggest that the risk of an occupational accident is 13% higher among workers on 10 hours shifts and 28% higher among workers on 12 hours shifts. Furthermore, Dembe et al. (2005) report an increase in occurrence of occupational accidents by 23% among employees working at least 60 hours per week.

Folkard and Tucker (2003) considered fatigue as encompassing both physical, mental and emotional stress and other behavioural aspects. Furthermore, they argued that all of these areas require further exploration if the extent of the experience of fatigue is to be understood. Both physical strain and workers mental or emotional state can cause disruption which further may lead to accidents. In the theory of distraction (Hinze, 1996) it is argued that factors such as time pressure to complete projects and one's mental state can distract the workforce from hazards and this increases the probability of accidents. This is also the argument in the 'constraints-response' theory by Suraji et al. (2001). This theory argues that project conditions, management decisions or emotional distress (dismal factors) can cause responses that create inappropriate actions (proximal factors) thus leading to accidents. Studies have highlighted the importance of line management and that a large proportion of site accidents were management-related (Pate-Cornell & Murphy, 1996; Zhou, 2007).

In a study by Mathisen and Bergh (2016) the role of engagement, emotional exhaustion and health complaints on action errors and rule violations was investigated. Two main hypotheses were explored (a) there is a positive association between emotional exhaustion and action errors/violations, and health complaints and reduced engagement mediates this relationship (the ''adverse pathway"); (b) there is a negative relationship between engagement and action errors/violations, and health complaints mediate the relationship (the ''beneficial pathway"). 653 offshore workers from two platforms responded to a survey measuring the study variables. Findings supported the hypotheses, except for the expected mediation of health complaints of the emotional exhaustion and action errors/violations relationship. Additional findings also showed that reported action errors and violations increased with reported overtime hours.

Some studies even argue that human error as a result of fatigue is the most dangerous (Folkard & Tucker, 2003). Lamond and Dawson (1999) argued that fatigue could result in performance impairment equivalent to, or greater than 0.1% of blood alcohol concentration, a level that is deemed unacceptable for driving a crane, or operating dangerous equipment. It is also four times more likely to contribute to workplace accidents than drugs or alcohol.

Stress has been linked with issues such as poor sleep quality, excessive drinking, feeling depressed, feeling anxious, jittery, inattentive etc. which, in turn, may result in people becoming momentarily distracted, making dangerous errors in judgement, and/or fail in normal activities (Hoffmann & Stetzer, 1996; Leka & Jain, 2010; Mearns, Flin, Gordon & Fleming, 2001; Payne, Bergman, Beus, Rodriguez, & Henning, 2009; Proctor et al., 1996). Job stress and perceived risk are factors that increase workload and increased workload can lead to increased stress a decrease in the ability to cope in dangerous situations. Hence, perceived risk is also a stressor for offshore workers (Parkes, 1998). Stress can reduce working memory capacity as well as attention (Hancock & Szalma, 2008). As a result, stress has been found to significantly reduce situational awareness (Sneddon, Mearns, & Flin, 2013). Further, stress offshore can take the form of physical pain in different body regions (e.g., musculoskeletal pain) (Chen, Yu, & Wong, 2005). For example, Flin et al. (2008) demonstrate clearly in their work that stress can severely impact workers' general achievement levels in a negative way, both with respect to efficiency and accuracy. Reports (Hansen et al., 2011) also highlight how conflicts may affect interpersonal relationships at work, such as communication patterns between employees, which may be a threat to safety. In the study by Chen et al. (2005), exploring the relationship of work-related stress and social support with health-related behaviours of smoking, alcohol usage and physical inactivity, among 561 offshore oil installation workers of a Chinese state-owned oil company, they found that that stress and social support was associated with health-related behaviours such as smoking, alcohol and physical inactivity (Chen et al., 2008). Furthermore, according to Parkes (1998), a total ban on alcohol on offshore installations is strictly enforced. Parkes (1998) revealed that current findings suggest that alcohol consumption among the offshore work force remains relatively high. Horsley and Mackenzie (1996), reported that 32% of offshore workers claimed to drink more than 21 units of alcohol a week, when compared with 24% of the general male population as reported by the Scottish home and health department.

Earlier it was described how Karasek (1979) explains job stress as a result of a combination of high demands, low control and low social support at work. It is also well documented that stress also affects employees' overall level of performance in a negative direction, both in terms of degree of efficiency and accuracy in work (Flin, O'Connor & Crichton, 2008). The simplest representation of this relationship is done by using the Yerkes - Dodson inverted U - curve. This is a classic model in a simple way describes how our overall performance level is rising in line with increased arousal, up to a point where we are performing optimally, but then rapidly decreases when the degree of arousal continues to increase. This relationship could also have implications for how safety in connection with an operation is

ensured, in particular a high level of stress could induce the poorer performers in the performance of safety-critical operations.

This relationship is supported by Mearns et al. (2001) in their study of human and organisational factors and their impact on safety on board 11 oil installations in the UK sector of the North Sea. The study clearly shows that the variable most likely to predict accidents and near misses on an oil installation is ' unsafe work practices'. This finding is congruent with other studies of similar context (Hoffmann & Stetz, 1996; Lawton, 1998). The number one predictor of 'unsafe work practices' turns out to be the employee having a perception of 'high production pressure'. It is important to note that it does not have to be an actual pressure present, as long as the employee has a perception that such pressure is present. It is the feeling of stress that can contribute to the uncertain performance of safety-critical operations. Stress as a result of high production pressure is directly related to work practices. It is therefore easy to see a correlation between being stressed as a result of perceived production pressures and doing critical errors at work. Ramvi (2003) showed a correlation between the quality of the psychosocial work environment and commitment to safety at work at two different oil installations in the North Sea. At both installations, there was a close relationship between three social conditions: respect/self-respect, team spirit and commitment/engagement to change and constructive work with safety issues. The factors discussed in Ramvi's (2003) research are related to the characteristics of the psychosocial work environment. Furthermore, Ramvi argues that a lack of psychological job demands may lead to employees becoming passive, routine oriented and lacking initiative. This situation will rarely, if ever, be good when promoting safety at work. Two other studies also support the observations that there is a relationship between psychosocial conditions and safety. In their research, Goldenhar, Williams and Swanson (2003) and Glasscock et al. (2006) showed a correlation between several stressors and safe work practices. In a recent study exploring the relationships between organisational factors and hydrocarbon leaks on offshore platform results showed that correlations with hydrocarbon leaks indicate that the organisational factors explored in this study can predict different levels of leaks (Bergh, et al., 2014c; Olsen, Næss & Høyland, 2015).

The results from other studies imply that non-physical stressors should be included as a potential input associated with injuries in injury risk models for construction workers. Petersen (1975) argue that the underlying root causes of accidents are multiple and do not only involve unsafe practices. He claims that unsafe practices are symptoms of the problem and that many other causes may contribute to an accident. For example, unsafe work conditions are symptoms of management oversight and lack of control, which can lead to a lowering of performance standards and subsequently to a chain of serious events. According to Liska et

al. (1993) the consequence of inadequate management control allows the existence of four groups of factors that contribute to accidents. These factors are personal factors; job factors; unsafe work conditions; and unsafe practices.

Even though stress has been shown to negatively affect performance (Cannon-Bowers & Salas, 1998; Driskell & Salas, 1996), there is little recognition of the effects of personal limitations (stress or fatigue) on personal performance. For example, when members of drilling teams were asked whether their personal performance was effected by stress and fatigue, over one third of the respondents agree that their performance is not affected when fatigued. When comparing the responses from aviation and medicine, the results for drilling team members (35%) are similar to those from aviation (26% agree), but medical personnel are more likely to deny the effects of fatigue on performance (59% agree) (Sexton, Thomas, & Helmreich, 2000). Understanding and acknowledging the effects of personal limitations, such as stress or fatigue, on performance can reduce the likelihood of error and increase the use of error management strategies (Sexton, Thomas, & Helmreich, 2000). This is perhaps particularly important because offshore drilling team members typically work a 12-hours shift system and sometimes working up to 18 hours during critical operations. Offshore personnel may also be required to work for long periods during critical operations. Furthermore, offshore team members may change as service personnel join regular team members because the operations require it. Similarly, experts may join the onshore team for short periods. Yet, respondents report that being fatigued, or working with less experienced personnel, does not affect their performance. As such, recognizing the effect of personal limitations is a topic that should be addressed by raising awareness of stress effects and integrating the topic of stress management into training interventions targeting human factors (Crichton, 2005). Training may be able to help educate employees about the limits of human performance (physically and mentally) under stress (OESI, 2016).

It is important to also consider the impact of physical hazards on workers' mental health (Leka & Jain, 2010). Overall, there is evidence to suggest that poor physical working conditions, in general, can affect both workers' experience of stress and their psychological and physical health (Bjerkan, 2010; Sauter, Lim, & Murphy 1996; Seo 2005; Warr, 1992). For example, in the oil and gas industry personnel at offshore installations may be exposed to physical stressors such as noise; vibration; poor lightning and ventilation; hazardous chemicals; confined living accommodation and work spaces; and adverse weather conditions. The severity of these stressors depends on installation design and construction, but also on occupation. Excessive levels of noise and vibration, independently and in combination have been found to be associated with impaired memory and learning (Hygge et al., 2003; Sherwood

& Griffin, 1990) and other aspects of impaired cognitive performance (Ljungberg et al., 2004; Seidel et al., 1990). Ratings of noise and other environmental stressors also correlate with measures of psychological well-being, and perceived workload may mediate these relationships (see Parkes, 1998). Physically demanding work and highly demanding jobs are potential risk factors for musculoskeletal disorders in the oil and gas industry. Research shows that musculoskeletal disorders are common for the offshore community (Chen, Yu, & Wrong, 2005; Morken, Mehlum & Moen, 2007). In a study by Chen et al. (2005) the relation between psychosocial factors and musculoskeletal pain in Chinese offshore oil installation workers were explored. Their study supported the accepted knowledge that exposure to psychosocial risk can lead to musculoskeletal disorders and suggested that in future studies of work related musculoskeletal disorders, psychosocial factors must be given due consideration.

Interestingly, even though the importance of human and organisational factors has been researched in the last twenty years, it has not always been regarded as crucial in the industry's safety work. In fact, despite growing awareness of the impact of psychosocial risks and related issues in the oil and gas industry, actions taken to manage psychosocial risks at the company level are limited and in many cases non-existent. This is largely due to the lack of industry specific information and knowledge on the actions required to manage such risks and mitigate their impact. While sharing knowledge of good practice is essential to promote action (e.g. Kramer & Wells, 2005), there are hardly any examples of good practice from companies in this sector in the area of psychosocial risk management. This emphasizes the importance of incorporating proactive psychosocial risk management into modern business strategy in the sector.

1.7 Conclusion

The focus for the studies conducted in this thesis was greatly influenced by the Norwegian context as well as research related to the psychosocial work environment. So, to show the foundations which these studies are built on, it was important to explore the following main areas in the first chapter: 1) the current situation with regards to the modern workplace and the emergence of new risks such as psychosocial risks and issues like work-related stress; 2) the working conditions in Norway and the Norwegian oil and gas industry in particular; and 3) the theories and research related to psychosocial risk factors and its impact on health and safety, also focusing on the oil and gas sector.

In order to further explore the basis/foundation for the studies in this thesis, chapter 2 will explore some of the main frameworks, standards and guidance that focus on managing the

psychosocial work environment that corporations use in their efforts to promote a robust and good psychosocial work environment.

2 Chapter: Putting theory to work

Over the last years several initiatives and projects have provided organisations with guidance, tools and methods in order to ensure good business practice related to the psychosocial work environment (BSI, 2011; Leka, Jain, Cox, & Kortum, 2011; WHO, 2010). On the other hand, researchers, international bodies and networks within occupational health psychology have also argued that there is a need to understand how research and best practices can be translated into companies' daily practice (ESENER, 2015).

For companies to successfully use theory and the frameworks launched by international projects and bodies, it is essential to re-interpret and adjust them to fit the language and systems of particular business contexts. If an organisation has a tradition of using risk management as a cornerstone in their decision-making process related to health and safety issues, it is important to use the same concepts when preparing the business case for managing the psychosocial work environment. For example, in the oil and gas industry the risk management of chemicals is a familiar concept, so when describing the business case related to the psychosocial risk management, the same terminology should be applied: identification of hazards, likelihood of developing ill-health and other outcomes, severity of exposure, mitigation actions, residual risk, etc.

As such, this chapter will explore today's resources (e.g. legislation, frameworks and standards) that companies have available in order to manage the psychosocial work environment in their business context. As such, risk management, being the fundamental principles and cornerstone of legislation and guidance for the promotion of health and safety at the workplace, will be addressed first. Furthermore, the relevant legislation and guidance at international and national level will be explored in more detail.

2.1 The concept of risk management

Risk management is often described as the identification, assessment, and prioritization of risks, followed by coordinated efforts to minimize, monitor, and control the probability and/or impact of unfortunate events or to increase opportunities (Hubbard, 2009). The ISO 31000 (2009) / ISO Guide 73:2002 definitions of risk also include the 'effect of uncertainty on objectives'. In this definition, uncertainties include events (which may or may not happen) and uncertainties caused by ambiguity or a lack of information. They also include both negative and positive impacts on objectives.

Risk management has over the years been applied to a wide range of areas and can be related to several sources such as: uncertainty in financial markets; threats from project failures; legal liabilities; accidents; natural causes and disasters as well as deliberate attack from an adversary; or events of uncertain or unpredictable causes. Over the years several risk management standards have been developed. Some examples are the Project Management Institute, the National Institute of Standards and Technology, and ISO standards (ISO 31000; ISO Guide 73:2002). The tools, definitions and aims used in these risk management standards seem to vary widely depending on the context, i.e. whether risk management is used as part of project management, security, engineering, industrial processes, financial portfolios, public health and safety. OHSAS (Occupational Health & Safety Advisory Services) defines risk as the combination of the probability of a hazard resulting in an adverse event, times the severity of the event (OHSAS 18001, 2007).

The use of risk management principles in occupational health and safety (OSH) has a long history (Cox & Tait, 1998; Hurst, 1998; Stanks, 1996). Risk management is an integral part of performing occupational health and safety audits. Within the field of health and safety it serves to identify and assess the risks derived from hazards and the implementation of appropriate action to reduce or even eliminate such risks. A hazard can be anything present in the workplace that has the potential to cause an injury to workers, either a work accident or an occupational disease. Examples of physical hazardous situations can be working on a ladder, handling chemical substances or walking on wet floor. Examples of psychosocial hazardous situations are job content, job insecurity, isolation, bullying or harassment, since employees' health is affected by their perceptions and experience about work organisation and other related factors (BSI, 2011). Occupational health and safety is subject to legal requirements in several countries, while in other countries there is no relevant legislation. At the European level, the European legislation clearly states that risk management should be used when preventing health and safety problems (EC, 1989).

Risk management is also an integral part of how Health Safety and the Environment (HSE) is managed in the oil and gas industry. According to HSE regulations, companies must analyse their own activities in detail to map how dangerous situations can occur and develop – and which consequences the various scenarios may have. Safety and contingency measures must be commensurate with the risk in each individual activity. The higher the risk, the more numerous and wide-ranging measures must be implemented. The design of facilities and plants, the choice of technical solutions with good inherent safety characteristics, and the choice of effective preventative measures in operation are included in the measures to prevent undesirable incidents (PSA, 2014).

Similarly, we see that over the years there has been an increased focus on integrating risk management principles in the area of psychosocial work environment (BSI, 2011). For example, Health circles were developed in Germany to enable the promotion of health at the workplace. The approach focused particularly on organisational and psychosocial factors (Aust & Ducki, 2004). Another example is the Work Positive pack with HSE's Management Standards which is an updated version of the "Work Positive stress management approach for SMEs". It includes the HSE Management Standards for Stress at Work and consists of tools that can assist companies in identifying and reducing the potential causes of stress (O'Connor, 2002).

There are also other good practice examples such as PAS1010 (BSI, 2011) and PRIMA-EF (Leka & Cox, 2008). These will be discussed in more detail later in this chapter. However, before exploring available international best practices, frameworks and standards any further, legislation related to psychosocial risks will be described and discussed.

2.2 European legislation on psychosocial risks

The European Union (EU) Framework Directive 89/391/EEC on Safety and Health of Workers at Work states the employer's general obligations to ensure workers' health and safety in every aspect related to work, addressing all types of risks. As such, psychosocial risk management is among the employers' responsibilities related to managing the work environment. Several policies and guidance, such as the Framework Directive, of relevance to the psychosocial work environment are available at the European level. A recent paper by Leka et al. (2015) looks more closely at the various legal requirements. In their study they identify a number of regulatory instruments and voluntary instruments that are of relevance or directly address psychosocial risks and mental health in the workplace. The regulatory instruments of relevance to psychosocial risks are listed in Table 2.1.

Table 2-1: Regulatory instruments

Directive 89/391/EEC the European Framework Directive on Safety and Health at Work
Directive 2010/32/EU implementing the Framework Agreement on prevention from sharp injuries in the hospital and healthcare sector concluded by HOSPEEM and EPSU
Directive 2003/88/EC concerning certain aspects of the organisation of working time (consolidates and repeals Directive 93/104/EC)
Directive 90/270/EEC on the minimum safety and health requirements for work with display screen equipment (fifth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 92/85/EC on pregnant workers, women who have recently given birth or are breast-feeding
Directive 94/33/EC on the protection of young people at work
C155 Occupational Safety and Health Convention (ILO), 1981
Directive 2000/78/EC establishing a general framework for equal treatment in employment and occupation
C 183 Maternity Protection Convention (ILO), 2000
C 181 Private Employment Agencies Convention (ILO), 1997
Directive 2006/54/EC on the implementation of the principle of equal opportunities and equal treatment of men and women in matters of employment and occupation
Directive 2002/14/EC establishing a general framework for informing and consulting employees in the European Community
Directive 2002/15/EC on the organisation of working time of persons performing mobile road transport activities
C187 Promotional Framework for Occupational Safety and Health Convention (ILO), 2006
Directive 96/34/EC on the framework agreement on parental leave
Directive 2000/43/EC implementing the principle of equal treatment between persons irrespective of racial or ethnic origin
Directive 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) [replacing Directive 89/655/EEC]
Directive 2008/94/EC on the protection of employees in the event of the insolvency of their employer (repealing Directive 2002/74/EC and Council Directive 80/987/EEC)

Directive 98/59/EC on the approximation of the laws of the Member States relating to collective redundancies
Directive 92/91/EEC - concerning the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling (eleventh individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 92/104/EEC on the minimum requirements for improving the safety and health protection of workers in surface and underground mineral-extracting industries (twelfth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 89/654/EEC concerning the minimum safety and health requirements for the workplace (first individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 89/656/EEC on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace (third individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 90/269/EEC on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers (fourth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
C175 Part-time Work Convention (ILO), 1994
Directive 97/81/EC concerning the framework agreement on part-time work
Directive 99/70/EC concerning the framework agreement on fixed-term work
Directive 2000/79/EC concerning the European Agreement on the Organisation of Working Time of Mobile Workers in Civil Aviation.
Council Directive 2001/23/EC on the approximation of the laws of the Member States relating to the safeguarding of employees' rights in the event of transfers of undertakings, businesses or parts of undertakings or businesses
Directive 2002/73/EC on equal treatment for men and women as regards access to employment, vocational training and promotion, and working conditions (amending Directive 76/207/EEC)
Directive 2009/38/EC on the establishment of a European Works Council or a procedure in Community-scale undertakings and Community-scale groups of undertakings for the purposes of informing and consulting employees (recast)
Directive 93/103/EC concerning the minimum safety and health requirements for work on board fishing vessels (thirteenth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
Directive 92/57/EEC on the implementation of minimum safety and health requirements at temporary or mobile construction sites (eighth individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

Directive 91/383/EEC supplementing the measures to encourage improvements in the safety and health at work of workers with a fixed-duration employment relationship or a temporary employment relationship

Source: Adapted from Leka, Jain, Iavicoli & Di Tecco (2015)

The regulatory instruments of relevance to psychosocial risks are valid to all EU member states. It should be noted that even though these regulations are relevant for psychosocial risk management, the terms mental health, work-related stress or psychosocial risk are not used directly in the majority of them. Even though the Framework Directive 89/391/EEC on Safety and Health of Workers at Work does not list the words psychosocial risk or mental health explicitly, it does state that employers must address and manage all types of risk at source and the European Social Partner Framework Agreement on Work-related Stress (2004) clarifies the relevance of the Framework Directive to work-related stress.

Apart from the regulations presented above, it is important to be aware that countries also have national regulations in order to address HSE and psychosocial risk in particular. The next section will look further into the Norwegian inspection authorities and legislation.

2.3 The Norwegian inspection authorities and legislation

Like all Scandinavian countries, Norway has a sound custom for employee-management cooperation and participation in the working environment. The “working life democratization” in Norway, which started in the 1960’s, has had great influence on the Norwegian working environment. This included the major revision of the Norwegian labour law in 1977 that will be discussed in more detail in the next section. The law specifically states that the working environment shall give employees full protection against physical and psychological hazards. Employees are also entitled to a meaningful job where they are encouraged to participate and take control over their working situation. This has also influenced Norwegian oil and gas companies’ health and safety efforts.

Oil and gas company credibility depends on safety being taken seriously at all levels of the organisation and throughout the supply chain. The companies operating on the Norwegian continental shelf are responsible for complex work processes which demand that well developed management systems are in place. Furthermore, due to the important role that the oil and gas industry plays in Norway and the welfare state, it is crucial that the operations offshore are both safe and reliable. Companies on the Norwegian continental shelf have to obey strict requirements set forth by regulators. In order to have a “licence to operate” offshore, the oil and gas industry have over the last decades continually worked with improving health and safety. This includes the prevention of major incidents as well as long-time exposure to a

poor working environment leading to ill-health (Det Kongelige Olje- og Energidepartement, 2003).

In Norway there are several inspection authorities that contribute to regulating and ensuring compliance with the laws and regulations for health and safety at the workplace. In this regard, two inspection authorities are particularly important; the Norwegian Labour Inspection Authority and the Petroleum Safety Authority Norway (Regjeringen, 2016).

2.3.1 Norwegian inspection authorities

The Norwegian Labour Inspection Authority is a governmental agency under the Ministry of Labour that focuses on occupational safety and health. The agency's overall objective is to contribute to a healthy working environment, safe and secure employment conditions and meaningful work for the individual. The Labour Inspection Authority requires enterprises to work systematically with health and safety, ensuring compliance with work environment laws and regulations. Laws and regulations are the foundation of all the Labour Inspection Authority's activities and they have administrative, supervisory and information responsibilities in relation to The Working Environment Act. The Working Environment Act applies to all land-based operations with employees. The employer is responsible for complying with the requirements of the Act, and for ensuring that the enterprise maintains a healthy and safe working environment. These responsibilities are explained and reinforced by the regulations relating to internal control. Supervision is done by conducting reviews of enterprises' internal control systems to reveal whether regulations and procedures are being followed or by performing intermittent tests to check whether internal control systems function well and that companies meet legal requirements (The Norwegian Labour Inspection Authority, 2016).

In addition, the Petroleum Safety Authority Norway (PSA) is an independent government regulator with responsibility for safety, emergency preparedness and the working environment in the Norwegian petroleum industry. The PSA sets the terms for health, safety, the environment and emergency preparedness in the petroleum sector. Furthermore, they follow up to ensure that industry players maintain high standards in this area, and thereby contribute to creating maximum value for society. The PSA regulatory authority covers both petroleum activities on the NCS and the petroleum-related plants and associated pipeline systems. This means that they serve as the regulator for technical and operational safety, emergency preparedness and the working environment in all phases of the petroleum industry, covering the initial planning of a development project and continuing through the design, construction, operation and possible removal phases. The PSA conduct audits in order to

ensure that the petroleum industry and related activities are supervised responsibly. Furthermore, the PSA supply information and advice to companies in the industry, encouraging appropriate collaboration with other HSE regulators nationally and internationally, as well as contributing actively in distributing knowledge about HSE to society at large (PSA, 2016b).

2.3.2 Norwegian Working Environment Act

The first labour legislation in Norway is from the late 1800s. The legislation has since then been through an extensive development and change in line with developments in society. The basis for the Norwegian worker laws were laid out in 1892 with the law on management of work in factories. This first law applied to industrial workers, but also other groups of employees had legal rights to their employers, for example, through the Mining Act of 1842. The purpose of labour legislation was to prevent accidents and health hazards in factories and other industries. To a large extent the protective measures related mainly to the protection against accidents and technical factors at the workplace. It was not until later that rules on working hours were introduced (Ministry of Labour and Social Affairs, 2015).

One example is the major revision of the labour law of 1842 and 1936 and the introduction of the Working Environment Act in 1977 which aims to secure good working conditions and equality in the workplace. More specifically the Act of 1977 aims at making sure that workplaces have good conditions of employment and treats workers with respect and equality; securing a working environment that promotes a healthy and meaningful working situation, including protection from physical and psychosocial hazards and has a standard of welfare that is consistent with the level of technological and social development of society; ensuring the workplaces are adopted to fit the individual employee's capabilities and life circumstances; providing a basis where employees in cooperation with the employer can develop and improve their working environment and promote inclusive working conditions.

The Norwegian Working Environment Act further stipulates that there must be a balance between the "working life" and the "private life". The main focus is that there has to be a possibility both to participate in working life and to have a "family life". As such, the Act established the right for all employees to have flexible working hours.

From 1977 the law covered virtually all workers and it clearly required employers to ensure a fully satisfactory work situation. Furthermore, it included rules that strengthened the employee's right to be involved in the workplace (i.e. safety delegates), reduced working hours, stronger rights and protection against dismissal and the right to have time off for sick leave or maternity leave. The revised law also introduced a new process for handling disputes related to dismissal and resignation (Ministry of Labour and Social Affairs, 2015).

Organisational and psychosocial work aspects strengthened exponentially. As such, the Act highlighted employees' right to be involved and that they are given the opportunity for personal and professional development. For example, when planning and arranging the work, emphasis shall be placed on preventing injuries and diseases. The organisation, design and management of work, working hours, pay systems, including use of performance-related pay, technology, etc., shall be arranged in such a way that the employees are not exposed to adverse physical or mental strain and that due regard is paid to safety considerations (Ministry of Labour and Social Affairs, 2015).

With regards to the organisation, participation and development in particular, the Act states that employers shall pay special attention to designing a working environment that enables the employee's professional and personal development through his or her work. Furthermore, the Act states that work shall be organized and arranged with regard for the individual employee's capacity for work, proficiency, age and other conditions. Furthermore, emphasis is placed on giving employees the opportunity for self-determination, influence and professional responsibility. During re-organisation processes that involve changes of significance for the employees' working situation, the employer shall ensure the necessary information, participation and competence development to meet the requirements of this Act regarding a fully satisfactory working environment (The Norwegian Working Environment Act 1977).

In 2006, extensive editorial changes in the Working Environment Act of 1977 were made. Prior to the release there were several areas that the government, politicians, trade unions, employers, press and other interest groups discussed. Some issues that were discussed were flexibility, use of temporary workers, working hours/overtime, protection against discrimination in general, autonomy, protection for whistle-blowers etc. Some of the changes in the law included new rules about flexible work schedules for part-time employees, information and consultation of employees and extended protection against dismissal during illness (Ministry of Labour and Social Affairs, 2015).

On 1 January 2013 a total of 47 regulations issued under Norway's Working Environment Act were replaced by just six, requiring a new way of searching these provisions. This change intended to provide a simpler overview of rights and duties under the Act by consolidating regulations which deal with the same conditions. Although the structure of the regulations was altered, their requirements remained by and large unchanged. A number of the regulations consolidated into the reduced set are also applicable to the petroleum sector – either directly or through incorporation in the health, safety and environmental regulations. The new

regulations basically apply to petroleum operations on the Norwegian continental shelf as well as to activities at the land-based plants. Provisions on the working environment must be complied with as an integrated part of the requirements in the overall HSE regulations for the petroleum industry.

2.4 Oil and gas specific requirements and legislation

Norway's regulations for petroleum operations offshore and on land are risk-based, and give great emphasis to principles for reducing health, safety and environmental (HSE) risk. The aim is to minimise the threat of accidents, personal injuries, occupational illness and environmental damage. The key regulations relating to HSE in the offshore petroleum industry and at land-based facilities subject to our supervisory authority are found in two sets of regulations, for HSE and the working environment respectively.

2.4.1 Health, Safety and Environment (HSE) regulations

Integrated and specific regulations for HSE in offshore petroleum operations and at certain land-based facilities are prepared and enforced jointly by the regulators for their respective areas of authority. These regulations consist largely of risk- and performance-based requirements. They regulate important aspects of HSE for the petroleum industry in an integrated and coherent manner. The regulations include the Framework regulations, the Management regulations, the Activity regulations, the Facilities regulations and the Technical and Operational regulations (PSA, 2016b).

The Framework regulations provide a framework for comprehensive and prudent activities, and contain provisions on such matters as: scope, responsible parties (assignment of responsibility), risk reduction principles, application of maritime regulations as an alternative to certain technical requirements in the petroleum regulations for mobile facilities and principles for HSE, including requirements for a good HSE culture (PSA, 2016b).

The Management regulations are enforced by the PSA as well as by the Norwegian Environment Agency and the health authorities. The regulations bring together all overall management requirements relating to HSE, and specify requirements for such aspects as: risk reduction, barriers, management elements, resources and processes, analyses and measurements, handling of nonconformities and improvements. In addition, they contain requirements relating to the material and information that must be submitted or made available to the regulators, such as applications for consent, notifications, statements and reporting (PSA, 2016b).

The regulations to conducting petroleum activities are issued and enforced by the PSA as well as by the Norwegian Environment Agency and the health authorities. These regulations govern the way various activities are conducted, and specify requirements for such aspects such as: planning and monitoring, operational preconditions for start-up and use, working environment factors, facilitating work, health-related factors, the natural environment, emergency preparedness, drilling and well activities, maritime operations, maintenance and manned underwater operations. These regulations also include a section on psychosocial conditions and state that "The employers shall ensure a good psychosocial working environment by considering conditions that can influence the employees' health, safety and welfare. Special emphasis shall be accorded the interaction between requirements for work performance, the employees' perception of control over their own work and social support in the working environment" (PSA, 2016b; The Activities Regulations, 2015).

The Facilities Regulations (2010) govern the design and outfitting of facilities, and specify requirements for such aspects as: robust solutions, safety functions and loads, materials, work and recreational areas, physical barriers, emergency preparedness, drilling and well systems and maritime facilities (PSA, 2016b). Furthermore, the Technical and Operational Regulations (2010) apply to land-based facilities. Their structure and content mirror the Facilities and Activities regulations. They are issued and enforced by ourselves and the health authorities (PSA, 2016b).

Certain rules pursuant to the Working Environment Act which apply to offshore activities are incorporated in the regulations. These relate to such matters as working hours, time off and offshore tours. The regulations emphasise the employee's right to be involved in all processes which may have an impact on HSE.

Guidelines have also been issued for the five sets of regulations. These are not legally binding. However, regulations ('hard' law) and guidelines ('soft' law) should be viewed jointly in order to obtain the best possible understanding of what the government wishes to achieve by their means. As such, the next section will focus on 'soft' law, non-binding instruments that have been developed to address the psychosocial work environment.

2.5 International frameworks and best practices

New frameworks, guidance and standards that directly refer to psychosocial risks and their associated problems have over the last years developed. This has been achieved through increased stakeholder involvement in the EU (Ertel et al., 2010).

The guidelines and best practice frameworks are based on the principles outlined in international guidelines on occupational safety and health management systems. In 2001, the International Labour Organisation (ILO) published ILO-OSH 2001, also titled "Guidelines on occupational safety and health management systems" to assist organisations with introducing OSH management systems (ILO-OSH, 2001). These guidelines encourage continual improvement in employee health and safety, achieved via a constant process of policy, organisation, planning and implementation, evaluation, and action for improvement, all supported by constant auditing to determine the success of OSH actions (ILO-OSH, 2001). The ILO management system was created to assist employers to keep pace with rapidly shifting and competitive industrial environments. In Table 2.2, the key voluntary instruments of relevance to psychosocial risks and mental health in the workplace that are applicable in the EU are presented (Leka et al., 2015).

Table 2-2: Voluntary standards and guidance

Guidance: EC, 1999 Guidance on work-related stress – Spice of life or kiss of death?
Guidance: EU-OSHA, 2002 How to Tackle Psychosocial Issues and Reduce Work-Related Stress
Guidance: WHO, 2008 PRIMA-EF: Guidance on the European Framework for Psychosocial Risk Management: A Resource for Employers and Worker Representatives
Guidance: ILO, 1986 Psychosocial factors at work: Recognition and control
Guidance: ILO, 2012 SOLVE approach
Guidance: WHO, 2003 Work Organisation and Stress
WHO Healthy Workplaces Framework, 2010 Healthy workplaces: a model for action: for employers, workers, policymakers and practitioners
WHO Mental health declaration for Europe, 2005 and Mental Health Action Plan for Europe
WHO European Mental Health Action Plan, 2013
Guidance: ILO, 2012 Stress Prevention at Work Checkpoints - Practical improvements for stress prevention in the workplace
EU High-level Conference, Brussels, 2010 - Investing into wellbeing at work: Managing psychosocial risks in times of change
Committee of Senior Labour Inspectors (SLIC), 2012 Campaign on psychosocial risks at work
Communication from the Commission COM(2014) 332 on an EU Strategic Framework on Health and Safety at Work 2014-2020

Framework Agreement on Work-related Stress, 2004 European social partners - ETUC, UNICE(BUSINESSEUROPE), UEAPME and CEEP
Communication from the Commission {SEC(2007) 214-216} Improving quality and productivity at work: Community strategy 2007-2012 on health and safety at work
EU-Conference, Berlin, 2011 - Promoting mental health and well-being in workplaces
EN ISO 10075-1: 1991 Ergonomic principles related to work-load – General terms and definitions
R194 revised annex, ILO 2010 Recommendation concerning the List of Occupational Diseases and the Recording and Notification of Occupational Accidents and Diseases
EN ISO 10075-2: 1996 Ergonomic principles related to work-load – Design principles
Opinion of the European Economic and Social Committee, 2013 on the European Year of Mental Health — Better work, better quality of life (2013/C 44/06)
Council of the European Union Conclusions, 2002 on combating stress and depression-related problems
European Pact for Mental Health and Wellbeing, 2008 Together for mental health and wellbeing
European Parliament resolution T6-0063/2009 on Mental Health, Reference 2008/2209(INI), non-legislative resolution
Green paper – EC, 2005 Improving the mental health of the population: Towards a strategy on mental health for the European Union
European Parliament resolution (2006/2058(INI) on improving the mental health of the population. Towards a strategy on mental health for the European Union
Guidance: WHO, 2007 Raising awareness of stress at work in developing countries: a modern hazard in a traditional working environment: advice to employers and worker representatives
Guidance: EU-OSHA, 2011 Workplace Violence and Harassment: a European Picture
Guidance: WHO, 2003 Raising awareness to psychological harassment at work
Charter of Fundamental Rights of the European Union (2000/C 364/01)
Guidance: ILO, 2006 Violence at Work
Communication from the Commission COM(2010) 682 An Agenda for new skills and jobs: A European contribution towards full employment
WHO Action Plan, 2012 for implementation of the European Strategy for the Prevention and Control of Non-communicable Diseases 2012−2016
Council of the European Union Conclusions, 2003 on Mental health – Conference on Mental Illness and Stigma in Europe: facing up the challenges of social inclusion and equity

Council of the European Union Conclusions, 2005 on a Community Mental Health Action – Outcome of proceedings
Opinion of the European Economic and Social Committee, 2005 on the Green Paper Improving the mental health of the population — Towards a strategy on mental health for the European Union (2006/C 195/11)
EC 2007 - White paper - Together for health - A Strategic Approach for the EU 2008-2013
Framework Agreement on Harassment and Violence at Work, 2007 European social partners - ETUC, BUSINESSEUROPE, UEAPME and CEEP
The Standing Committee of European Doctors (CPME) Position Paper, 2009 Mental Health in workplace settings "Fit and healthy at work"
Council Resolution 2000/C86/01, on the promotion of mental health
Mental and Physical Health Platform (MPHP) 2009 the Mental and Physical Health Charter and Call for Action
Recommendations from Mental Health Europe (MHE), 2009 Work Programme of the Spanish-Belgian-Hungarian Trio Presidency of the Council of the EU (2010 – 2011)
Recommendations of the European Parliament and of the Council, 2006 on key competences for lifelong learning
Council of the European Union Conclusions, 2011 on 'The European Pact for Mental Health and Well-being- results and future action'
Council Decision 2003/C 218/01, on setting up an Advisory Committee on Safety and Health at Work
Council Resolution 2000/C218/03, on action on health determinants
Council of the European Union, 2000 Lisbon Strategy: to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion
Council of the European Union Conclusions, 2001 on a Community strategy to reduce alcohol-related harm
Framework Agreement on Telework, 2002 European social partners - ETUC, UNICE (BUSINESSEUROPE), UEAPME and CEEP

Source: Adapted from Leka, Jain, Iavicoli & Di Tecco (2015)

An example of good practice guidance is the European Excellence Framework for Psychosocial Risk Management (Leka & Cox, 2008). The framework focuses on work-related stress and workplace harassment and was developed by the PRIMA-EF consortium consisting of institutions that have established substantive international reputations in the general area of occupational health and safety. Furthermore, they have expertise in all the key areas of

PRIMA-EF activities such as: psychosocial risk management; work-related stress; workplace violence, harassment, bullying and mobbing, occupational health and safety legislation, occupational health services, social dialogue, stakeholder engagement, SMEs, gender issues, ageing issues, occupational sector issues, indicators and monitoring, interventions, corporate social responsibility, strategic occupational health and safety management, business excellence, innovation, organisational learning, and the economic discourse of the work environment (management) and networking.

The development of PRIMA-EF was a stepwise process that included an evaluation of the different aspects of the risk management process, establishment of an inventory of best practice and a comprehensive review and analysis of psychosocial risk management across Europe (Leka, Jain, Cox, & Kortum, 2011). The review conducted was particularly concerned with identifying best practice models that utilized the whole risk management cycle. The PRIMA-EF model, including the best practice principles, was built on a critical assessment and harmonisation of methods in EU that have shown to be effective in managing psychosocial risks at the workplace. A number of practical tools such as factsheets, guidelines and inventories of best practice in psychosocial risk management have been developed. The PRIMA-EF model (see Figure 2.1) that has been established is meant to provide support to both the enterprise level and the governmental level. The framework aims at accommodating all existing psychosocial risk management approaches across the EU and be used as a comprehensive, overarching framework for the harmonisation of practice and methods in the area of psychosocial risk management. Furthermore, since the establishment of the PRIMA-EF model there has been an increasing interest from other countries outside the EU, such as Japan (Leka, Jain, Cox & Kortum, 2011).

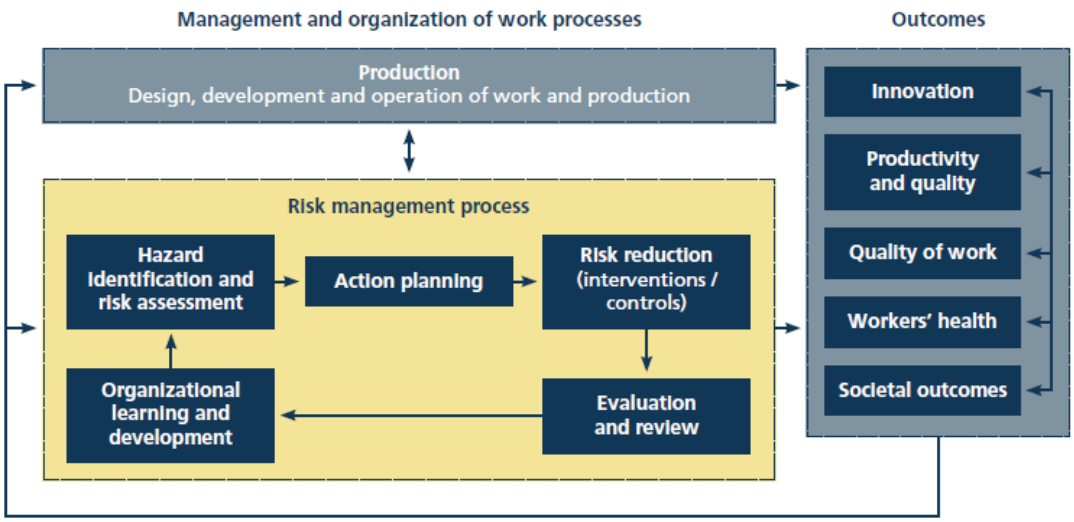


Figure 2.1: PRIMA-EF model for the management of psychosocial risks

Source: Adapted from Leka & Cox (2008)

As a follow-up of the establishment of the PRIMA-EF it was decided to develop a standard for psychosocial risk management in order to harmonize several approaches across the EU. This was seen as important because the voluntary standards such as OHSAS 18000 and the ILO-OSH 2001 do not make specific reference to the psychosocial work environment. This may lead to organisations lacking the practical support in order to implement an effective way to manage psychosocial risk. As such, a group of key stakeholders, including the PRIMA-EF consortium, WHO, EU-OSHA, the European Trade Union Confederation, and the UK Engineering Employers Federation together with the British Standards Institution worked on the development of a Publicly Available Specification (PAS) for psychosocial risk management (Leka, Jain, Widerszal-Bazyl, Zolnierczyk-Zreda & Zwetsloot, 2011).

The BSI standard for psychosocial risk management (PAS1010) was published in 2011 (BSI, 2011). The standard is appropriate to leaders, business owners, health and safety professionals, human resources managers and specialists and employee representatives. It is meant to provide organisations with guidance for how to manage psychosocial risk efficiently while at the same time be in line with legal requirements and updated research within the field. The guidance and recommendations in PAS1010 can be incorporated into any OSH management system and importantly it is intended to apply to all types and sizes of organisations and to accommodate diverse geographical, cultural and social conditions (Leka et al., 2011).

In the newer frameworks and standards, such as PAS1010 and PRIMA-EF, risk management is described as two distinct but intimately related cycles of activity: risk assessment and risk reduction. They are linked by the processes involved in translating the output of the former into an input to the latter: translation (see Figure 2.2).

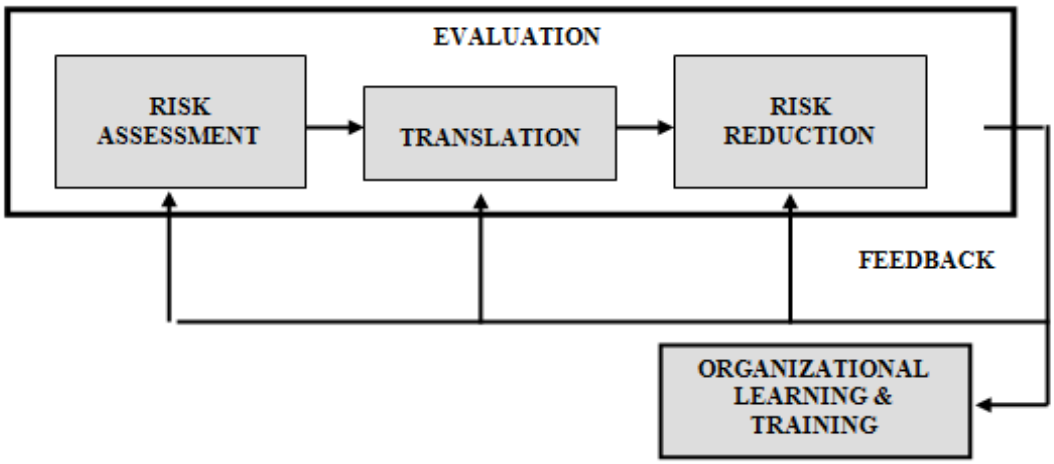


Figure 2.2: Risk management process: Risk assessment and risk reduction

Source: Adapted from Cox, Griffiths & Rial Gonzalez (2000a)

The model also includes consideration of evaluation and organisational learning and training. Because all aspects of the risk management process should be evaluated – and not just the outcomes of the risk reduction stage – the 'evaluation' stage is treated as supra-ordinate to all the other stages. The risk reduction stage, in practice, tends to involve not only prevention but also actions more orientated towards individual health.

The work from the European Framework for Psychosocial Work Environment work has further been disseminated into the World Health Organisation's (WHO) Global Framework for Healthy Workplaces (WHO, 2010). This framework combines evidence-based approaches and principles of health protection and health promotion and is meant to be used by companies, countries and international stakeholders. At the heart of the WHO Healthy Workplace framework are leadership support, worker involvement and the need for organisations to address four avenues of influence when promoting health and wellness at the workplace. The four avenues of influence are: 1) health and safety concerns in the physical work environment; 2) health, safety and well-being concerns in the psychosocial work environment; 3) personal health resources in the workplace; and 4) the ways the company participates in the community

to improve the health of workers, their families and the community. Through an 8-step process, workplaces are guided through a continual improvement process that uses a systems approach to create awareness, provide education and skill building opportunities, offer environmental support and assist with policy development.

At a national level, standards have also been developed. One example is the Canadian National Standard for Psychological Health and Safety in the Workplace (2013). The Mental Health Commission of Canada (MHCC) provided leadership and commissioned the Standard, working collaboratively with the Bureau de Normalisation du Québec (BNQ) and CSA Group. The content of the Standard was developed collaboratively by BNQ and CSA Group, with input from a Technical Committee of volunteers with significant experience and expertise in this subject matter. The membership of the Technical Committee included volunteers from various sectors.

This standard, which is the first auditable standard in this area, aims at helping small, medium and large size businesses, across all sectors, to promote good mental health and prevent psychological harm of employees. More specifically it is a standard that outlines a systematic approach to develop and sustain a psychologically healthy and safe workplace. It focuses on mental illness prevention and mental health promotion. It is also a voluntary standard, meaning it is not a legal framework or regulation. The Standard includes information on issues such as the identification of psychological hazards in the workplace; the assessment and control of the risks in the workplace associated with hazards that cannot be eliminated; the implementation of practices that support and promote psychological health and safety in the workplace; and the implementation of systems of measurement and review to ensure sustainability of the overall approach (Mental Health Commission of Canada, 2013).

2.6 Continual improvement process

At the heart of most standards and guidelines related to risk management is a continual improvement process, which involves a systematic examination of all aspects of the work undertaken to consider what could cause injury or harm, whether the hazards could be eliminated, and if not what preventive or protective measures are, or should be, in place to control the risks (BSI, 2011; ILO-OSH, 2001; Leka, Cox, & Zwetsloot, 2008; WHO, 2010). In order to avoid pitfalls and is sustainable in the long-run curtain general principles should be followed. In this regard, Edward Deming popularized the PDCA or Plan, Do, Check, Act model in the 1950s. It arose out of the scientific method of “hypothesize, experiment, evaluate”. The theory builds on the idea that when initiating any new venture, it will not be perfect from the

start, so by applying a process of continual improvement companies can avoid costly errors (Burton, 2010).

The PDCA approach includes iterative principles found in scientific research. Repeating the PDCA cycle brings the company closer and closer to the goal (see Figure 2.3). Over the years since Edward Deming started promoting the PDCA Cycle the model has been modified and sometimes expanded by individuals and organisations in the workplace. As such, some variations are highly complex, suitable only for the most sophisticated, complex hierarchical organisations. For example, in some models there are variations with four differently named steps, variations with seven, eight, or ten steps (Burton, 2010; Leka, Cox, & Zwetsloot, 2008; Mental Health Commission of Canada, 2013). These process models may be known as continual improvement systems, or as health and safety management systems.

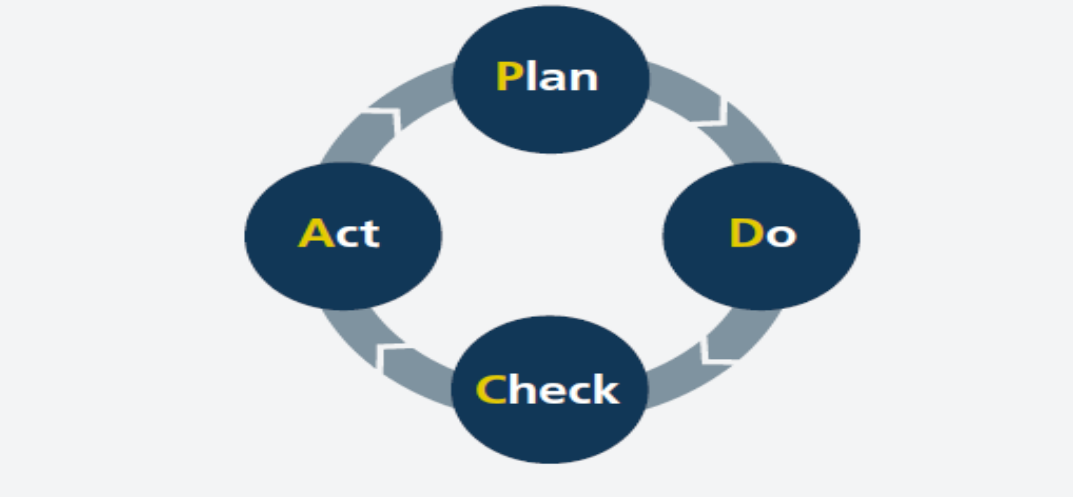


Figure 2.3: The PDCA Cycle

Source: Adapted from PAS1010 (BSI, 2011)

Best practice frameworks, and standards such as PRIMA-EF, PAS1010, WHO's Global Framework for Healthy Workplaces, often incorporate five important elements or principles: (1) a declared focus on a defined work population, workplace, set of operations or particular type of equipment, (2), an assessment of work environment factors important for health and well-being (3) the design and implementation of actions designed to remove or reduce poor working environment factors (4) the evaluation of those actions, and (5) the active and careful management of the process.

Before start-up, best practice principles point out the importance of planning well ahead and preparing the organisation. As such, they highlight the importance of securing early commitment from senior managers, line managers and employees (BSI, 2011; Cox, 1993; EU-OSHA, 2012; Leka, Cox, & Zwetsloot, 2008; WHO, 2010). In order to promote commitment, leaders need knowledge on how management of the psychosocial work environment is highly relevant to business results. This can be done by establishing a business case. The purpose of a business case is to describe the business rationale for starting a project (Schmidt, 2002). The business case for strengthening the integration of the management of the psychosocial work environment needs to answer the question: what are the business reasons for encouraging line management to put effort into managing the psychosocial work environment? Furthermore, the business outcome must be described. This can be financial reasons, non-financial reasons and a combination of the two; for example, how promotion of a good psychosocial work environment characterized by low sickness absence, acceptable turnover, safe behaviour, and high work engagement is linked to achieving a cost-efficient and value-based operation. Business cases are created to help decision-makers ensure that the proposed initiative will add value and have priority (Leka, Jain, Cox & Kortum, 2011).

The business case should be tailored to the size and risk of the organisation. For example, in the oil and gas industry, with its high risk potential, it is critical to create a business case where the initiatives are linked to both the prevention of ill-health and the promotion of safe and reliable operations. The business case should reflect a balance between knowledge from research, the internal experiences and context of the company, and its internal requirements. These sources should shape both the content and construction of the business case and workplace interventions, ensuring commitment from the mangers in the organisation. By doing this, the business case will be recognisable as well as the key elements in the case proposed will be justified.

Furthermore, the frameworks and standards highlight the importance of identifying and understanding underlying causal factors before solutions are selected. Important psychosocial factors relevant for employee health are usually situation specific; what is present in one type of work or affects a particular type of worker may not be present in another job or affect a different type of worker. As such, best practice principles often recommend that the identification of psychosocial hazards relies on the expert judgement of employees on the adequacy of the design, organisation and management of work (BSI, 2011; Leka, Cox, & Zwetsloot, 2008; WHO, 2010).

The assessment should address known psychosocial factors that are particularly important with regards to health and well-being (BSI, 2011; Leka, Cox, & Zwetsloot, 2008; WHO, 2010). Examples of these factors, as discussed in the previous chapter, are job demands, job control, social and managerial support, role and responsibilities, and interpersonal relationships (Leka & Jain, 2010). A risk assessment should bring together two elements to allow the identification of likely risk factors: identification of upside and downside risks (psychosocial hazards) and information about the possible harm associated with psychosocial hazards collected both from the risk assessment and from otherwise available organisational records such as absence data and occupational health referrals. According to ISO 31000:2009 the consequences associated with a risk can enhance the achievement of objectives (i.e. positive consequences) or can limit or diminish the achievement of objectives (i.e. negative consequences).

Based on the analysis of possibly hazardous situations and the assessment of risk to health, a discussion regarding psychosocial hazards at work should be initiated, and an action plan to managing those problems through a risk reduction should be established (BSI 2011; Leka & Cox, 2008). The development of an action plan, based on the evidence from the risk assessment, involves deciding on: what is being targeted, how and by whom, who else needs to be involved, what the time schedule will be, what resources will be required and how the action plan will be evaluated (Leka & Cox, 2008). In this process, it is seen as essential to involve key stakeholders, including managers and employees when identifying interventions. This is because they often are the ones closest to the issues and best placed to suggest improvements. The overall aim is to; 1) involve employees in finding solutions and actions for how to control psychosocial risk and 2) create ownership to the improvement process. The action plan should then be implemented as planned and its progress monitored and reviewed, and the processes involved and their outcomes eventually evaluated (BSI 2011; Cox, 1993; Cox, Griffiths, & Randall, 2003; Leka & Cox, 2008).

When introducing a system for managing psychosocial risk, it needs to be integrated and followed-up into daily operations (Leka, Cox, & Zwetsloot, 2008; Leka, Vartia, Hassard, Pahkin, Sutela, Cox & Lindstom, 2008). International frameworks relevant for the psychosocial work environment are general descriptions of best practice and meant to be applicable in different contexts (Kompier & Kristensen, 2001; Leka, Vartia, Hassard, Pahkin, Sutela, Cox & Lindstom, 2008). In order to be able to use these frameworks, the content must be adjusted to fit different occupational sectors and organisational contexts. As such, the frameworks and best practice principles for psychosocial risk management need to be re-interpreted and

translated into existing management systems in order to protect and promote the health, safety and welfare of employees (Bergh et al., 2014a).

Today many companies, particularly larger companies within the oil and gas industry, have chosen to implement structured performance management systems. This is to meet changes in the nature of work, competition and external demands. The performance management system translates company strategies into more specific strategic objectives. The purpose of having a performance management system is to achieve the best possible performance in a company by creating conditions and providing tools necessary for managers and teams to utilize their full potential in a dynamic and unpredictable business environment. The Balanced Scorecard is likely to be the best-known method for translating strategy into action; offering a robust framework, capable of helping organisations successfully navigate the uncertainties of competition and changing dynamics (Kaplan & Norton, 2006; Neely, 1998; Niven, 2006). Thus, if the psychosocial work environment is a critical area for success, as is the case for the oil and gas industry, it should be included in this system. By establishing a fully integrated solution, companies will be able to manage the risk in a sustainable manner. This will be discussed further later on in this thesis.

Implementing a comprehensive intervention strategy is also considered good practice. As such, organisations should address interventions at primary, secondary and tertiary level (see Table 2.3) (Leka, Cox, & Zwetsloot, 2008; Murphy & Sauter, 2004). Primary interventions take the form of organisational and work development, where the goal is to eliminate stress at its source in the workplace (Cox, Griffiths, & Randall, 2002; Jones, Borge, Steffy, et al. 1988). An example of a primary prevention method is the risk assessment of psychosocial hazards (Cox, Griffiths, & Randall, 2002) where the focus is on underlying causes such as the way work is designed, managed and organized.

Interventions referred to as secondary prevention often have a focus on the provision of education and training (BSI, 2011). Through the provision of training, employees can become more aware about psychosocial risks, work-related stress and hence better able to address them. Issues that can be covered through training include interpersonal relationships (between colleagues and with supervisors), time management and handling conflicts (BSI, 2011). Secondary interventions most frequently used in the workplace seek to teach workers certain skills and strategies for preventing and handling physiological and psychological symptoms of stress. Some common techniques are biofeedback, meditation, and cognitive-behavioural skill training (Murphy, 2003).

Tertiary interventions are actions taken to limit the effects once a problem has become evident, e.g. in cases where individuals have already been harmed by exposure to hazards (BSI, 2011). The action here is on the consequences of exposure to psychosocial hazards, which can be either psychological or physical in nature. When affected employees have been off work because of ill health, appropriate return-to-work and rehabilitation programmes should be implemented to support their effective reintegration into the workforce (Leka, Cox & Zwetsloot, 2008). Both the secondary and the tertiary intervention levels emphasise the individual employee, i.e. secondary interventions concentrate on worker training (Lindquist & Cooper, 1999) while tertiary interventions are largely focused on employee assistance through counselling (Cox, Griffiths, & Rial-Gonzalez, 2000a; Leka & Cox, 2008).

Research and best practice guidance argue that organisations need to combine different methods to manage psychosocial risks in order reduce stress and ill-health (La Montagne et al., 2004; Leka, Vartia, Hassard, Pahkin, Sutela, Cox & Lindstom, 2008; Murphy, 2003; Sutherland & Cooper, 2001; WHO, 2010).

Table 2-3 Levels of work-related stress management interventions

Level	Focus
Primary Intervention	The management of psychosocial risks should prioritize interventions that reduce risks at source. There are a number of arguments for giving it precedence; European law, and transposed national legislation in EU Member States, prioritizes such measures within organisations and the need to target problems at source. They can also be significantly cost-effective as the focus of interventions is put on the causes and areas within the organisation where change is required. Moreover, they promote organisational healthiness as they address issues related to organisational culture and development. Interventions of this kind call for and promote dialogue and a participative approach; resulting actions can be tailored to different contexts and are general in nature.
Secondary Intervention	Involve taking steps to improve the perception and management of psychosocial risks for groups that could be at risk of exposure. They are not a substitute for primary prevention interventions. The focus of these actions is on the provision of education and training. It is assumed that, through the provision of training, employees can become more aware about psychosocial risks, work-related stress, harassment and third party violence and hence better able to address them. Issues that can be covered through training include interpersonal relationships (between colleagues and with supervisors), time management and handling conflicts.
Tertiary Intervention	In cases where individuals have already been harmed by exposure to hazards, actions can be taken once a problem has become evident to limit its effects. The action here is on the consequences of exposure to psychosocial hazards, which can be either psychological or physical in nature. Thus, people who are suffering from psychological ill health, which includes burnout, depression or strain, can be provided with counselling and therapy, and those suffering from physical symptoms can benefit from occupational health services provision. When affected employees have been off work because of ill health, appropriate return-to-work and rehabilitation programmes should be implemented to support their effective reintegration into the workforce. Interventions at the workplace should assess how to adopt work processes, work places, tools and / or working time schedules to the individual.

Source: Adapted from PAS1010 (BSI, 2011)

As highlighted before, the best practice principles for psychosocial risk management also include consideration of ‘evaluation’ and ‘organisational learning and training’. The evaluation of action plans is an important step, but one that is often overlooked or avoided. Not only does it tell the organisation how well something has worked in reducing stress but it allows

the re-assessment of the whole situation, providing a basis for organisational learning (Leka & Cox, 2008). To evaluate the interventions fully, the work and well-being of staff should be re-assessed. The evaluation should also assess the strength and the weakness of both the action plan and the implementation process. Lessons learned should be explicitly identified. The evaluation can be performed by using similar techniques as used in the risk assessment (interviews/focus groups), but with one extra ingredient: they ask staff to comment on their experiences of the interventions (Cox, 1993). The evaluation phase essentially establishes a continuous process for improvement (Cox & Griffiths, 1995).

In chapter 7 of this thesis available quantitative and qualitative risk data collected through the psychosocial risk management process in an oil and gas company over the last 8 years is explored. This is done in order to study specific and common psychosocial risks in the petroleum industry in particular. The study also offers recommendations on how the results further can be utilized in building a robust system for managing psychosocial risks in the industry. One example is the utilization of risk data in order to develop a simple and user-friendly risk indicator integrated into the internal performance management system. Indicators can be practical and efficient to use and can signal areas and units that need further in-depth assessments. Furthermore, by integrating psychosocial risk into the performance management system there is an increased likelihood that managers, who on a daily basis use the performance management system, will also focus on psychosocial risk. The next section will explore the role of performance management systems and in particular the vital role of indicators.

2.7 The psychosocial work environment and performance management

Performance management includes activities that ensure that goals are consistently being met in an effective and efficient manner. Performance management can focus on the performance of an organisation, a department, employee, or even the processes to build a product or service, as well as many other areas. The purpose of having a performance management system is to achieve the best possible performance in a company by creating conditions and providing tools necessary for managers and teams to utilize their full potential in a dynamic and unpredictable business environment (Rausch, Sheta & Ayesh, 2013).

Larger companies, in particular, within the oil and gas industry, have chosen to implement structured performance management systems to meet changes in the nature of work, competition and external demands (Bergh et al., 2014b). As mentioned previously, the Balanced Scorecard (BSC) is a strategy performance management tool supported by design methods and automation tools that can be used by managers to keep track of the execution of

activities by the staff within their control and to monitor the consequences arising from these actions. The critical characteristics that define a balanced scorecard are its focus on the strategic agenda of the organisation concerned, the selection of a small number of data items to monitor and a mix of financial and non-financial data items (Kaplan & Norton, 2006; Neely, 1998; Niven, 2006). Thus, if health and safety is a critical area for success, as is the case for the oil and gas industry, it should be included in the system.

While the "balanced scorecard" terminology was coined by Art Schneiderman, the roots of performance management as an activity run deep in management literature and practice. In fact, historians such as Alfred Chandler propose that the origins of performance management can be seen in the emergence of the complex organisation - most notably during the 19th Century in the USA (Chandler, 1962). More recent influences may include the pioneering work of General Electric on performance measurement reporting in the 1950s and the work of French process engineers in the early part of the 20th century (Epstein & Manzoni, 1997). However, it should be noted that none of these influences is explicitly linked to original descriptions of balanced scorecard by Kaplan and Norton (Kaplan & Norton, 2006).

Kaplan and Norton's first book (Kaplan & Norton, 1996) remains their most popular. The book reflects the earliest incarnations of balanced scorecards - effectively restating the concept as described in the second Harvard Business Review article (Kaplan & Norton, 1993). In Kaplan and Norton's second book (Kaplan & Norton, 2000), the focus of attention was moving from the design of Balanced Scorecards themselves, towards the use of Balanced Scorecard as a focal point within a more comprehensive strategic management system. Subsequent writing on the Balanced Scorecard by Kaplan and Norton has focused on uses of the Balanced Scorecard rather than its design (Kaplan & Norton, 2008), however many others have continued to refine the tool itself (Abernethy et al., 2005). Modern balanced scorecards have evolved since the initial ideas proposed in the late 1980s and early 1990s, and the modern performance management tools including Balanced Scorecard are significantly improved - being more flexible (to suit a wider range of organisational types) and more effective (as design methods have evolved to make them easier to design, and use) (Malina & Selto, 2001).

In the company in which the research in this thesis was conducted, there is a performance management process called “Ambition to Action”. This management process is based on the Balanced Scorecard. “Ambition to Action” is a process that balances alignment, going from strategic objectives to individual goals. In this process the company: 1) defines its most important strategic change areas; 2) chooses indicative measures for the strategic

deliverables; 3) sets concrete actions and expected deliverables, including clear deadlines and accountabilities targeting the strategic objectives; 4) as well as translating the deliverables into individual performance goals.

The Ambition to Action system covers five perspectives: people and organisation; health, safety and the environment; operation; market; and finance. There are key performance indicators for the five different perspectives in the Ambition to Action system.

A performance indicator or key performance indicator (KPI) is a type of performance measurement (Parmenter, 2015). A KPI is used in order to evaluate how successful an organisation or a particular activity is. Success is often defined in terms of reaching a strategic goal or it can simply be the repeated, periodic achievement of some levels of an operational goal (Parmenter, 2007). As such, when choosing the right KPIs it is important to have a solid understanding of what is important to the business. What is important often depends on the department measuring the performance - e.g. the KPIs useful to finance will really differ from the KPIs assigned to health and safety. Because of the importance of knowing the business when choosing KPIs, various techniques to assess the present state of the organisation, and its key activities, are associated with the selection of performance indicators. These assessments often lead to the identification of potential improvements, so performance indicators are routinely associated with 'performance improvement' initiatives. A very common way to choose KPIs is to apply a management framework such as the balanced scorecard (Parmenter, 2007).

One way to improve the effectiveness of a particular process or area is to change the way it is measured (Neely, 1998). Measurement is an important part of any management process and forms the basis for continuous improvement. Measuring health and safety performance is no different and effectively doing so will compound the success of a company's improvement efforts. Finding the perfect measure of safety is a difficult task. Within the HSE perspective the key performance indicators can be either proactive (leading) or reactive (lagging) in nature (Øien, Utne & Herrera, 2011).

Lagging indicators measure a company's incidents in the form of past accident or incidents. Examples include sickness absence, work-related illness cases, injury frequency and severity; lost workdays or worker compensation costs. The major drawback to only using lagging indicators of safety performance is that they tell you how many people got hurt and how badly, but not how well your company is doing at preventing incidents and accidents. The reactionary nature of lagging indicators makes them a poor measure of prevention (Øien, Utne, Tinmannsvik, & Massaiu, 2011). For example, when managers see a low injury or sickness

absence rate, they may become complacent and put safety on the bottom of their to-do list, when in fact, there are numerous risk factors present in the workplace that will contribute to future injuries.

Leading indicators are focused on future safety performance and continuous improvement. These measures are proactive in nature and report what employees are doing on a regular basis to prevent injuries (Øien, Utne, Tinmannsvik, & Massaiu, 2011). Examples include safety training; reduction of muscular-skeletal disorder risk factors; employee perception surveys or safety audits.

Over the last years, evidence from research related to stress, work-related ill-health and human reliability, has highlighted the need to increase focus on proactive actions and implement indicators that can reveal underlying factors in the way work is organized, designed and managed. As such, a balanced scorecard should also make use of indicator measures related to psychosocial risks, including human and organisational aspects.

In order to integrate psychosocial risk management into the organisation's internal performance management system, chapter 4 describes the development of an HSE indicator for psychosocial risk in the oil and gas industry (Bergh et al., 2014b). The development process included a number of interrelated steps utilizing the evidence-based practice model (Briner, 2012). This has resulted in the establishment of a proactive exposure indicator automatically published in the internal organisational performance management system of the organisation. The Ambition to Action system was utilized in order to follow-up initiated actions. Having an indicator fully adopted into the existing management system and linked to the larger HSE risk management process represents a powerful tool in managing psychosocial risk. The chapter also addresses challenges encountered in the process and lessons learned that can be useful for other organisations and the industry as a whole.

Another potentially effective tool in order to manage the psychosocial work environment is to incorporate a focus on psychosocial risk into the internal auditing procedures. As such, the next section will focus on the psychosocial work environment and auditing.

2.8 The psychosocial work environment and auditing

As discussed earlier, in order to improve health and safety in the workplace, governments and organisations have since the 1990's increasingly developed and applied Occupational Health and Safety Management (OHSM) systems (Hasle & Zwetsloot, 2011; Gallagher et al., 2001; Frick & Wren, 2000; Robson et al., 2007; Rocha, 2010). One example of this is the Du Pont safety management system (Frick & Wren, 2000). Having an OHSM

system in place is increasingly becoming a business-to-business requirement, as is the ISO 9000 quality management standard. The development of these types of systems has generally taken place in large corporations. Since the early 1990s, this development has also raised the issue of OHSM integration with quality and/or environmental management systems, and with business processes (EU-OSHA, 2002, 2010; Zwetsloot, 1994).

Even though these management systems address both health and safety in the workplace, it is still argued by several researchers that they focus mostly on safety rather than on workers' health (Hasle & Zwetsloot, 2011). However, in recent years OHSM systems have been increasingly developed towards a more comprehensive approach where all health and safety risks are addressed equally. As discussed earlier in this chapter, this shift has also been demonstrated in EU and national regulations, international frameworks and best practice principles and standards on health and safety (HSE, 2007; Leka et al., 2011; WHO, 2010).

An important part of the OHSM system is auditing and as such several organisations and industries across the globe have adopted audits in their internal monitoring systems in order to assess their compliance with OHSM regulations and standards (Hasle & Zwetsloot, 2011). More and more OHSM systems are based on OHSAS 18001 and are certified against that standard. OHSAS 18000 is an international occupational health and safety management system specification. It should be noted that the OSHAS 18000 will be replaced by ISO 45000.

Audit is the process of systematic examination of a quality system carried out by an internal or external auditor or an audit team. Audits are performed to verify conformance to standards through review of objective evidence (Allegrini, et al., 2006; Hass, et al., 2006; Sobel, 2011). To benefit the organisation, auditing should not only report non-conformance and corrective actions but also highlight areas of good practice and provide evidence of conformance. In this way, other departments may share information and amend their working practices as a result, also encouraging continual improvement (Pain, 2010). Two types of auditing are often described in standards such as ISO 9000: auditing by an external certification body (external audits) and auditing by internal staff trained in this process (internal audits) (Reding et al., 2007). According to the Institute of Internal Auditors (IIA), it is considered more appropriate for internal auditors to audit outside their usual management line so as to bring a degree of independence to their judgments (Reding et al., 2007).

Auditing is commonly used in order to ensure that an organisation's health and safety management system is being effectively implemented in order to prevent accidents and ill health occurring in the workplace (Evans & Parker, 2008). Evans and Parker (2008) describe auditing as one of the most powerful safety monitoring techniques and an effective way to

avoid complacency and highlight slowly deteriorating conditions. This is true especially when the auditing focuses not just on compliance with requirements but also on effectiveness of work processes. However, researchers have also argued that audits do not necessarily cover contemporary complex work environment issues, such as psychosocial hazards (Hohnen & Hasle, 2011). This has led to a growing awareness that standards, tools and methods need to be further developed to include these issues and integrate them into business practices (Hasle & Zwetsloot, 2011; Hohnen & Hasle, 2011; Leka et al., 2011). As such, chapter 6 presents and discusses a pilot study for conducting internal psychosocial risk auditing in the oil and gas industry, focusing on offshore units. Psychosocial risk auditing is a proactive method for monitoring the status of psychosocial factors influencing the risk of stress and ill-health in the oil and gas industry. It is a systematic and independent assessment of the status of psychosocial factors and barriers. It reveals non-compliance with requirements and best practice within different relevant levels of the organisation, and is suitable as a basis for the development of risk reduction measures. The method comprises performance standards that are linked to the company's internal organisational requirements related to the psychosocial work environment. A range of different methods and data are used to assess and grade compliance with these standards. The aim of the auditing is to provide transfer of experience between units and the development of best practice while supporting organisational learning in offshore (and onshore) environments.

2.9 Applying knowledge, theory and frameworks to an internal business context

In Norway, particularly Einar Thorsrud and Fred Emery had a strong influence on how we view the working environment. Their research in the 1960-70s on autonomous groups and "psychological job demands" which describes what employees need in order to thrive in the job has been especially influential (Thorsrud & Emery, 1969). In this context applied research plays an important role of exploring how research on the area of psychosocial work environment best can be translated into practice.

As the knowledge on psychosocial factors and their potential impact on health and safety has grown over the last decades, as discussed, there has also been an increase in the number of legislation, standards and frameworks on the management of psychosocial risks. However, despite legislation and high focus on the management of psychosocial work environment, there still is a way to go. There seems to be a gap between the knowledge of psychosocial factors and its impact on employee's health and safety and how to practically utilize this knowledge in order to systematically manage psychosocial risk in the workplace (EU-OSHA, 2012). The most important factors making psychosocial risks particularly difficult to deal with are the lack of available information and suitable tools to help companies manage these risks effectively

(ESENER, 2015). Some scholars have pinpointed that an important challenge within research is the lack of detailed descriptions of the content of interventions used / tried out. Interventions related to psychosocial risk management are generally poorly described with too few details making it difficult to understand what elements of the intervention did, or did not, work (Gilbert-Ouimet et al., 2015; Hasson et al., 2014). The lack of detailed descriptions prevents organisational learning and also possibilities for implementing practical interventions in organisations.

From a company perspective, it is important to have internal psychosocial risk management practices that are evidence-based. Combining knowledge from research on psychosocial risk factors with the information about the specific organisation ensures that methods and tools are adapted in ways that are most suitable to the organisational context. It also ensures that the development of the company specific practices are evidence-based (Briner, 2012). Based on the evidence-based practice model, decision-making in the studies described in this thesis is based on the following four aspects: The first type of evidence is scientific research published in academic journals and so on. The second type is organisational evidence, which may be data, facts and figures gathered from the organisation. The third evidence is the professional experience and judgment of practitioners and last the stakeholder evidence. This is the values and concerns of people who may be affected by the decision (Barends, Rousseau & Briner, 2014). The fourth type is stakeholders' values and concerns. The process of developing a company specific method or practice consists of interrelating these sources of knowledge (shown in Figure 2.4).



Figure 2.4 Evidence based practices - Sources of evidence to consider

Source: Adapted from Barends, Rousseau & Briner (2014)

As argued in a report from the UK regulator, the Health and Safety Executive, “Organisations need to be much more proactive in devising and thinking through their hazard assessments as off the-shelf measures are likely to have limited utility. A more proactive approach should also help to ensure that local knowledge about specific tasks, jobs, and psychosocial hazards is fully incorporated into the assessment process” (Rick, Briner, Daniels, Perryman, & Guppy, 2001, p.83).

Not paying attention to these sources of knowledge may result in poor decisions based on unsupported beliefs, trends and / or ideas spread by individual gurus (Barends, Rousseau & Briner, 2014). Since its formal introduction in 1992, evidence-based practice has become a well-known interdisciplinary approach (Spring, 2007). The approach initially started within medicine and over time spread to other professions such nursing, psychology, social work, education, library and information science. Within psychology, evidence-based practice requires that the practitioners follow psychological approaches and techniques that are based on the best available research evidence (Briner, 2012; Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). This means that before decisions-makers decide on important topics or issues, they should first ask what the available evidence on the certain topic is. As such, the decision-maker, for example a leader in an organisation, explores what is known by considering the evidence from multiple sources, instead of basing a decision on personal judgment alone.

Dealing with this interface of theory and practice is more pertinent to the objectives of research and assessing its quality (Becker & Bryman, 2004). As Hart (1998) observes, research can generally be classified according to its design features and its intended outcomes. Furthermore, a key element of good research is integration. Integration is about making connections between ideas, theories and experience. It is about placing some episode into a larger theoretical framework, thereby providing a new way of looking at that phenomenon (Hart, 1998).

2.10 Conclusion

The thesis aims to build a bridge between academic knowledge and practical everyday life and show how to implement evidence-based practice in companies. As such, the intention was to develop psychosocial risk management methods and tools that applied a terminology that was easy to understand independently of professional background and aligned with the company jargon. The studies in this thesis will provide, as described by Pedersen, Nielsen and Kines (2012), “realistic interventions” where the key elements are to “identify what works for

whom, under what circumstances, in what respects and how" (p.49). Instead of trying to control for real-life phenomena the realistic interventions in this thesis attempt to learn from them. Thus, describing the introduction of psychosocial risk management in a real organisation enhances the ecological validity of the research. To perform laboratory experiments in this context would be problematic in relation to constructing conditions perceived as relevant for the managers in the organisation.

To contribute with regards to how established research findings on psychosocial risk factors can be applied, the research in this thesis will show the integration of international frameworks for psychosocial risk management into practice and internal business processes. This will be explored in the oil and gas industry, where international recognized frameworks and standards for managing psychosocial risk have been integrated into the internal management system. The figure below illustrates where best practice principles, tools and methods for managing psychosocial risk have been integrated into the internal management system.

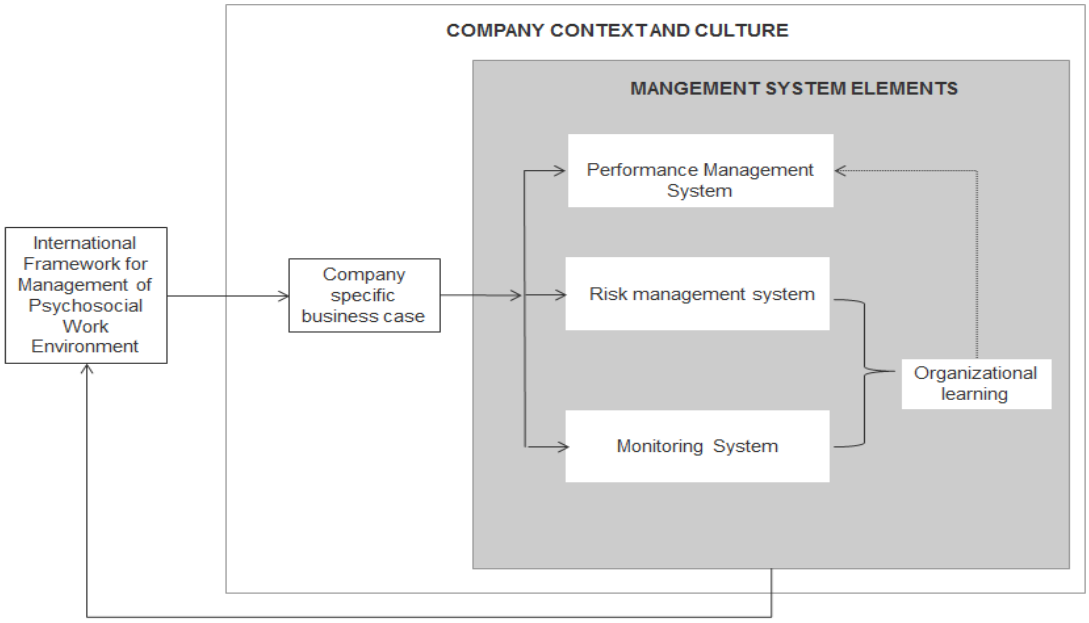


Figure 2.5: Integration of international frameworks for psychosocial risk management into practice and internal business processes

Chapter 4 describes the development and testing of a performance indicator for psychosocial risk in the oil and gas industry (Bergh et al., 2014a). The indicator is today used as a health and safety indicator in the internal performance management system. Chapter 5 explores the relationship between the psychosocial risk indicator (PRI) and objective measures

of major accident potential, such as hydrocarbon leaks (Bergh et al., 2014b). Chapter 6 describes the development of an internal audit tool of the psychosocial work environment in the oil and gas industry (Bergh et al., 2016). Chapter 7 explores specific and common psychosocial risks in this particular company. This was achieved by exploring the available quantitative and qualitative risk data collected through the developed psychosocial risk management (PRIMA) method over the last 8 years in order to explore specific and common psychosocial risks and its impact on health and well-being in the petroleum industry in particular (Bergh, et al., 2017). Further details on the four studies can be found in chapters 4-7.

In order to enable the aims of this research, various methods were utilized. As such, the next chapter will describe the methodology applied in this thesis.

3 Chapter: Methods

"The best practice is inspired by theory."

Donald Knuth

Until today, companies and organisations are still reporting that they do not have good enough systems for managing psychosocial risk factors in the workplace. Researchers (e.g. Leka et al., 2015) argue that despite the increase in policy, frameworks and best practice principles available to employers, there seems to be little uptake and use of these in businesses' daily practices.

Given the above, this research has two aims. Firstly, and given that this is an under-utilized and poorly managed risk area in companies, it explores how the oil and gas industry can develop and implement a psychosocial risk management system by applying research and best practice in a Norwegian oil and gas company, in order to raise awareness of how psychosocial risk management practices can be integrated into a company's internal management system. The second aim is to raise awareness and to stimulate the application and use of established knowledge at organisational and national levels in this area. In this sense, the ultimate aim of this research is to inform policy makers about what it takes to actually implement and integrate policy into company context and at the same time to promote a comprehensive approach to worker protection and the promotion of their health. For scientific purposes the thesis aims to contribute to the knowledge on how psychosocial risk factors impact health and safety in the oil and gas industry and can be managed as part of an overall risk management process. It also aims at strengthening the methods and approaches researchers can use in order to follow-up and collect in-company information about the psychosocial work environment in organisations.

As explained above, this is an under-studied area with lack of data. Increased insight and enhanced understanding can, therefore, best be provided by using a mixture of research methods. As such, this chapter focuses on the application of research methods in social sciences, specifically in applied psychology and company practices, to both widen and gain more knowledge about how psychosocial risk management (research, standards and best practice frameworks) can be practically implemented into a company overall management system. It further discusses the rationale for the research design and measures used. More detailed accounts of the actual methodologies used and detailed accounts of data collection methods employed in specific studies are presented in Chapters 4-7.

In this setting, methods refer to specific research techniques or tools that researchers use in order to collect and analyse relevant data to address research objectives and questions. Since different questions require different methods to answer them, the choice of particular research methods for a study is informed by a range of factors (Punch, 2005). Important quality criteria that should be included and evaluated when choosing research methods are (e.g. Becker et al., 2006; Coaley, 2010): the appropriateness of the method for the study; the purpose of the study; the research problem, questions and objectives; the researcher's inclinations or/and preferences among other practical considerations; and the already available knowledge. The following sections of this chapter present in more detail the overall methodology underpinning the research presented in this thesis. The chapter starts by explaining the mixed methods approach and then a section is dedicated to qualitative and quantitative methods research design. Subsequently, the chapter continues by explaining the main characteristics of the research approach, including data analysis considerations. Finally, it refers to ethical issues and principles relevant to this thesis.

3.1 Research approach – Using mixed methods

To explore how companies can go from policy to an integrated psychosocial risk management approach in the internal management system, this thesis applied a mixed methods approach using both qualitative and quantitative tools in order to explore specific research questions. Combining quantitative and qualitative methods provided insightful findings by ensuring that the limitations of one type of data were balanced by the strengths of another. In fact, each source of data represents an important piece in understanding the issue under study. Additionally, the different studies seek to answer different research questions, although they are linked within the overall purpose of this thesis.

In the literature, many definitions of mixed methods are available. Mixed methods research is often described as a research approach or methodology that focuses on research questions that call for real-life contextual understandings, multi-level perspectives, and cultural influences (Johnson, Onwuegbuzie, & Turner, 2007), as is the case here.

The four studies in this thesis are linked and cover various aspects related to the application of psychosocial risk management principles at the workplace. All the four studies build on and collect data according to principles outlined in the psychosocial risk management paradigm (presented in Chapter 2) (Cox et al., 1983; Cox et al., 2002; Cox & Griffiths, 1995). The risk data collected through the psychosocial risk management approach in the company provided input to the design, implementation and results of studies presented in chapters 4, 5

and 7 respectively. Furthermore, the development of the auditing tool for psychosocial risk in study in chapter 6 was based on the original psychosocial risk management approach applied in the company. Each of the four studies considers and describes the practical implications of integrating methods and tools into the company internal management system. For this reason, it was important to implement and integrate best practice principles into the company context by assessing topics from multiple perspectives through mixed methods to enhance and enrich the meaning of a singular perspective. Moreover, it was seen as essential to contextualize the information and to allow for the datasets to build upon one another.

In this thesis a combination of the three classes of mixed methods (quantitatively driven design, qualitatively driven design, and interactive design) described by Johnson, Onwuegbuzie and Turner (2007) was utilized. The study in chapter 4 this thesis, focused on the development of a psychosocial risk index, used a mixed method, quantitatively driven design, where the research is first and foremost quantitative with the qualitative method added to complement the quantitative study. As such, the qualitative data provide increased and deeper understanding to the research question at hand. When a quantitative phase followed a qualitative phase, the intent was to develop a survey instrument informed by qualitative findings (Plano Clark, 2010). In these types of studies, the criteria to quantitative quality are prioritized while, in addition, focusing on high quality qualitative data collection and analysis. The study in chapter 5 (focused on testing the psychosocial risk indicator) used a quantitative design. The study analysed quantitative data from the psychosocial risk indicator, installation age, hydrocarbon leaks and leakage sources.

The studies in chapter 6 and 7 used an interactive design. In this case the researcher equally emphasizes quantitative and qualitative data, methods, methodologies, and paradigms. Furthermore, in this type of mixed study, quantitative and qualitative and mixed methods quality criteria are emphasized (Onwuegbuzie & Johnson, 2006; Johnson & Christensen, 2014). The findings in study 3 were collected through both qualitative and qualitative means equally (Bergh et al., 2015) and instead of keeping results distinct the data was combined in the result section (Sandelowski, Voils, & Knafl, 2009). In chapter 7 the study utlised qualitative and quantitative methods in order to answer different hypotheses. This integration was achieved by reporting results together in the result and discussion section, such as reporting first the qualitative quotes or themes followed by quantitative statistical results that support or refute the qualitative results.

In line with Onwuegbuzie and Leech (2006), the studies in this thesis used a mixed methods framework in order to carry out: data reduction (reducing the dimensionality of the

data), data display (describing data pictorially), data transformation (qualitative data into quantitative or vice versa), data correlation, data consolidation (both types of data are combined to create new variables or data sets), data comparison (comparing data from both data sources), and data integration (both sets of data are integrated into either a coherent whole or two separate sets of coherent wholes). Furthermore, analysis strategies for mixed methods can take two forms, parallel track and crossover track Greene et al. (2001). In a parallel track, data is analysed separately and comparisons and connections are made at the stage of drawing conclusions and inferences. In a crossover track, analysis can be more interactively where the results of one method are summarized or transformed to be used by the next method for further processing. For example, studies 1, 3 and 4 connected data by analysing one dataset, for example qualitative interview data, and then using the information to inform subsequent data collection such as quantitative surveys. In this way the crossover occurs by connecting the analysis of results of the initial phase with the data collection of the second phase of research (Creswell & Plano Clark, 2011).

The data used in this thesis is largely based on primary data (data gathered specifically for the research purpose) (Matthews & Ross, 2010). However, the thesis also includes secondary data in the form of internal records and documentations of risk and technical integrity. In the chapters 4, 5 and 6, the secondary data is only used as an addition to the data collected specifically for the purpose of the study at hand. In chapter 7 collected risk data over an 8-year period was assessed and analysed. Because the secondary data were not produced primarily for the research in this thesis, the researcher had to exercise caution when deciding to use the data (Matthews & Ross, 2010). It was important to ensure the quality of these company data was sufficient for use in scientific research. Secondary data used directly in study analyses (e.g. chapter 5 and 6) was either; 1) previously collected by utilizing principles outlined by best practice frameworks (e.g. PAS1010 and PRIMA-EF); 2) official data reported to the Petroleum Safety Authority (PSA); and 3) internal facts about installation age, weight and number of leakage sources. As such, using data that had been collected by applying best practice principles ensured a certain level of quality.

An overview of the studies conducted is presented in Table 3.1. Four studies have been conducted in order to explore the implementation and integration of psychosocial risk management tools into a company's overall management system.

Table 3-1: Overview of studies: data sources, sample size and reason for methodological choice

Studies	Data sources	Sample sizes	Reason for methodological choice
Chapter 4	Mixed method		Overall purpose was to develop a psychosocial risk indicator. Primary data was collected through survey and semi-structured interview methods. The study used a 26-item questionnaire and semi-structured interviews to assess and test stakeholders' experience of psychosocial risk.
	Company survey	1000 (30 000*)	
	Interview	17	
	Review of internal procedure		
Chapter 5	Quantitative method		Purpose was to assess the correlation between the developed psychosocial risk indicator (PRI), hydrocarbon leaks and other technical indicators. Primary data on psychosocial risk was collected through survey. Secondary data related to installation technical complexity and age was collected from the internal database.
	Company survey	3694	
	Registered data		
Chapter 6	Mixed method		Purpose was to describe the piloting of an auditing tool for psychosocial risk. Primary data was collected through semi-structured interviews and a tailor made survey. Company data was used in order to check compliance with established performance standards.
	Interview	21	
	Company survey	446	
Chapter 7	Mixed method		Purpose was to explore specific and common psychosocial risks in the oil and gas industry in particular. Secondary data was used in order to explore available survey data collected through the PRIMA method over the last 8 years. The survey data used was tailor-made based on interview data, according to the PRIMA methodology.
	Company survey and Interview	1812	

Summing up, many reasons can be identified in the literature for conducting a mixed methods research study (Collins, Onwuegbuzie, & Sutton, 2006; Greene, Caracelli, & Graham, 1989; Migiro & Magangi, 2011). In an integrative perspective the following eight main reasons

of undertaking mixed methods studies are important: triangulation, completeness, offsetting weaknesses, answering different research questions, explanation of findings, illustration of data, hypotheses development and testing, and instrument development and testing (Doyle, Brady, & Byrne 2009). All these benefits and rationales apply to this research, while the main reason for using mixed methods is that a complete picture of the complex area being studied could not be generated by any one research method alone.

Having considered the overall research design in this thesis, the next section will discuss qualitative and quantitative methods in particular.

3.2 Qualitative and quantitative methods

The four studies in this thesis have used both qualitative and quantitative methods. Studies in chapters 4, 6 and 7 are based on a mixed methods design combining quantitative and qualitative methods, while the study in chapter 5 is based on a quantitative design only. Over the last decades there has been an increase of variety of research methods used within applied psychology. Throughout history the quantitative method, which draws its intellectual inspiration from the natural sciences approach, has been the cornerstone within psychological research (Chamberlain & Murray, 1998). However, the qualitative approach has gained prominence.

The two approaches are rooted in different epistemological positions, and use different research practices (Bryman, 2004; Cooper & Stevensen, 1998; Henswood & Pidgeon, 1992). Traditionally there has been an ongoing debate between the two paradigms of qualitative and quantitative research methods (Reichardt & Rallis, 1994). As such the qualitative method applies the constructivist or the realist paradigm (Braun & Clarke, 2006) while the quantitative method uses the positivist paradigm (Guba & Lincoln, 1994; Howe, 1988), exploring the richness, depth and complexity of the issue at hand. However, both quantitative and qualitative research share several characteristics. They 1) seek answers to a question; 2) systematically use a predefined set of procedures to answer the question; 3) collect evidence; and 4) produce findings that were not determined in advance and are not readily applicable beyond the immediate boundaries of the study (Denzin & Lincoln, 2000).

In the next section qualitative methods will first be explored further. The qualitative methods used in the studies were based on semi-structured interviews and analysis of internal records and documents. The details of the construction of the semi-structured interviews and data collection strategy are presented in chapters 4, 5 and 6 However, the general characteristics and arguments for choosing this method are explained in the next section.

3.3 Qualitative methods

The qualitative research is an effective way of providing complex descriptions of how people experience a given research topic or area. Several unique aspects of qualitative research contribute to rich, insightful results. Some examples of these aspects are: 1) collecting feedback from participants that build on each other's comments and ideas; 2) applying techniques and methods (interviews or group discussions) used in order to explore a topic engaging respondents more actively than is possible in a more structured survey; 3) going beyond initial responses and rationales by having the opportunity to inquiry and explore more in-depth; 4) the opportunity to observe, record and interpret non-verbal communication as part of a respondent's feedback, which is valuable during interviews or discussions, and during analysis (Banister, Burman, Parker, Tylor & Tindall, 1994; Cassel & Symon, 1994). Common qualitative methods are participant observation, in-depth interviews, analysis of company documents/records, field notes, researcher journals, focus groups or case studies (Marshall & Rossman, 1998; Maykut & Morehouse, 1994; Savin-Baden & Major, 2013).

For this thesis, qualitative methods such as semi-structured interviews and company records and documents analysis were utilized in order to explore the company specific context related to the psychosocial work environment and to provide richer detail of stakeholder views and preferences. This was particularly important because the nature of psychosocial issues in companies is complex and not straight forward.

According to Rowley (2012), interviews are useful in situations which apply to studies 1 and 3 of this thesis. Using the interview technique gave some clear advantages when collecting data. It allowed for more in-depth data collection and comprehensive understanding of the leader and employee perspective, experience, values and needs. Stephens (2007) adds to this point that semi-structured interviews provide the chance to gain a description of the experiences of the interviewee in terms that are meaningful to him/her. Regarding this, both studies 1 and 3 were particularly interested in collecting the experience and opinion of employees in the company about the management of psychosocial risk. It is also argued that semi-structured interviews are suitable when there is little known about the subject (Rowley, 2012). As such, semi-structured interviews were used in studies 1 and 3 as an opportunity to gather data for exploratory purposes. In line with Bogner et al.'s (2009) recommendations, employees (as experts in their own work environment) were interviewed in an exploratory phase as this allowed for a more efficient and concentrated means of gathering data. Conducting interviews can serve to shorten time-consuming data gathering processes and build applied knowledge for understudied issues. It is also important to highlight that psychosocial risk had not been studied extensively in this company before. Furthermore, in

line with the PRIMA method, it is important to collect data that will allow an understanding of the specific context in a company. As such, qualitative methods such as interviews are valuable to achieve this.

Even though qualitative methods (in the form of the interview technique) were an important and effective way of collecting data for the purposes of studies 1 and 2, it was also important to be aware of potential weaknesses. For example, interviews are time consuming in terms of both recruitment and carrying out. As a result of timing and travel, interviews can be expensive. Interviews are also energy-consuming, as they involve substantial concentration from the interviewer. Interviews can deliver biased responses and it is more difficult to generalize results (King, 2004). Taking into consideration these issues, the studies in this thesis used interviews with representative samples, and the interview data was used as input to a tailor-made questionnaire that was sent out to the entire organisation in scope.

The studies in this thesis also utilized secondary data as part of the assessment of psychosocial risk. In a context were efficiency (time and cost) is highly valued the fact that secondary data already existed meant that they were a less expensive source of useful information than primary data (Cowton, 1998). In this thesis internal documents and risk data was used in order to assess: 1) pre-existing systems / procedures for managing psychosocial risk; and 2) pre-existing records / documentation of risk. For example, in chapter 5 internal records related to offshore installation technical complexity was used in order to assess the relationship between the developed psychosocial risk indicator (PRI) and hydrocarbon leaks. Information on the number of hydrocarbon leaks was also provided through internal records and systems. Furthermore, other secondary data used was information on work-related illness and / or results from previous work environment assessments and follow-up. These sources of secondary data were greatly useful for the implementation of psychosocial risk management within the company overall management system. However, there were also several disadvantages of these data that were recognized. For example, some data were also presented in a particular format that had to be re-examined and re-coded by the researcher for use in the current research (e.g. in chapter 7). However, the additional use of primary data addressed some of these disadvantages since through the use of quantitative and qualitative methods, it was possible to identify issues not previously addressed in relation to the psychosocial work environment in this company context.

The use of the qualitative methods allowed for flexibility and adaptability in this research. It was also possible to explore issues that might have been too complex to investigate through quantitative means alone (DiCicco-Bloom & Crabtree, 2006). For example, the studies used

the interview technique in order to tap into stakeholders' expert opinion about their work environment and the company specific management system. Furthermore, in some situations there is a need for "inserting new discourse within old systems of meaning – the active, constructive process of representation and re-representation in science" (Henwood & Pidgeon, 1992, p.102). This is, for example, the case in organisational interventions and according to Edgar Schein (1991) the traditional research paradigm has not worked very well since it has produced very reliable results about very unimportant issues. In that process, "we have lost touch with some of the important phenomena that go on in organisations, or have ignored them simply because they were too difficult to study by the traditional methods" (Griffiths, 1999, p.593).

However, quantitative methods were equally important in this research since the aim was to develop a psychosocial risk management system that could be used reliably across the organisation and would be fit for purpose in the specific company context. The quantitative method used in this thesis was the survey. Details of survey construction and data collection strategies are presented in chapters 4-7. However, the general characteristics and arguments for choosing this method are explained in the next section.

3.4 Quantitative methods

In natural sciences and social sciences, quantitative research is the systematic empirical investigation of observable phenomena via statistical, mathematical techniques (Black, 1999; Creswell, 2014; Given, 2008; Johnson & Onwuegbuzie, 2004). In the quantitative approach the objective is to develop and use theories, mathematical models and/or hypotheses related to an identified topic. The use of measurement is a central element in quantitative research because it allows the researcher to assess the essential link between empirical observation and mathematical expression (Creswell, 2014).

Although a distinction is commonly drawn between qualitative and quantitative aspects of scientific investigation, it has been argued that the two can go hand in hand. For example, based on analysis of the history of science, Kuhn concludes that "large amounts of qualitative work have usually been prerequisite to fruitful quantification in the physical sciences" (Kuhn, 1961, p.162).

In line with good practice within the quantitative approach, the research in this thesis utilized specific, narrow questions and collected samples of statistical data from studies where participants answered a set of questions in a survey. The research studies assessed whether the collected data could be generalized to a larger population (e.g. the entire company or the

industry at large). The surveys, which were conducted online, explored the employees' subjective experience of their psychosocial work environment.

The advantages and disadvantages of surveys have been addressed by several authors (Duffy, Smith, Terhanian, & Bremer, 2005; Ilieva, Baron, & Healey, 2002; Jansen, Corley, & Jansen, 2007; Kaplowitz, Hadlock, & Levine, 2004; Porter, 2004; Sheehan, 2001). Regarding advantages, the use of surveys in this thesis allowed the involvement of a greater number of employees, enhanced the generalization of results across the company, and allowed for greater objectivity and accuracy of results. Furthermore, online surveys were cost efficient and a practical way to gather data, covering a large amount of issues related to a specific topic. Additionally, they allowed for anonymity which in the case of psychosocial risk research is essential (Leka, & Cox, 2008).

There may also be some weaknesses when using surveys as a method for collecting data. for example, issues related to coverage and sampling error which may lead to two traditional concerns for researchers, namely low response rate and representativeness (Sheehan, 2001). Although representativeness is more important than response rate, response rate is of central relevance if it reduces representativeness (Cook, Heath, & Thompson, 2000). The surveys in studies 2, 3 and 4 were distributed to the entire organisation / company in scope. The response rate to the surveys was considered satisfactory, strengthening the likelihood that the sample was representative for the entire organisation in scope. A number of strategies have been proposed to increase response rates for online-based survey studies. In line with empirical studies, this research utilized techniques, such as number of contacts or reminders, personalised correspondence, and pre-contacts, in order to increase the response rate (Cook et al., 2000; Göritz & Crutzen, 2012). It should also be noted that the studies in chapter 4 and 5 utilized multiple risk assessment data collected from several samples from across the company as input to the studies and its results. This contributed to strengthening the representativeness of the results in this thesis. With regards to representativeness it is important to highlight that when developing implementing and integrating psychosocial risk management in this company it was extremely important to work within a number of well-defined guiding principles based on research. Firstly, methods and tools developed are based on well-established knowledge on how various psychosocial hazards affect health. Furthermore, the methods and tools used are founded on acknowledged approaches for identifying, assessing and obtaining proofs, including the use of standardized tools developed specifically for psychosocial risk assessments (Cox et al., 2003; Leka et al., 2008).

Additionally, authors have identified other weaknesses regarding the use of surveys. For example, people may not be entirely honest with their responses. Furthermore, there may be differences in understanding and interpretation of the questions in the survey and the researcher is not able to ask follow-up questions (Breakwell, Hammond, & Fife-Schaw, 2000; Kline, 1993). As such, particular considerations were given to these issues in this thesis. For example, in studies 1, 3 and 4 research questions were explored by utilizing both qualitative and quantitative methods. In addition, review of available data provided the researcher with the ability to triangulate information and cross-check its validity.

It was a conscious choice to use analysis and reporting of results that were as straight forward and simple as possible in the studies of this thesis. This was done because all the studies were performed as part of ongoing work in the company to implement psychosocial risk management and the studies also aimed at raising stakeholder awareness about the management of psychosocial risk. As such, it was crucial that language, procedures and analysis were as straight forward as possible. A detailed description of survey design, the data collection processes and analyses is provided in Chapters 4-7.

The next section addresses a key aspect of this research, triangulation, and its value for ensuring credibility, reliability and validity.

3.5 Triangulation

Triangulation is defined as the use of multiple methods in studying the same phenomenon for the purpose of increasing study credibility. This implies that triangulation is the combination of two or more methodological approaches, theoretical perspectives, data sources, investigators and analysis methods to study the same phenomenon.

The mixed methods research in this thesis used triangulation in its research design in order to enhance confidence in the findings. As such, the research utilized more than one approach to investigate the research questions in the conducted studies. For example, triangulation has been used to check the consistency of findings by using different methods to collect data, in order to illuminate complementary aspects of the same subject or topic. Points where data diverge are of great interest to the researcher and provide the most insights (Patton, 1999).

According to (Denzin, 1978), there are four basic types of triangulation, namely: 1) data triangulation, which involves time, space, and persons; 2) investigator triangulation, involving multiple researchers in an investigation; 3) theory triangulation, which involves using more than one theoretical scheme in the interpretation of the phenomenon; and 4) methodological

triangulation; this type of triangulation involves using more than one method to gather data, such as interviews, observations, questionnaires, and documents. According to this categorization this thesis utilized types 1, 2 and 4.

The study in chapter 4 utilized investigator triangulation and methodological triangulation. When developing the indicator, data was triangulated by using internal risk data, results from the pilot survey, and feedback (interviews) from internal stakeholders in the company. Furthermore, the study was performed by involving additional experts to validate results. As such, the development process as a whole consisted of several interrelated sources of knowledge; updated research; internal practitioner experience; context and local evidence; and stakeholder preferences (Bergh, 2014b; Briner, 2012). In the development of the indicator it was important to ensure a good balance between the collected data from the different sources. These types of data triangulation come as a result of the idea that the robustness of data can vary based on the time data was collected, people involved in the data collection process and the setting from which the data was collected (Begley, 1996).

The study in chapter 5 utilized data triangulation. The collected data was triangulated by testing psychosocial risk, hydrocarbon leaks, installation age and number of leakage sources for offshore installations for two consecutive years (2010 and 2011). This was done in order to see if the results were valid over time. Results showed the same patterns (e.g. significant correlation between psychosocial risk, hydrocarbon leaks, installation age and number of leakage sources) for both years.

Methodological triangulation and investigator triangulation was utilized in chapter 6. As such, the auditing tool for the psychosocial work environment collected feedback from employees at relevant levels in the organisation and talking independently to management and employees. This was done in order to avoid being manipulated by the views of a selected few interview respondents. This is in line with Blewett and O'Keeffe's (2011) argument that audit methodology needs to take into account the multiplicity of views available within an organisation in order to triangulate the audit data and reach an adequate picture of the situation. Furthermore, the auditing tool applied a range of different methods and data to assess and grade the status of the performance standards, including document reviews, analyses of existing HSE data, interviews, field observations and questionnaire. Furthermore, the study findings were cross-checked by additional experts to increase reliability and validity and interviewers for confirmation purposes (Denzin, 1978). This provided a check with regards to selective perception and illuminated blind spots when interpreting the analysis. The goal is not to seek consensus, but to understand multiple ways of seeing the data (Bogdan & Biklen,

2006; Denzin, 1978; Patton, 1999). In chapter 7 data was triangulated by involving additional experts in order to validate the findings (investigator triangulation); applying more than one method for exploring the topic at hand (methodological triangulation) and by exploring multiple datasets collected at different times over the research period. The aim of the study in chapter 7 was to explore common and specific psychosocial risks offshore and onshore at the Norwegian continental shelf. The results from the various risk assessments (risk data) were used as the basis for both the qualitative and quantitate studies performed. As such, the use of data collected from various units over a longer time period strengthens the confidence in the results of the study. Furthermore, the categorization of items was checked by additional experts to explore alternative ways of perceiving the items categorized and to increase inter-rater reliability. Some authors argue that triangulation is just for increasing the wider and deep understanding of the study phenomenon, while others have argued that triangulation is actually used to increase the study accuracy, in this case triangulation is one of the validity measures (Denzin, 1978; Olsen, 2004; Smith & Kleine, 1986; Webb, Campbell, Schwartz, & Sechrest, 1966).

The next section specifically explores the issues of reliability and validity as they apply in this research in more detail.

3.6 Reliability and validity

The concept of error in research is linked to important concepts in measurement theory. These concepts are reliability and validity (Brains & Manheim, 2011; DeVillis, 2003). It is generally accepted that the concept of scientific validity addresses the nature of reality and as such is an epistemological and philosophical issue as well as a question of measurement. For the research within this thesis, validity is essential because it can help decide what types of tests to use, and help to make sure researchers are using methods that are not only ethical and cost-effective, but that also truly measure the idea or construct in question.

In this thesis and as discussed previously, the process of validation comprises a collection of evidence from different types of sources over many years. Researchers argue that the process of validation might in fact develop over a number of years (Anastasi, 1988; Bryant, 2008; Osterlind, 2006). There are many different types of validity. Some examples are face, content, external, internal, predictive and construct validity (Bryant, 2008; Osterlind, 2006).

Face validity is the extent to which the methods and tools used in the studies is subjectively viewed as covering the concept it seeks to measure. It refers to the transparency or relevance of a test as it appears to test participants (Gravetter & Forzano, 2012; Holden,

2010). Face validity was a very important issue in this thesis, both with regards to the individual tools developed in the studies but also for the 'legality' of the implementation and integration of the psychosocial risk management principles in the company. In order to increase stakeholder buy-in and commitment it was imperative that the methods and tools were familiar and seemed to cover what they seek to measure. Generally, face validity means that the test 'looks like' it will work, as opposed to 'has been shown to work'. Face validity is often contrasted with content validity and construct validity.

Content validity is a non-statistical type of validity that involves the systematic examination of the test content to determine whether it covers a representative sample of the behaviour domain to be measured (Bryant, 2008; DeVillis, 2003; Osterlind, 2006; Urbaina, 2004). One example of how content validity was assessed in this research can be found in chapter 4 where a review of the scientific literature on work-related stress and psychosocial risk management was performed as input to the identification of items used in the psychosocial risk indicator. The literature review covered work-related stress, psychosocial hazards, psychosocial risks, psychosocial risk assessment, psychosocial risk management, best practice, work organisation, theoretical frameworks, interventions, indicators, measures and tools (Bergh et al., 2014a). The same exercise was performed in chapter 6 as part of developing the auditing tools for psychosocial risk. In chapter 5 the indicator developed in chapter 4 was applied as a measure of psychosocial risk. In addition, internal data on technical factors (installation age, number of leakage sources and installation age), was chosen based on a review of scientific literature on human performance in high hazard industries/activities (Bergh, 2014c). In addition, this research is founded on the psychosocial risk management method and the PRIMA-EF framework that incorporate best practice principles, reliable and valid methods and tools in this area.

External validity is related to generalization (Pearl & Bareinboim, 2014). In research it is often important to be able to make statements about people or the population at large. How well we can do this is referred to as study generalizability. A study that readily allows its findings to generalize to the population at large has high external validity. In the current research, the tools described were developed specifically to the particular company which may in turn make it more difficult to generalize research results. Consequently, the tools and methods should not be directly used in other company settings. However, the experience from the overall process, particularly related to the implementation process as a part of the internal management system, should be valuable knowledge to other organisations and the industry as a whole.

On the other hand, internal validity is the approximate truth about inferences regarding cause-effect or causal relationships (Brewer, 2000; Liebert & Liebert, 1995; Shadish, Cook & Campbell, 2002). Internal validity was an important issue in this research and it applies to all the studies performed. In chapter 4 it was important that the indicator provided a 'good enough' assessment of psychosocial risk. In order to strengthen the internal validity, the study used both internal and external evidence in designing the indicator. In chapter 5 the indicator's correlation to safety indicators was tested. Because the company is in the oil and gas industry, operating in a high risk environment, it was viewed as important to explore this issue. In study 3, where the aim was to perform a systematic and independent assessment of the status of psychosocial factors and barriers and reveal non-compliance, internal validity was an important issue. Because psychosocial hazards are situation specific, the audit assessment needed to consider the particular context of work. This was done by identifying risks by collecting workers own experience (through first interviews and then distribution of tailored surveys) about the adequacy of the design and management of their work. This information was used to determine which of the psychosocial hazards actually affects the health of those exposed to them or the healthiness of their organisation and, in turn, provide proof of compliance or non-conformance (Blewett & O'Keeffe, 2011; Hasle & Zwetsloot, 2011; Robson et al., 2007). Results from the study in 7 provided valuable information about common and specific psychosocial risks, exploring the impact of psychosocial factors on health and well-being. The results also provided input about the validity of other tools, such as PRI, developed in this thesis.

Also predictive validity was considered in this thesis. Predictive validity refers to the degree to which the operationalization can predict (or correlate with) other measures of the same construct that are measured at some time in the future (Osterlind, 2006). As such, it was important that the psychosocial risk indicator (PRI) (chapter 4 and 5) would correlate with similar measures of psychosocial risk in the future. In order to strengthen predictive validity, the development and testing process included an evaluation of external and internal evidence; and utilization of internal and external knowledge about risk to weigh items in the psychosocial risk index. Furthermore, chapter 5 explored whether technical factors such as installation age, weight and number of leakage sources have an impact on the number of hydrocarbon leaks at offshore installations. Analysis results showed that only the psychosocial risk indicator significantly accounted for variation in hydrocarbon leaks (Bergh et al., 2014c) which added to the predictive validity of the developed measure.

Construct validity is the degree to which a test measures what it claims, or purports, to be measuring (Massick, 1995; Polit & Beck, 2012). Like external validity, construct validity is related to generalizing. But, where external validity involves generalizing from the study

context, such as the company where these studies took place, to other companies, people, places or times, construct validity involves generalizing from the methods and measures utilized in this thesis to the concept of the program and measures applied. In order to answer this, it is important to see construct validity as an overarching construct with the other validity measures falling beneath it (Messick, 1998; Schotte, Maes, Cluydts, Doncker & Cosyns, 1997). As such, construct validity in this thesis should be demonstrated from a number of perspectives. For example, the studies in this thesis explored data by performing correlation coefficients, multiple regression analysis and independent t-tests. Furthermore, as highlighted above, the studies also addressed other types of validity (face, content, external and internal) which according to authors are important contributors to the quality of the study's construct validity (Messick, 1989, 1995).

Reliability on the other hand relates to the overall consistency of a measure (Osterlind, 2006). Do the results from a study give the same measurement when used by different people or on different occasions? This question was asked in all studies. High reliability can be assumed if a measure produces similar results under consistent conditions. As such, error can either be random or systematic. This means that random error affects the reliability of a measurement, whereas systematic error affects the validity of a measurement (Osterlind, 2006). These issues were addressed in all studies conducted as part of this research. For reliability testing there are also different methods that can be utilized by researchers; some examples are internal consistency and test-retest. To test reliability through the method of internal consistency entails examining the internal consistency of a measure. Internal consistency concerns the degree to which the multiple items on a test converge on the same conclusions about the true score.

More specifically, in chapter 4 reliability was strengthened by using baseline data as input to the development of the indicator was based on both external and internal evidence. The researcher performed a literature review focused on scientific literature on work-related stress and psychosocial risk management. This ensured that the indicator was built on a sound theoretical framework. More specifically, it guided the choices the researcher made with regards to testing and establishing the indicator (e.g. pilot survey). Furthermore, to ensure utilization of internal evidence, it was decided to perform a systematic evaluation of the internal risk data and to interview internal stakeholders regarding their experience and preference. In addition, Cronbach's alpha was used in order to calculate the internal consistency of the PRI index. As such, items with poor reliability were removed and the items in the pilot survey were reduced from 26 to 11 in the process. Every dimension that was left under each category

showed higher alpha values than 0.70, the accepted level for this statistic (Tabachnick & Fidell, 1996). This ensured an overall consistency of the indicator as a measurement.

Chapter 5 used the PRI index which had already been tested with regards to internal consistency. In this study the indicator was shown to have a significant relationship with safety indicators as measured through regression analysis. Results measured by the indicator in 2010 were compared with those obtained in 2011. The measurement of psychosocial risk (PRI) showed significant correlation with safety indicators for the two years. In order to ensure reliable results, chapter 6 applied tools which are designed in a way that capture the specific contextual situation. As such, some of the tools used as part of the audit tool for the psychosocial work environment were flexible and tailored to meet the needs of the group of workers involved, wile, other tools were standardized and pre-defined.

Furthermore, in chapter 7 in this thesis experts were involved in order to validate the results from the thematic analysis conducted to ensure inter-rater reliability and reduce bias. So triangulation helped to prevent or reduce the researchers own potential biases.

When low internal consistency is observed in a measure, this is revealed by a low reliability coefficient (Osterlind, 2006; Strube, 2008). In studies this is often measured by calculating Cronbach's alpha (DeVillis, 2003). This was for example important when establishing scales, consisting of several individual items (Hair, 2010). The guiding principle with in research is that multiple responses reflect the true response more accurately than a single response (Hair, 2010; Nunnally, 1978; Osterlind, 2006). Using a scale consisting of several items offers the opportunity to assess different facets of a concept in order to produce a more precise measurement of a specific concept (Osterlind, 2006). All the studies in this thesis used scales consisting of several items. However, as observed in chapter 7 when there are few items in an index (variables that contain fewer than 10 questions) this may result in a low Cronbach's alpha (Pallet, 2013). This was observed in some of the samples utilized and, in particular, this was the case for the job demand category. The processes of developing the scales was also informed and driven by current theoretical knowledge. However, due to the practical setting in which this research was conducted it was consistently being influenced by the pragmatic limitations of the data collected. Often industrial data do not fully meet the requirements of science, which means they should not be used for research at all or used with considerable care, as was the case in this thesis. From an industry perspective it also means that scientific data are difficult to compare with their own data, and therefore difficult to use in their practices. In this thesis part of the struggle was to make use of existing industrial data in a scientifically sound way. Though this approach has its limitations, it implies a valuable

attempt to make scientific use of the large reservoir of existing industry data, and to make industrial practice and scientific research more compatible.

After describing the methodological approaches taken in this thesis, ethical issues also need to be considered. As such, the next section will provide more details with regards to various ethical issues.

3.7 Ethical issues

There are many ethical issues in relation to research when dealing with human subjects, e.g. confidentiality, dignity, integrity and informed consent. The integrity of researchers is paramount. In the next section ethical considerations will be described in more detail.

The research, having been approved by the Ethics Committee of the Institute of Work, Health & Organisations, University of Nottingham, ensured that ethical standards were adhered to at every phase. Thus in line with ethical standards and guidelines, the following ethical issues were fully addressed.

3.7.1 Ethics and loyalty

The studies were planned with a clear knowledge about the possible interaction between data, loyalty, background and position (Malterud, 2001). A researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions (Malterud, 2001). Is it possible for a person employed in a company to perform research on the implementation of psychosocial risk management in the same company? Some might claim that it is not possible. However, perhaps it is not possible to do these studies with *only* researchers from outside of the company either? This question has been given considerable thought throughout the studies conducted. To be employed in the company where the studies have been performed opened many doors which might have remained closed for other external researchers. To get access to the databases in the company and understand the possibilities they had, could not easily have been done by an external researcher. An external researcher would probably also not have been given permission to test and develop the tools and methods described in this thesis. Getting the right permissions to develop the indicator and testing the audit tool would have been especially difficult for an external expert.

In order to avoid the negative aspects of being employed in the company, studies involving evaluation of the impact on health and safety as a result of interventions (psychosocial work environment initiatives) in the company have been avoided. Furthermore,

the researcher has used other experts to validate findings. This was done in order to reduce the possibility of bias in the results. It is however, essential to acknowledge that the relationship between the researcher and the company has importance, causing bonds of loyalty. This would be a large problem in a study were the intent was to evaluate the effectiveness of interventions. However, the aim of this thesis was to gain more knowledge, describe and showcase how psychosocial risk management can practically be integrated into a multinational oil and gas company, and test the validity and usefulness of the implemented systems. The execution of this research project, related to the implementation of psychosocial risk management, is a professional undertaking that should be subject to common sense with an awareness of the sensitivities of those involved. For those with a recognized professional background, their codes of conduct, ethical principles and advice on and issues of best practice should be brought to bear. Its completion is also framed by the national and European health and safety legislation. It was essential that the researcher had evidence of her competence and was fully aware of the ethical aspects of this work as well as the legal and scientific aspects.

3.7.2 Informed consent

Informed consent entails that the human subjects in studies are informed of the nature and implications of research before they contribute and that their participation is voluntary (Homan, 2001). It is argued that the principle of informed consent should be a standard feature for ethical consideration in all social research (Homan, 2001). Furthermore, Bryman (2004) contends that participants in studies are given as much information as possible.

In this thesis participants in the different studies performed were made aware through participant information sheets and consent forms that their responses to surveys and interviews would be used as part of the psychosocial risk management process in the company as well as for research purposes. In line with the principles of informed consent the participants were made aware of their right to withdraw from the study at any point in time and also to refuse to respond to any question they felt uncomfortable with. Informed consent was obtained from all participants in primary and secondary data collection. The risk assessment practices in the company apply the same principles put forward by the psychosocial risk management approach (PRIMA) (Cox et al., 1983, 2002; Cox & Griffiths, 1995). As such, the internal guideline for risk assessments states: “It is important that interviews are confidential and undertaken in a 'safe' and open climate, and that this is communicated to all employees from an early stage. Each interviewee should clearly understand the purpose and nature of the interview and give consent to participate in it. Their participation is requested as 'experts' in the psychosocial hazards of their work”. As such, informed consent was also covered for the secondary data used in this thesis.

The principle of access and acceptance is also an important part of ethical considerations. This involves obtaining permission to carry out a study in an institution or organisation. According to Homan (2001), it involves getting researchers access into a specific facility and/or letting them conduct their research in a particular way.

Planning, carrying out and reporting on research have been done with focus on research ethics and in close corporation with the Centre for Organisational Health & Development which is a World Health Organisation collaborating centre in occupational health, at the University of Nottingham. Collaboration with external researchers, in this case the research supervisors, was important because they would be able to question findings and perform interpretations. The company gave the permission to publish the results from the studies in international journals.

3.7.3 Anonymity and confidentiality

All data collected was kept in accordance to the Data Protection Act (1998). The researcher adhered to the BPS Code of Conduct (2000).

Assuring participant anonymity and confidentiality was important during this work, especially because the researcher was employed in the same company where the studies were performed. As such, it was critical to ensure non-identification of participants and safeguard against this. Furthermore, this is particularly important in studies on the psychosocial work environment due to the sensitivity of issues address (Leka & Cox, 2008).

There is widespread agreement about the interests of participants in protection of privacy, and the corresponding duties of researchers to treat personal information in a confidential manner. The ethical duty of confidentiality refers to the obligation of an individual or organisation to safeguard entrusted information. The ethical duty of confidentiality includes obligations to protect information from unauthorized access, use, disclosure, modification, loss or theft. In each of the studies in this research, the issue of confidentiality was addressed by making sure information provided by participants was kept with the strictest adherence to confidentiality. To protect participants, the studies in this thesis only collected and used anonymous or anonymized data. The participants were informed that data collected would remain strictly anonymous and confidential with possible identifiers removed. Individual participants were assured that they would not be identified in reports or scientific publications written on the basis of the research findings.

It should also be pointed out that the company where the research was performed has strict internal procedures and requirements for handling sensitive information. The anonymous

results from the surveys and interviews are stored at password protected team sites and only personnel with specific roles have access to the team sites. These procedures are an integrated part of the company's management system.

In the next four chapters, the studies performed in this thesis will be more thoroughly described. As such, chapter 4 focuses on the first study describing the development and implementation of an internal performance indicator for psychosocial risk.

4 Chapter: Developing a performance indicator for psychosocial risk in the oil and gas industry

The first study of this thesis focused on the development and testing of a performance indicator for psychosocial risk as part of a company's performance management system. The study has been published in the journal Safety Science (Bergh, Hinna, Leka & Jain, 2014b). The findings of this study informed the establishment of a proactive exposure indicator automatically published in the internal organisational performance management system of the organisation. The development process included a number of interrelated steps utilizing the evidence-based practice model. Having an indicator fully adopted into the existing management system and linked to the larger HSE risk management process represents a powerful tool in managing psychosocial risk.

The process of establishing the Psychosocial Risk Indicator (PRI) incorporated the elements of evidence-based practice (Briner, 2012). In the evidence-based practice model (see Figure 4.1) decision-making is based on four aspects: the company context, key stakeholders' and practitioners' experiences as well as research evidence. As such these sources shaped both the content and construction of the PRI.

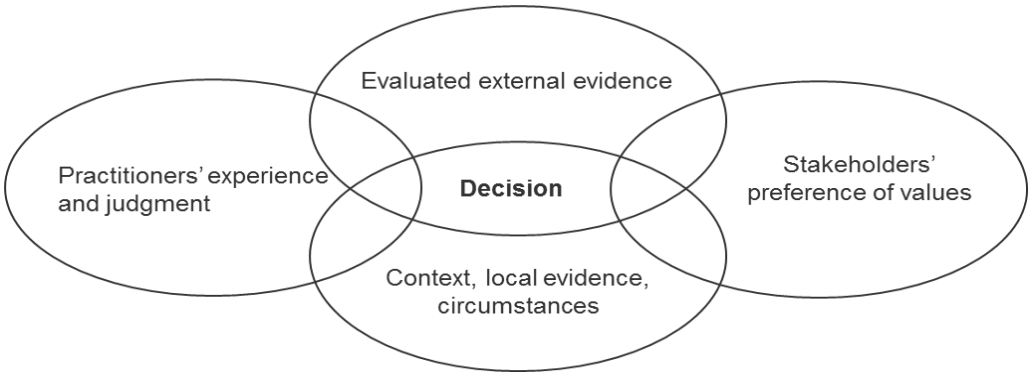


Figure 4.1 Evidence-based practice in occupational health psychology

Adapted from Briner (2012)

4.1 Method

The development of the indicator consisted of several interrelated steps: (1) Theoretical framework establishment; (2) Establishment of baseline data to the indicator; (3) Development of the psychosocial risk indicator; (4) Evaluating the usability of the indicator as input to the risk picture; and (5) Implementation of the indicator as part of the company internal performance management system.

In order to develop an indicator, it was important to review the scientific literature on work-related stress and psychosocial risk management. A literature review was performed using the following key words: work-related stress, psychosocial hazard, psychosocial risk, psychosocial risk assessment, psychosocial risk management, best practice, work organisation, theoretical framework, interventions, indicators, measures and tools. Electronic searches were performed using the following online databases for relevant published articles (including internet based searches): Science Direct, Web of Knowledge/Science, Zetoc, Applied Social Sciences Index and Abstracts, Health and Safety Science Abstracts, Medline, PsycINFO. Searches of the University of Nottingham's library catalogue and Google Scholar were also conducted. A number of sources, including review studies were identified. Following the literature review, it was decided to use the World Health Organisation review on the health impact of psychosocial hazards at work (Leka & Jain, 2010) as the scientific basis, since this was identified as the most comprehensive scientific review in this area at the time. In addition, two best practice guidance frameworks and a standard were used: the European framework for psychosocial risk management (PRIMA-EF), the WHO Global Framework for Healthy Workplaces (2010), and the British Standards Institution guidance standard for psychosocial risk management – PAS1010 (BSI, 2011).

When establishing the indicator, it was important that the experience and risk data from the company were utilized. As such, a systematic evaluation of empirical data collected from the psychosocial risk management (PRIMA) method was performed. In order to establish an indicator based on internal experience data from PRIMA and external research the following steps were taken:

a. The PRIMA process as implemented in the company allowed for the identification of psychosocial risk factors associated with employee health and well-being. A standardized tool called the General Well-Being Questionnaire (GWBQ) (Cox et al., 1983) was used together with tailored questions on the psychosocial work environment (developed after extensive interviews with employees), to capture issues that are pertinent to specific operations and work groups in the company. Risk data was collected across all business units that had performed PRIMA.

b. The questions from PRIMA were clustered according to the underlying psychosocial hazard dimension they corresponded to according to scientific evidence (WHO, 2010). Questions related to the main psychosocial hazard dimensions of: job demands; job control; interpersonal relationships; social support; and role clarity.

c. A comparison was conducted between the questions derived from the internal PRIMA risk assessments and similar items included in standardized instruments (i.e. the UK Health & Safety Executive Indicator Tool and the QPS Nordic) as well the company's annual employee survey (AES). Standardized items were selected and some were rephrased so that all items fit a common scale. Each item was presented with a five-point response scale, ranging from poor to excellent. The initial 26 item survey is shown in Table 4.1.

Table 4-1: Pilot Survey – 26 items

Factors (underlying dimensions)	*Single items*
Job control	Your possibility of knowing what tasks to prioritise
	The degree of influence concerning your work
	Your possibility to plan your own working day
	The degree of influence on the amount of work assigned to you
	Your possibility to be sufficiently involved in decisions that concern your work
	The degree of influence on what you do at work
	Your possibility to set your own work pace
	Your possibility to decide when to take breaks
	Your possibility to get help to prioritise the tasks
	The degree of influence over the way you work
Job demands	Your possibility of keeping up with tasks
	The level of your workload
	The level of your work intensity
	Amount of tasks compared to the resources available
	The congruence between your skills and the job to be performed
	Your capacity to deliver according to demands
Role clarity	The clarity of the areas of your responsibility
	The clarity of what is expected of you at work
	The clarity of planned goals and objectives for your job
Support	The support from your immediate superior
	The availability of your colleagues
	The availability of your immediate manager
	The support from your colleagues
Relationships	The quality of relationships in your entity
	The level of co-operation in your entity
	The level of communication in your entity

d. The 26-item survey was distributed electronically to a randomly selected sample (n = 1000) within the organisation. The sample included employees working with various tasks

(onshore, offshore and project), both genders (male and female) and different roles (leaders and professionals at different levels). This sample was drawn from the company population to be representative in terms of key characteristics (age, gender, job role and years of experience). The targeted sample was informed that their participation was entirely voluntary and anonymous and the results would be confidential. They were also informed that the survey would take approximately 5 minutes to complete and the results would be utilized to develop a final index. In total, 730 employees responded to the 26-item questionnaire (response rate 73%).

e. Questions were reduced into a shorter index by examining three major characteristics of the single item responses: the distribution, the central tendency and the dispersion. Variables with an abnormal distribution were excluded. The mean was used to assess the central tendency. In order to determine the internal consistency of the questions within each dimension (e.g. support, role, etc.), scale reliability analysis was conducted examining the Cronbach's alpha statistic. To reduce items from 26 to 11, item analysis was applied in order to evaluate the correlation of related survey items. This analysis assessed how well a set of items in the pilot measured one characteristic (or construct) and helped identify questions that were overlapping or problematic. To identify removable items, the omitted item statistics section of the output was assessed. This provided information about what would happen if any one item from the analysis improves or worsens. This information allowed the researcher to fine-tune the index, keeping the good questions while replacing the bad. Every dimension that was left under each category showed alpha values higher than 0.70, the accepted level for this statistic (Tabachnick & Fidell, 1996). Thus, internal consistency was found to be satisfactory for all dimensions in the indicator. Final decisions on the PRI items were made after discussions among key stakeholders in the organisation, including key experts and departments in the organisation such as health, safety and environment, human resources, operational leaders. It was decided not to conduct any other analysis, such as factor analysis, because the 11 selected items were perceived to be 'fit for purpose' in terms of internal risk data from the PRIMA process collected throughout the organisation. The stakeholders perceived the items to be a good representation of the internal psychosocial risk picture. Furthermore, the fact that the items were based on standardised questionnaires and internal data and knowledge resulted in the stakeholders deciding that this solution was good enough from a cost-benefit point of view. In addition, the PRI development was seen as a continuous process since there would be further evaluation through the AES and improvement over the years.

f. The 11 items that remained after the analysis were incorporated into the AES in order to reduce the number of internal surveys distributed to employees yearly. Their inclusion in the AES also imposed two other changes on the indicator items: (1) the items needed to be phrased as positive ‘‘I’’ statements, and (2) the response scale needed to be the same as that of the AES, i.e. a 6-point response scale needed to be applied, ranging from fully dissatisfactory to fully satisfactory. By changing the items to positive ‘‘I’’ phrasing, the usability of the reference data collected from the pilot study was reduced (Breakwell et al., 2000). Furthermore, the implementation of a 6-point scale also posed challenges as the response to a 6-point scale is more likely to show positive skewness than a 5-point scale with a neutral option; however a 5-point scale with a neutral score can be ambiguous (Coolican, 2004).

g. The adjusted items, in all 11 items covering 5 psychosocial factors, were distributed through the AES to the whole company, 30,000 employees in total. To ensure internal consistency of the adjusted questions, Cronbach alphas were again calculated. In total 17914 employees responded to the AES (response rate 60%). The sample was examined in terms of its characteristics to establish whether it was comparable to the company, and it was established that the sample included good representation of job roles, sites, locations, etc. from the company population. The Cronbach alpha statistics still showed that every dimension was within alpha values higher than 0.70. As such, the adjustments that were made to the items were considered to be satisfactory and the new items were deemed appropriate for this purpose (see Table 4.2).

Table 4-2: Final psychosocial risk index

Factors (underlying dimensions)	*Items*	*α*	*Mean*	*SD*
Job demands	My work load is satisfactory	0.71	4.35	1.11
	Normally I am able to complete my work tasks within normal working hours		4.21	1.25
Role clarity	In my department the tasks and responsibilities are clearly distributed	0.77	4.49	1.09
	I am clear about the goals and objectives for my job.		4.85	0.97
Relationships	The atmosphere is good among the colleagues in my unit	0.85	5.26	0.87
	Collaboration is good in my department		5.05	0.94
Job control	I can influence my workload		4.41	1.13

	I have sufficient opportunity to plan my own working day	0.77	4.51	1.10
Support	I get support from my colleagues when needed	0.81	5.07	0.83
	I receive necessary support from my immediate superior		4.84	1.13
	My immediate superior is available if I want to discuss aspects of my work situation		4.92	1.10

*p < 0.05, **p < 0.01, ***p < 0.001

4.2 Results

The indicators in the company are quantifiable measurements that are easy to communicate and user-friendly. HSE indictors are expected to follow a set of criteria defined by the internal governing documents of the organisation. To reflect the way other Key Performance Indicators (KPIs) and indicators are communicated in the company, it was decided that the psychosocial risk indicator would be automatically published as a single score in the performance management system. When establishing the psychosocial risk indicator (a single score) it was important to apply a system for weighting to ensure that the 11 items in the index will provide a good enough risk indication. The weighting was decided on the basis of input and dialogue with stakeholders, including key experts and departments in the organisation such as health, safety and environment, human resources, operational leaders., and utilization of experience data derived from conducted PRIMAs (in particular psychosocial risk assessments) in different work units in the organisation over a two-year period. The overall assessment showed that role clarity (e.g conflicting objectives, unclear / interfacing responsibility.), job demands (e.g. high workload, time pressure) and job (e.g. lack of autonomy and involvement) were particularly important with regards to health and well-being. These factors were found to have the most significant impact on employee well-being. It was decided to apply negative weight to the items to emphasize the significance of these factors' impact.

The mean score for the whole population was used as a criterion for when negative weighting would apply to the high risk items. The weights were calculated by first assessing the mean score for the single items related to hazard categories (role, demand and control) on company level. The mean score for these items from the two successive years 2009 and 2010 was assessed: Job control = 4.40; Job demand = 4.20; Role clarity = 4.60. The remaining items in the index were not weighted.

In order to decide on the cut-off for applied weights, it was decided to use the following rationale. Scores on items that were significantly below the mean score of the entire population were weighted. As such, it was decided to test when change in mean scores would be

significant as this would be different depending on sample size. Since most units within the company consist of 70–120 respondents, it was decided that a minimum of 100 respondents would be used as a reference point when testing to verify whether a change in score is significant. Testing showed that an increase/decrease of 0.3 in the results would be significant in units with 100 respondents. In order to further check whether the threshold for weighting made sense managers, HR leaders and HSE professionals were involved. When applying the weight to the PRI items, the internal stakeholders perceived the results as "right" based on their knowledge of the unit risk picture. In addition, the researcher's knowledge of and familiarity with the units from previous conducted risk assessments supported the threshold for adding weight. Therefore, scores lower than 0.3 under the mean for the whole population were given a negative weight, in other words, the items were given more weight the further they were from the mean score.

The final cut-off for weighting was applied to the following items:

- My work load is satisfactory.
- Normally I am able to complete my work tasks within normal working hours.
- In my department the tasks and responsibilities are clearly distributed.
- I am clear about the goals and objectives for my job.
- I can influence my workload.
- I have sufficient opportunity to plan my own working day.

After the weight (W) was applied (WQx), the mean scores of the 11 items (Qx), as presented in Table 4.2, were calculated. In order to make it fit with other HSE risk indicators used in the company, it was then decided to convert the indicator into a ''1–100 scale''. The following formula was used to calculate the weighted PRI score:

$$\mathrm{PRI} = \mathrm{Mean}(WQ1 + WQ2 + WQ3 + WQ4 + Q5 + Q6 + WQ7 + WQ8 + Q9 + Q10 + Q11) * 16.6777$$

4.2.1 Publication in the internal performance management system

As part of the expectations set by internal stakeholders it was important that the indicator was part of the fully automated system that regularly publishes HSE indicators in the internal performance management system. In order to achieve this, the following steps were included:

a. The data (11 items) was transmitted from the annual employee survey tool into the internal HSE data warehouse.

b. In the HSE data warehouse the data was computed into a single indicator by applying the formula for weighting. The formula is applied to the mean score of the single items in the index for each business unit, but never lower than 25 respondents (to avoid possible identification of respondents).

c. The indicator for each business unit is then automatically published as a single score in the company's internal performance management system.

d. The distribution of the indicator results from all units in the company was assessed in order to set cut-off scores for different risk levels, e.g. high, medium and low. This formed the baseline for future PRI scores and follow-up.

e. Assessment of the distribution of the organisational PRIMA data conducted over the past two years, the qualitative data from the employee interviews, and company HSE records were used to establish a baseline for cut-off scores. The 15% threshold was established on the basis on the following rationale. Units falling in the 15% range would have PRI scores of 63 and below. Results showed that in units with a score of 63 or lower, the single items in the PRI index were rated 4 or below in the AES (4 indicating exposure to psychosocial hazards). The 15% cut-off was also chosen because it was a pragmatic way of prioritizing efforts, ensuring follow-up in units with the poorest scores (indicating higher risk). This was in line with control-banding where thresholds indicate level of risk by colour and match the distribution of red, yellow and green risk areas. Applying familiar concepts such as this was one of the pre-requisites put forward by key stakeholders in the company. In addition, the indicator would be further evaluated in order to check the indicator´s usability. As such, units that fall within the 15% lowest scores are given a high risk level and should always be followed by a more comprehensive and in-depth psychosocial risk assessment and follow up.

Units that fall between 15–50% of scores are given a medium risk level and should consider to be followed by a more comprehensive and in-depth psychosocial risk assessment and follow up. Units within the 50% highest PRI results are classified as low risk indicating that the psychosocial work environment is considered satisfactory. Based on this initial assessment of the distribution of PRI scores, the cut-off for high, medium and low were decided and implemented as fixed scores for the coming years (Figure 4.2).

f. The indicator result is linked to a colour to indicate the risk level: green = low risk; yellow = medium risk; red = high risk. The indicator is automatically published in the

performance management system by using a histogram visualizing all the indicator results for the respective units in one business area. The histogram provides line management with an overview of where the business needs to prioritize follow-up. This allows for internal benchmarking within each organisational unit and between organisational units.

g. A table in the performance management system also shows the recommended follow-up based on PRI results. If follow-up is indicated, then the Psychosocial Risk Management Approach (PRIMA) is the company's chosen method for follow- up (as described before) and specific guidance has been developed for units on how to implement the process.

4.2.2 Practitioners' experience and judgment: Evaluation of the usability of the indicator as input to the risk picture

To ensure that the formula captured a ''good enough'' risk picture for the units, the indicator results were triangulated through an additional qualitative evaluation of the indicator (having previously examined the indicator in relation to data on sickness absence and near misses). The evaluation assessed the implementation of the indicator as a tool for management to target, prioritize and initiate follow-up related to the psychosocial work environment. Semi-structured interviews with key stakeholders were used. The invited participants had to have prior knowledge about PRI through usage. They also had to represent various business areas. Participants were invited to take part by email. They received information about the process, including a short description about the content of the interview. They were also informed that the interview was a voluntary process and confidential and all data would be kept anonymous.

The interviewees were experts on their own work environment and were encouraged to share their viewpoints and experiences of the psychosocial work environment and the use of the indicator in particular. The following aspects were included in the interviews: Former practices related to psychosocial risk management; Indicator usability and business value; and experiences related to control-banding (red, yellow and green) etc.

The participants interviewed (in all 17 interviewees) in the evaluation process represented line management from different levels in the organisation, including HR and HSE personnel.

The results from the triangulation showed that PRI was perceived as adding value in identifying potential risk and prioritizing follow-up. The indicator was seen as a proactive indicator that will be useful in relation to preventing ill-health and human error. It was further

considered as an obvious part of the HSE risk management process. Line managers reported that the indicator reflected the perceived situation in their unit.

4.2.3 Discussion: Adapting to the company's framework and requirements

As with HSE in general, the successful management of psychosocial risks requires that it is integrated in the daily work processes and not treated as a separate project (Leka & Cox, 2008). In light of this, it was seen as crucial that the establishment of the indicator was integrated within the existing framework of the organisation. The decisions related to the development of the indicator were based on input from several perspectives. It was crucial to find a balance between the knowledge from research, the internal experiences and the company's framework. As such, certain prerequisites were taken into consideration when developing the indicator. As Briner (2012) argues when describing the principles of evidence-based practice, the different perspectives may vary in quality or relevance and this may vary from case to case depending on the context. However, even though the evidence may differ from case to case it is still crucial that all perspectives are included in the process. Taking the evidence-based practice principles into account, the process of developing PRI consisted of several interrelated sources of knowledge. In the development of the indicator it was important to ensure a good balance between these sources.

Implementing an indicator into the existing performance management system meant that the development needed to be compliant to the requirements regulating the HSE indicators in the company. The HSE indicators in this particular company are in line with external recommendations for developing indicators. For example, in the article by Oien et al. (2011) some of the following characteristics for an indicator are listed as important: simple to communicate, user-friendly interface, easily integrated into normal operation activities, ability to take local actions based on indicator results, and expressed in a quantitative way. As such, these guiding principles formed the basis when deciding how to publish and communicate this particular indicator.

Histograms were used to make the indicator score available for benchmarking across business units, showing all units in a business area. This was seen as an easy and accessible way of presenting results. Furthermore, a histogram would be a useful tool for the risk owner to prioritize where to initiate appropriate follow-up based on the risk level. When publishing the indicator in the performance management system it can be used in a number of ways to specify the units' performance across the organisation, e.g. to identify those units in need of further follow-up and/or to identify those who are currently performing well and have practices that would be beneficial for others to adopt. Furthermore, for the business units to take actions

based on results, it was seen as critical that the indicator results were open and communicated directly to the risk owner.

In order to be able to manage risk across all units in the company it was crucial to implement the indicator items into the internal annual employee survey (AES). Due to corporate strategy of keeping the AES as short as possible, it was from an early stage, and reiterated by other stakeholders in the company (such as the human resources department), that they would only allow few additional items to be added to the AES. Therefore, it was not possible to include entire indexes from standardised questionnaires as they were lengthy. As a result, a short index, tailored to meet the company's needs, was introduced into the AES.

Introducing a short index (11 items) into the AES had both positive and negative aspects. On the positive side by including the items in the AES, the likelihood of survey fatigue would decrease and the sustainability of the initiatives related to improve the psychosocial work environment would increase. In addition, the one year follow up falls within good practice guidelines since there should be time for the implementation of interventions to address key issues and for these to show results before risk is re-assessed (Leka et al., 2008). However, on the other hand, it meant that not all aspects related to psychosocial risks could be assessed. The index introduced assessed five key factors, however it did not assess other areas also highlighted as important in the literature, such as organisational change and work-life balance (Leka & Jain, 2010). Taking this into consideration, it was imperative to ensure that the items in the index chosen were not only based on research, but were also deemed relevant for the organisation. Companies within the oil and gas industry are faced with particular challenges related to their operations including dangerous working conditions, and a globalised workforce with diverse attitudes, beliefs, values and behaviour (Mearns & Yule, 2009). As such, local knowledge about the hazards in the company was used as a guide when choosing items to include in the indicator.

Since the aim of a risk assessment exercise would be to identify at-risk groups, an analysis should ideally be conducted of the relationship between hazards and harm. In psychosocial risk assessment, potential hazards would be a number of psychosocial factors, and harm would be employees' general health, safety and well-being. When analysing the data, the relationship between psychosocial hazards and employee well-being should be analysed. This would allow for potential risk factors to be identified and prioritised.

Because the indicator only gives a coarse assessment, the company chose to weigh risk factors in order to place further emphasis and prioritize issues that had been identified as being high risk (a similar approach has been adopted in the UK by the Health and Safety

Executive in their Management Standards for Work-related Stress Indicator Tool). These issues were identified through internal risk assessments based on the principles described. The weighting of items would also allow for potential at-risk groups to be more clearly identifiable and it would put the focus further up the risk chain where the focus is on the ones in the "grey zone", between optimal health and ill-health, also referred to as "sub-optimal health".

Recommended PRI follow-up	*Cut-off score*
Green	≥ 73
Yellow	64 - 72
Red	≤ 63

Figure 4.2: PRI cut-off scores

Furthermore, when interpreting results, the rationale of risk assessment has been used as a guide. This meant that in order to use the results to identify groups that could potentially be at risk, a stricter cut-off score was applied. This ensures that the organisation adheres to strict criteria in relation to hazard identification that could affect workers' health. The psychosocial indicator was published as a single score and control-banding, visualised by colour indicating the risk level, was applied (see Figure 4.2). This is a familiar method when dealing with other types of risk in the physical work environment, such as chemicals.

The establishment of the indicator was done in close cooperation with line management, as well as HSE and HR professionals from across the company. Throughout the different stages of the development of the indicator, key stakeholders from the business were involved. They contributed in particular with feedback and input on the minimum level of respondents, feedback on cut-off scores for the indicator, and the use of benchmarking. By combining the input from the different sources, e.g. research findings, local experience/context, practitioners' viewpoint as well as the key stakeholders' requirements, the indicator has ended up as an intuitive, simple and user-friendly tool. This was also highlighted by the managers involved in the evaluation of the indicator.

Evidence-based practice principles have been central in developing the indicator. It is also important to note that the psychosocial risk indicator described in this chapter is tailored to fit the specific organisational context, particularly with regards to the specific items, the weighting and the cut-off criteria. As such, the indicator has been influenced by research on

psychosocial risks, company specific requirements, internal risk data and internal HSE experts. As a consequence, the indicator should not be directly adapted to other company settings. However, the experience from this process, particularly related to the implementation of a psychosocial risk indicator as an integrated part of the balanced scorecard system, should be of valuable knowledge to other organisations and the industry as a whole.

4.2.4 Limitations and future directions

It is also important that some further challenges are discussed. Implementing an indicator on psychosocial risk has created resistance in the organisation. The resistance was in particular related to the application of more traditional key performance indicator criteria to the area of psychosocial work environment. In the literature on performance indicators, several important characteristics are highlighted when establishing performance indicators (Parmenter, 2007). They should be specific, simple, compatible, measurable, achievable, comparable, relevant, stable and time-based. Furthermore, they should have the attention of top management and the results should clearly communicate further actions needed.

The criteria for performance indicators also act as the foundation for how HSE indicators are developed and applied in this particular oil and gas company. However, traditionally these criteria have been used for physical aspects of HSE and not for psychosocial and organisational aspects. The psychosocial and organisational aspects have mainly been dealt with through the AES, which is a large employee survey, consisting of more than 80 items covering a wide range of aspects, such as financial aspects, company values and management performance. It was particularly the criteria of comparability, simplicity and compatibility that proved to be the most challenging and different from how it usually was done in the company and needed attention. Indeed, it should be mentioned that there are different approaches to risk indicators from the Kinney-type methods (Kinney & Wiruth, 1976) to the hospital standardised mortality ratios (Bottle et al., 2011). Advantages include simplicity, numerical expression, prioritising, and comparative ease of use.

In order for the PRI index to be sufficiently organisational-specific there were several aspects that needed to be addressed. Firstly, due to the different contexts and challenges (offshore, plants, onshore, projects) in which the company operates, it was essential that the items in PRI were sufficiently general, i.e. the items being general enough and reflecting themes and issues that could be understood by employees from the various work environments. In this context, the phrasing of the items is only one contributor making the index organisation-specific. Other aspects that ensure an organisational-specific indicator are: 1) use of risk data from PRIMA results when choosing items; 2) weighting of items in the index based on internal risk data; 3) building the

indicator in line with other traditional indicators i.e. communicating results as one score, openly across the company; and 4) integrating the indicator into the company's Balanced Scorecard, allowing for benchmarking between units.

However, it should be noted that there are also disadvantages with arguably the most important being their application to issues where subjective evaluation is important and that subjective evaluation is influenced by contextual factors. This is of outmost importance when dealing with psychosocial risks and although the indicator developed in this company is expressed numerically and aims at ranking and prioritizing, it should be underlined that it is only part of the overall system of dealing with psychosocial risks within the organisation. Even though the PRI was developed through years of work with different teams and employees with diverse experience throughout the organisation, it is just part of a wider system with the focus being on the expert opinion of employees, with data collected through both quantitative and qualitative methods, and follow-up at the team/work unit level.

As argued in the report from the UK regulator, the Health and Safety Executive, ''organisations need to be much more proactive in devising and thinking through their hazard assessments as off the- shelf measures are likely to have limited utility. A more proactive approach should also help to ensure that local knowledge about specific tasks, jobs, and psychosocial hazards is fully incorporated into the assessment process'' (Rick et al., 2001, p.83). In order to be able to manage risk as well as contribute to organisational learning, it is critical that there is openness around the HSE results for the different units across the company. It is hoped that the process described in this chapter will promote openness and experience sharing to promote organisational learning. In addition, the ambition is that the indicator will be part of a more comprehensive system where collected risk data from follow-up will be valuable input when adjusting the items that form the basis of the indicator. Through PRIMA, psychosocial risk data will be collected from various sections of the business, e.g. identification of psychosocial risk factors impact on health, which again will provide input to the indicator tool. This will help build a robust indicator that will be sensitive to the changes that occur in the organisation over time (Oien et al., 2011). Implementing such a system, combining coarse identification with in-depth assessments and the storage of risk data, may also give an advantage as new forms of work give rise to new hazards – not all of which will yet be represented in scientific publications or known to the organisation. Any assessment of a particular group's work situation needs to allow for the discovery of new psychosocial factors (Leka & Cox, 2008). An internal database will be established where risk data will be stored and periodically categorized and analysed. The risk data collected and stored will then be used as a basis for adjusting the index ensuring predictive validity.

Finally, the process is continuously monitored and evaluated, not only in relation to outcomes such as employee health and well-being but also error, near misses and other safety concerns, as will be discussed in the next chapter.

4.3 Conclusion

Psychosocial risks have an important effect on organisations through employees' health and behaviour, both of which are linked to several organisational outcomes. As such, it is important that organisations have methods and tools to deal with this type of risk, implemented and integrated into their performance management systems. As HSE risk indicators are important tools used in the performance management system, it has been a priority to establish an indicator for psychosocial risk. The indicator was constructed in order to function as a steering element to ensure risk control, prioritize follow-up and manage psychosocial risks across the company, not as an assessment tool on its own. Using an indicator as a means of managing psychosocial risk should be sufficient when it is part of a comprehensive system where analysis of hazard/harm is assessed and followed up by appropriate actions on a regular basis. In the process of establishing an indicator it has been a priority to base it on sound theoretical frameworks and also fit it into the company's existing business management systems. By fully integrating it, the company will have a more sustainable and robust system for managing psychosocial risk.The next step in the process of integrating psychosocial risk management into the internal management system was to test the relationship between the Psychosocial Risk Indicator (PRI) and outcome variables related to health and safety. The testing of the indicator was essential in order to understand the link with other key indicators as well as to strengthen the business case for using PRI in the performance management system. This will be described in further detail in the following chapter.

5 Chapter: Psychosocial risks and hydrocarbon leaks: An exploration of their relationship oil and gas industry

Because the company has high risk operations, it was important to assess whether the indicator could be used in the prevention of accidents as well as stress and ill-health. The latter relationships were already evident from different sources of data in the company (such as qualitative PRIMA data and survey data in specific teams). However, there was no information on the usability of the PRI in relation to accident prevention. It was, therefore, decided that the second study in chapter 5 would test the extent to which the psychosocial risk indicator showed a significant relationship with hydrocarbon leaks on Norwegian oil and gas producing platforms and whether it can be used as a proactive indicator for the prevention of such leaks. The number of hydrocarbon leaks at offshore installations in the period from 2010 to 2011 was considered. This study also explored whether technical factors such as installation age, weight and number of leakage sources have an impact on the number of hydrocarbon leaks at offshore installations. This study has been published in the Journal of Cleaner Production (Bergh, Ringstad, Leka & Zwetsloot, 2014b).

Within the oil and gas industry, the traditional way of approaching safety has been to focus on technical factors, such as the number of leakage sources (i.e. valves, flanges and various types of equipment), age, weight and overall technical condition of the platforms (Aven & Pitblado, 1998; Vinnem et al., 2006). The assumption is that the higher technical complexity of platform layout and processing facility leads to increased risk of hydrocarbon leaks. Accordingly, the first hypothesis of the study was:

Hypothesis 1: There will be a significant relationship between technical factors such as installation age, weight, and number of leakage sources and number of hydrocarbon leaks.

The importance of human and organisational factors has been researched in the last twenty years, but has not always been regarded as crucial in the industry's safety work. The study aimed to address this gap by exploring the relationship of both possible technical aspects as well as work organisation aspects with hydrocarbon leaks. The increased emphasis on human and organisational factors with regards to safety can also be seen in the scientific literature on safety culture and safety climate (Cooper, 2002; Flin et al., 2008; Hale & Hovden, 1998; Haukelid, 1998, 2001, 2008; Guldenmund, 2000; Reason, 1997; Reniers et al., 2011). Within this literature, studies have often assessed the relationship between safety culture and safety climate and personal safety incidents, i.e. injuries and fatalities data. Fewer studies have assessed the relationship between safety climate and process safety incidents, i.e. escape of

toxic substances or the release of flammable materials, such as hydrocarbon leaks, which may result in fires or explosions. However, measures of safety culture and safety climate do not include an assessment of the important type of risk in the modern work environment addressed in the current study: psychosocial risk.

While there is an abundance of studies on psychosocial risks and their effect on health, the amount of research assessing the relationship between psychosocial hazards and major accidents, such as hydrocarbon leaks is very scarce (Bergh, Ringstad, Leka & Zwetsloot, 2014b). Furthermore, there are few, if any, studies that encompass all aspects of the psychosocial work environment, and their impact on the security of an organisation. Nevertheless, several studies address one or more of the items that are normally included in the psychosocial work environment. Most of these studies relate to the importance of high stress, often as a result of excessive workload, shift work etc. On the other hand, the relationship between work organisation, stress, and overall work safety is now gradually being recognised as an important area in the oil and gas sector, in need of further emphasis and research (Bjerkan, 2010; Chen, 2011; Hokstad et al., 2002). As such, the second hypothesis was the following:

Hypothesis 2: There will be a significant relationship between high psychosocial risk and a high number of hydrocarbon leaks.

5.1 Method

5.1.1 Procedure

According to international frameworks and guidance (e.g., PRIMA-EF, Leka & Cox, 2008; World Health Organisation's Global Framework for Healthy Workplaces (WHO, 2010), the use of indicators is seen as a way for companies to monitor risk and initiate appropriate follow-up. With regards to psychosocial risk, companies should include proactive indicators as part of their risk management processes as certain working conditions are related to the development of work-related stress and may have an impact on health, safety and environment (Leka et al., 2008). Being able to predict the seriousness of potential emerging events through the use of risk indicators can keep the organisation on the right track by setting goals and measuring whether these goals have been reached (Reniers et al., 2011).

5.1.2 Measures

As mentioned in the previous chapter, the development of PRI was based on the scientific literature on psychosocial hazards, work-related stress and their impact on health (Bergh et al., 2014b; Leka & Jain, 2010). In order to capture risk, the items used as a foundation

for the indicator were tailored to the company's context specific environment. This was done by conducting an evaluation of empirical risk data collected from an internal psychosocial risk management process. In general, the items in the indicator are closely aligned to other validated psychosocial questionnaires (e.g. COPSOQ, QPS Nordic and the UK HSE Indicator Tool). The response is measured on a 6-point Likert scale. In order to make the indicator fit the way that other HSE risk indicators are used in the company, it was decided to convert the indicator response into a "1-100 scale" with lower PRI scores high psychosocial risk and high PRI scores low psychosocial risk. The indicator is measured annually in the company and automatically published as an HSE indicator in the internal performance management system. The index has an internal reliability higher than .70 (Bergh et al., 2014a), which is considered an acceptable level for this statistic (Tabachnick & Fidell, 1996). Thus, internal consistency was found to be satisfactory for the index. For this study PRI data for the years 2010 and 2011 was used. Information on accidental HC leaks at offshore installations on the Norwegian continental shelf is reported annually to the PSA. This information was obtained for the years 2010-2011 for each of 30 installations. Hydrocarbon leaks are reported in three categories based on the magnitude of the leak (rate): above 10 kg/s, 1e10 kg/s and .1e1 kg/s. Even (registered) leaks at .1 kg/s have considerable accident potential (Petroleum Safety Authority Norway, 2012). Smaller HC leaks of sizes less than .1 kg/s were excluded, as only leaks above a specific level are considered to have major potential (process related) (Kongsvik et al., 2011). Information on HC leaks was collected from a company-internal database, called Synergi.

In order to assess the possible effect of technical conditions and technical complexity on HC leaks, it was decided to include installation age, weight and number of leakage sources (i.e. valves, fences and various types of equipment) as variables. This is in line with previous research by Kongsvik et al. (2011). This information was obtained from internal company data. The number of leakage sources was obtained from recent risk analyses updated regularly through the lifecycle of the installations included in this study (and required by Norwegian legislation).

5.1.3 Sample

As mentioned above, the relationship between the PRI and HC leaks was assessed for two subsequent years. The annual survey, containing the PRI index, is distributed to employees in all the installations in the company. The total survey response for 2010 was 19,116 giving a response rate of 84%. The respondents who indicated they worked onshore were excluded, leaving 3694 offshore workers. Furthermore, the total survey response for 2011 was 17,301 giving a response rate of 85%. The respondents who indicated they worked

onshore were excluded, leaving 3434 offshore workers. Only the offshore workers were included in this study.

The total number of HC leaks from two subsequent years 2010 and 2011, including all three categories of magnitude, were included (N= 318). The installations assessed in this study varied in size and age. As such, some installations had already been in operation for many years and were in a tail production phase while others were new installations.

5.1.4 Analysis

Statistical analysis was conducted using SPSS, version 20.0 2011. PRI scores were aggregated to the installation level (N 30). The aggregated variables were computed as the means of the employees' scores on each installation. Descriptive statistics (mean, range and standard deviations) for the sample are described in Table 5.1.

The analysis comprised two stages. First, bivariate correlations (Pearson's r) were calculated to examine potential associations between the PRI, installation age, installation weight, number of leakage sources and HC leaks, and are reported in Table 5.2. However, such analysis only shows relationships between two variables alone. Second, two multiple regression analyses (for 2010 and 2011 respectively) were conducted to identify whether the PRI, installation age, installation weight, and number of leakage sources (all predictor variables together) would significantly impact upon the probability of the occurrence of HC leaks (criterion variable) (Tables 5.3 and 5.4). This is important as in real life settings different variables together impact on various outcomes.

5.2 Results

The distribution of gender and mean age of employees on the installations have been relatively stable over the last years. In 2011 the installations had 76% men and 23% women and the mean age was 47. Table 5.1 shows the mean, range and SD for the PRI, HC leaks data, number of leakage source, installation weight and age. The total number of HC leaks for the two subsequent years was 318. Table 5.2 shows that certain variables are significantly correlated although the strength of the association varies. The PRI results for 2010 and 2011 show strong significant correlations ($p < 0.01$) with the number of HC leaks for 2010 and 2011. This indicates that offshore installations that have a high psychosocial risk (measured through PRI) have a higher ratio of HC leaks compared to installations with low psychosocial risk, confirming hypothesis 2. The PRI for 2010 and 2011 does not have any systematic relationship with the number of leakage sources, but PRI 2011 correlates significantly with installation age (although more weakly at $p < 0.05$). This may reflect the employees' perception of their physical workplace conditions.

Table 5-1: Descriptive statistics (mean, standard deviation (SD) for PRI, HC leaks, installation age, weight and leakage sources (N=30)

Variables	*Mean*	*SD and range*
Age of installation (years)	14.29	6.77 (3-29)
Weight of installation (tons)	8712	5235 (1500-26854)
Leakage source (per installation) *	10.221	6545 (2163-29092)
PRI 2010	62.44	9.36 (41-77)
PRI 2011	65.03	7.06 (52-76)
HC leaks 2010 per platform?	6.78	6.91 (0-29)
HC leaks 2011 per platform?	4.27	4.66 (0-18)

* Potential leakage sources i.e. valves, fences and various types of equipment

The number of HC leaks for both 2010 and 2011 was correlated with installation age. However, only HC leaks for 2011 were correlated with number of leakage sources. No correlation can be observed between HC leaks and installation weight although both weight and age were correlated with number of leakage sources. This overall pattern indicates that the technical complexity and condition of the installation influences the risk of HC leaks to some extent. Therefore, the correlation analysis results partly support hypothesis 1.

Table 5-2: Pearson's correlations – installation age, installation weight, number of leakage sources, PRI and hydrocarbon leaks 2010-2011

	Leakage source	*Weight*	*Age*	*PRI 2010*	*PRI 2011*	*HC 2010*
Weight	.42*					
Age	.53**	.04				
PRI 2010	.00	-.28	-.15			
PRI 2011	-.08	-.27	-.35*	.70**		
HC 2010	.33	.23	.39*	-.46**	-.57**	
HC 2011	.41**	.23	.34*	-.25	-.50**	.87**

*p < 0.05, **p < 0.01, ***p < 0.001

Two multiple regression analyses were conducted to examine the relationship between the number of hydrocarbon leaks and all potential predictors for 2010 and 2011 (testing both hypotheses). Table 5.3 summarises the results from the first analysis comprising 2010 data. The analysis with all four predictors produced R2 = .34, F(4,22) = 2.91, p < 0.05. Contrary to the correlation analysis results, when all variables were entered in the full regression model,

only the PRI for 2010 was found to have a significant regression weight, being significantly related to HC leaks. Therefore, with respect to the 2010 data, only the second hypothesis was confirmed. Table 5.4 summarises the results from the analysis comprising 2011 data. The analysis with all four predictors produced $R2 = .41$, $F(4,22) = 3.82$, $p < 0.05$. Again, similarly to the first case, only the PRI for 2011 had a significant regression weight, being significantly related to HC leaks. Therefore, with respect to the 2011 data, again only the second hypothesis was confirmed.

Table 5-3: Regression 2010 - PRI 2010, installation age, installation weight, leakage sources, and hydrocarbon leaks 2010 (N=30)

	B	*Beta*	*Sig*
PRI 2010	-.32	-.44	.029*
Number of leakage sources	.00	.27	.29
Weight	.00	-.04	.87
Age	.17	.16	.47

*p < 0.05, **p < 0.01, ***p < 0.001

Table 5-4: Regression 2011 - PRI 2011, installation age, installation weight, number of leakage sources, and hydrocarbon leaks 2011 (N=30)

	B	*Beta*	*Sig*
PRI 2011	-.31	-.46	.02*
Number of leakage sources	.00	.40	.09
Weight	.00	-.08	.68
Age	-.04	-.06	.80

*p < 0.05, **p < 0.01, ***p < 0.001

It was not possible to perform a regression analysis of both of the years combined because the samples are not fully independent.

5.3 Discussion

Our study aimed to examine the relationship between psychosocial risks, and technical aspects of offshore platforms (such as installation age, weight and number of leakage sources) with hydrocarbon leaks in offshore installations. Regression analysis indicated that only a poorer psychosocial risk score (higher psychosocial risk) reported for installations was associated with a greater number of hydrocarbon leaks for two consecutive years (supporting the second hypothesis of the study but not the first). In line with previous studies, this analysis showed that there is a significant relationship between human and organisational factors (also referred to as psychosocial risk factors) and unsafe work practices (Hestad & Lilleheier, 2009;

Hoffmann & Stetzer, 1996; Kongsvik et al., 2011; Mearns, 2001; Payne et al., 2009; Vinnem et al., 2010; WHO, 2010).

Furthermore, the results indicating that higher psychosocial risk reported for installations was associated with a greater number of hydrocarbon leaks are also in accordance with investigation reports of accidents that have occurred in the industry. These investigation reports have identified the organisational aspect as a critical aspect that needs to be addressed in the prevention of accidents in the industry. A report on organisational factors in accident investigation for the Norwegian Petroleum Safety Authority (PSA), identified changes in the organisation; communication; involvement; conflict and conflict handling as being particularly important (Thunem et al., 2009).

Considering both the correlation and the regression analyses conducted, this study found only partial support for the first hypothesis stating that there would be a significant relationship between technical factors, i.e. installation age, weight and number of leakage sources, and HC leaks. It was important to include these variables in the study because installation age, weight and number of leakage sources are seen as essential indicators for technical complexity of the equipment and platform lay out, which are relevant for the prevention of HC leaks. In the oil and gas industry technical failures leading to HC leaks are more likely to happen on larger, older and more complex installations (Kongsvik et al., 2011). Even though the correlation analysis conducted did indicate some significant relationships when testing between two variables at a time, these were not confirmed in the regression analysis, when testing for all possible predictor variables at the same time. The results from the regression analyses showed that only the PRI significantly accounted for variation in HC leaks, suggesting that psychosocial risks may be more important than the technical indicators included in this study. However, since in the correlation analysis, the number of HC leaks for both 2010 and 2011 was correlated with installation age (which was correlated with installation weight and number of leakage sources), and HC leaks for 2011 were correlated with number of leakage sources, it is advisable that further studies are conducted in order to more fully understand how these relationships actually play out in practice when all different variables can have an impact on such a high risk outcome (HC leaks). The overall pattern of results in the study indicates that the technical complexity and condition of the installation influences the risk of HC leaks to some extent but its significance is weakened when the impact of psychosocial risks is taken into account.

With the PRI results as the starting point, it makes sense to further follow-up the indicator results and assess the underlying factors in the psychosocial work environment which may

contribute in explaining the occurrence of ill-health, work-related stress and unsafe work practices. The follow-up should include a psychosocial risk assessment where the relationship between psychosocial hazards and employee health (early stress symptoms) is analyzed (BSI, 2011; Leka et al., 2008). This would allow the identification and prioritization of effective interventions that are tailored to address the risk of a particular work group. Furthermore, by preventing the negative exposure to a poor work environment, companies will be able to reduce the likelihood of HC leaks with major environmental or high fatality potential. The PRI and the follow-up activities should all be part of a comprehensive system where risk is identified and appropriate interventions initiated at the right level. Such interventions should address the different psychosocial hazards that might affect particular work groups with emphasis put on tackling the sources of risk through primary prevention. Work redesign, better work organisation, improvement of the social work environment and organisational culture have all proved to be effective primary level interventions to improve the psychosocial work environment. Awareness rising through developing individual skills are also important and can help in alleviating the symptoms of exposure to an unfavourable psychosocial work environment.

Finally, where negative impact is already evident, appropriate corrective (rehabilitative) actions should be implemented (see e.g. WHO, 2003). In designing appropriate interventions, the interplay between the physical and psychosocial work environment should be taken into consideration, especially in high risk sectors like the oil and gas industry. Improved physical working conditions are undoubtedly important when it comes to HC leaks; however, there is a need to better understand employee perceptions of the physical and psychosocial work environment and their interaction. Only in this way will preventive actions be comprehensive in the modern oil and gas work environment.

To effectively prevent the negative effects that psychosocial hazards may have on human performance, it is also important to have simple and easy tools that companies can use in order to identify and follow-up units where, for example, employees are exposed to high job demands, in combination with low control and low support. In this respect, the psychosocial risk indicator used in this study may serve as a proactive measure, giving the company an overview of the units with higher risk. Furthermore, these findings may increase our understanding of why and how companies can use proactive indicators (focused on exposure to poor working conditions) in their promotion of health-related issues as well as the prevention of poor HSE outcomes, such as HC leaks. The psychosocial risk indicator has an internal reliability that is acceptable in a scientific setting. The items that constitute the measure in this study have an acceptable level of internal consistency. However, it is important to note that

even though the PRI is not a perfect measure of all psychosocial hazards, it has been developed after years of research internally in the company and can act as a good indicator. In order to strengthen organisational learning there is on-going work being done to adapt the PRI if necessary on the basis of empirical data collected every year. Furthermore, it is also important to evaluate the relevance of new and emerging risks identified in this on-going research.

5.3.1 Limitations and contributions

Although this study has found a systematic significant relationship between measures of psychosocial risk and hydrocarbon leaks, the question of causality cannot be resolved by the research design alone, even though the present study has used independent and dependent variables from different time spans. It is likely that some other variables influence both psychosocial risk and HC leaks.

The quality of management and subsequent planning, coordination and improvement activities could be examples of such variables. Even so, the possible practical use of the psychosocial risk indicator as a risk indicator, part of the internal HSE risks picture discussion, remains valid. As such it is reasonable to assume that improving the psychosocial work environment (i.e. the way work is designed, organised and managed) will contribute to improving HSE performance. In the way forward, it may be useful to replicate the findings produced in this study and aim to investigate causal relationships and major accident risk.

In the oil and gas industry where it is seen as critical to have a holistic perspective on HSE, information about psychosocial factors, measured by the PRI, should be used in the risk management process along with other sources of information. As such, it is important for the business to understand the relationship among key indicators. Even though several indicators are equally important independently, it is the combination of indicators that provides managers with a navigation path to corrective actions, by highlighting the business areas that need the most attention (Parmenter, 2007). In this example it is about understanding more about the relationship between the indicator for psychosocial risk and hydrocarbon leaks. If installations observe both high psychosocial risk and frequent HC leaks, attention with regards to follow up should include a focus on how work is designed, managed and organised. As such, a shift in attention from interventions focused on strictly technical barriers to a more holistic approach which also includes psychosocial risk will be needed.

Furthermore, ensuring the implementation of proactive indicators focused on psychosocial risks, in addition to other more traditional indicators, can support a more holistic approach when assessing the HSE risk picture; thereby strengthening the likelihood that

business decisions are based on a balanced view of risk and priority areas for follow-up. Nonetheless, as indicators in general represent simplifications of complex relationships, they should be used in combination with other more in-depth methods (qualitative or quantitative in nature) to provide a more complete risk picture. This is why it is essential that the indicator is part of a comprehensive system combining identification of key psychosocial hazards, followed by in-depth risk assessment; and implementation of appropriate risk management measures. This would be in line with research that points out that because different work groups have different types of challenges and with different safety risks in their day-to-day activities, it is reasonable to assume that initiatives will be more effective if tailored with respect to various groups' needs (Bjerkan, 2010).

The study illustrates that psychosocial risk indicators may be useful in the effort of preventing the risk for HC leaks. Such indicators could be used as one of several sources of information for monitoring the risk for HC leaks and one of several pragmatic criteria for determining where to implement preventive safety measures. The psychosocial risk indicator used in this study could be used to strengthen the organisation's knowledge and understanding of the relationship between HSE indicators, within a more comprehensive indicator framework. Even though the indicator cannot be used directly by other companies within the industry it is important to highlight that the overall approach, particularly related to the implementation of a psychosocial risk indicator as an integrated part of a comprehensive system for managing psychosocial risk, should be of valuable knowledge to other organisations and the industry as a whole (Bergh et al., 2014b).

In order to strengthen compliance and provide line management with a practical tool that would support follow-up of the psychosocial risk indicator it was decided to develop and test an internal auditing tool for psychosocial work environment. The auditing tool would also be an important step in ensuring a stronger integration into the monitoring system. This process is described in the next chapter.

6 Chapter: Developing and testing an internal audit tool of the psychosocial work environment

The objective of the third study is to present and discuss the development of an auditing tool for the psychosocial work environment by presenting its pilot in an offshore installation. It also aims to describe how it is suitable for monitoring the status of safety barriers aimed to reduce the risk of the development of stress and ill-health in offshore and onshore environments. This study has been published in the journal Safety Science (Bergh, Hinna, Leka & Zwetsloot, 2016).

Safety barriers have been used to protect humans and property from enemies and natural hazards since the origin of human beings. When human-induced hazards were created due to the industrialism, safety barriers were implemented to prevent accidents caused by these hazards. The concept of safety barriers is often related to an accident model called the energy model (Haddon, 1980). Gibson (1961) pioneered the development of the energy model, while Haddon (1980) developed the model further as he presented his ten strategies for accident prevention. The model is today used within high risk industries, nuclear and petroleum industries (Sklet, 2006). Sklet (2006) proposes the following definitions of the term safety barrier: “Safety barriers are physical and/or non-physical means planned to prevent, control, or mitigate undesired events or accidents” and “A barrier function is a function planned to prevent, control, or mitigate undesired events or accidents” (Sklet, 2006, p.496).

As discussed previously, the company has a comprehensive toolbox aiding the business in controlling psychosocial risk, addressing interventions at primary, secondary and tertiary level. However, a tool for performing internal auditing related to the psychosocial work environment has been lacking. In 2011, the company initiated a pilot project with the goal of developing an internal auditing method that can measure the status of psychosocial barriers of considerable importance to the risk of stress and ill-health offshore and onshore.

The purpose of incorporating the psychosocial work environment into the monitoring system was to assure compliance with the management system and to provide a basis for improvement. As such, it was decided to use tools and methods that are applicable and can be considered as good audit practice. It is important to note that this company already had an extensive audit practice incorporated into the management system. One category within auditing practice is called verification tools. A verification tool in this company is described as the confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. Examples of verification activities are:

verification to ensure compliance with governing documentation; and verification of products and processes to ensure compliance with relevant standards and specifications. It was decided that the internal auditing tool for the psychosocial work environment would be a verification tool.

6.1 Method

6.1.1 Sample

The pilot group used in this study worked at an oil and gas installation on the Norwegian Continental Shelf. When drilling and well work is under way on the field, about 240 workers are at the installation on rotation 3x2 weeks. The scope of the audit covered 446 employees, personnel that are on a permanent shift rotation. Personnel on temporary shift were excluded.

The employees working on installations are transported to and from their workplace with a helicopter. The activities on a platform are continuous 24/7, night and day. Employees spend 2 weeks on the installation and 4 weeks off. The nature of work offshore, e.g. shift rotation, sets specific requirements to the organisation, management and design of work. Employees usually work a 12-hour shift over a two-week period. In practice this entails two week when they spend most of their time with their colleagues.

The sample included line managers and employees (N=303). The offshore installation has several sub-groups with specific roles and responsibilities:

- The Operations and Maintenance team has responsibility for the daily operations (control room) and the day-to-day maintenance of the offshore installation.
- The Planned Maintenance team is responsible for all long-term, often campaign, maintenance.
- The Logistics team is responsible for all lifting, storage and securing safe transport from supply vessels into the platform, in addition to the daily operations of helicopter landings and take-off.
- One team is responsible for food, cleaning and accommodation.
- One team is responsible for insulation, scaffolds and surface treatment work.
- The Maintenance and Modifications team is responsible for contractual parts of maintenance and modifications that are needed at the installation.
- The Inspection team is responsible for the inspection and testing of systems offshore.

The majority of employees are craftsmen/operators, electricians, mechanics, institutional cleaners, crane operators, logistics operators etc. More than half of the employees had been on offshore rotation for more than 10 years.

6.1.2 Audit tool for psychosocial risk

The purpose of the tool for auditing the psychosocial work environment is to audit the organisation's compliance with established requirements and performance standards and promote organisational learning.

Two main contextual premises in the company influenced the development of the internal auditing tool: 1) it needed to be risk-based, and 2) it needed to focus mainly on stress and ill-health. The risk-based approach, which included different tools and checklists, was used to identify breaches to barriers for the unit being audited. It was important for the company to test an auditing approach focused on stress and ill-health as it represents a critical business risk.

6.1.3 The pilot work: Step by step description of the auditing process

The preparatory phase starts 4 weeks before the installation visit and comprises the following activities: Establish the auditing team, define and clarify scope of work, prepare interviews and information gathering.

Establish the auditing team: The auditing team consists of 2 people with knowledge and experience within auditing and the psychosocial work environment.

Define and clarify scope of work: Identify which groups should be part of the scope. Work practices, governing documents, operating models specific to the offshore setting are reviewed. The auditing team meets and reviews all the data collected in the preparatory phase in order to get familiar with the installation, the organisation and their performance based on available data.

Prepare interviews and information gathering: The team then plans and prepares for interviews by finalizing interview guides, making appointments, and booking travel and accommodation.

It is essential that the assessment phase is conducted in a time-efficient manner in order to minimize the time required for completion of the assessments without minimizing quality.

Offshore visit: The auditing team interviews a selection of personnel from different levels of the organisation and from different shifts in order to get as representative views and

experiences as possible (max. 20 employees). The team also does observations during normal work operations, meetings and so on. For the interviews, workers are randomly selected based on defined criteria: gender, work experience, age, position etc. The interviews allow the employee to talk about their work in their own words. The auditor goes through a list of various aspects of work (e.g. task content, workload and pace, working hours, communication and leadership, etc. (Leka & Jain, 2010)). Examples of questions asked in the interview are: Tell me about your working day; Tell me about the way management communicates with employees; How is unacceptable behaviour addressed in your unit?; Please describe your workload; How are your role and responsibilities described and communicated?; How are deviations from roles and responsibilities addressed?; Who do you receive support from?; How do you address lack of support?

Analysing interview data and sending out the survey: In this phase the information collected in the preparatory phase, and the results from the interviews are analysed. Furthermore, a survey is designed and distributed to all employees in scope. The survey provides quantifiable data on the antecedents and consequences of work stress. It contains both tailored measures of work design (on the basis of the preparatory phase and analysis of the interview data) and standard measures of well-being.

Analysing the survey data and evaluating criticality and conditions. The findings from the survey form the basis of the evaluation of the compliance or non-conformance to the performance standards. Based on the demographic variables sub-groups are identified.

Presenting results and identifying actions: Results are then presented to the audited unit. A plan of action for addressing the identified risks is then developed. The auditing process (offshore version) is shown in Figure 6.1.

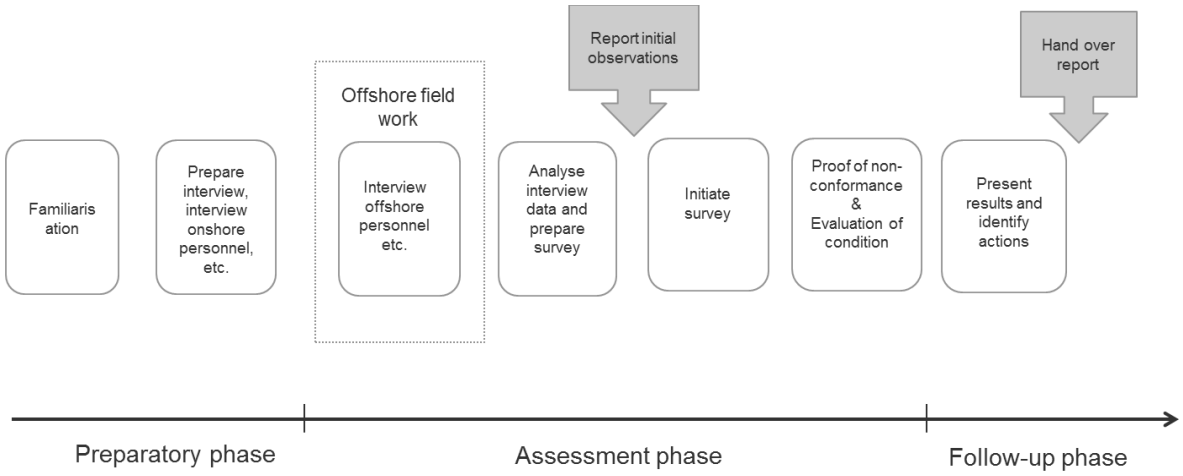


Figure 6.1: The auditing of psychosocial risk process (offshore version)

6.1.4 Establishing performance standards

To prioritize the psychosocial work environment and promote good practice across the company, it was decided to develop and establish performance standards applicable to the psychosocial work environment, linked to internal requirements.

The performance standards were chosen based on research on the relationship between the psychosocial work environment, stress and health (Leka & Jain, 2010). Several international frameworks were considered in order to find appropriate check lists and tools such as the HSE Management Standards for work-related stress in the UK, the ILO Stress prevention at work checkpoints, and BSI PAS1010. The HSE Management Standards provided a description of achievable conditions that formed the basis for the performance standards that were established. An overview of the performance standards is shown in Table 6.1.

Table 6-1: Performance standards for the psychosocial work environment

Standard – Psychosocial work environment
PS.01. Job demand Employees are provided with achievable and adequate demands, matching the agreed hours of work Abilities and skills are matched to employees' job demands Communication of work expectations is comprehensible and complete Concerns about the working environment are addressed Local procedures are in place to respond to any individual concerns
PS.02. Role and responsibility The different requirements placed upon employees, are as far as possible, compatible Employees are provided with information that support the understanding of their role and responsibilities The requirements that are placed upon the employees are, as far as possible, clear Systems are in place to enable employees to raise concerns about any uncertainties or conflicts they have in their role and responsibilities
PS.03. Job control Where possible, employees are in control over their pace of work Employees are encouraged to utilize their skills and initiative in order to perform their tasks Employees are encouraged to develop their skills Employees are consulted with regards to their work tasks Work practices enable employees to prioritize tasks
PS.04. Social support Policies and procedures are in place to support employees adequately Managers are enabled and encouraged to support their staff Employees are enabled and encouraged to support their colleagues Employees are aware of what support is available and how and when to access it Employees receive regular and constructive feedback Managers talk to their staff, listen to them and make it clear that they have been heard Commitments made to staff are clear and kept
PS.05. Interpersonal relationships Positive behaviours at work are promoted to avoid conflict and ensure fairness Employees share information relevant to their work Policies and procedures to prevent or resolve unacceptable behaviour are known and complied to Managers are encouraged to deal with unacceptable behaviour Employees are encouraged to report unacceptable behaviour
PS.06. Changes Employees are provided with timely information to enable them understand the reasons for proposed changes Adequate employee consultation (with regards to their own working environment) on changes is ensured and opportunities for employees to influence proposals are provided Employees are aware of the probable impact of any changes to their jobs. If necessary, employees are given training to support any changes in their jobs Employees have access to relevant support during changes
PS.07. Travel Employees have predictable travel pattern Employees are able to rest after travel across time-zones Work does not affect the employees' home situation in a negative manner

6.1.5 Establishing the psychosocial work environment verification criteria

In order to classify and report findings, the next step was to establish psychosocial work environment criteria; conditions and criticality. The findings from the audit of the psychosocial work environment are the result of the evaluation of a monitoring object which indicates either compliance or non-conformance with specified criteria. The criticality of a finding is related to the potential effect of the monitored object (ISO 9000). The findings are classified into different categories: red, yellow, green and white. Table 6.2 lists the adopted psychosocial work environment verification criteria.

Table 6-2: Audit criteria, condition and criticality used to classify and report findings

Classification of condition		Verification of compliance	Risk after evaluation of control and compliance	Action urgency	Proof of non-conformance for psychosocial factors
Red	Serious condition	Non-conformance with regulatory requirements or non-conformance with internal governing documents	High	Urgent Need for immediate initiation of actions Higher level management to be informed	Unattended cases of bullying complaints * / ** Psychosocial working conditions with high potential of causing ill-health (Likelihood ratio >1) *** AND More than 50 % of the workforce report Psychosocial working conditions as poor or inadequate ****
Yellow	Minor condition or room for improvement	Non-conformance with regulatory requirements or non-conformance with internal governing documents	Medium	Medium Actions to be taken as soon as possible	Unattended conflicts*/** Psychosocial working conditions with high potential of causing ill-health (Likelihood ratio >1) *** OR More than 50 % of the workforce report Psychosocial working conditions as poor or inadequate ****
Green	Accordance	No non-conformance has been identified or only minor aspects that are recommended to be improved	Low	Low Actions not required to be registered in internal audit management system	Between 50 and 25% of the workforce report psychosocial working conditions as poor or inadequate ****
White	Accordance	In accordance with relevant rules and regulations	Low	None	Working conditions meet the requirements and standards ****
Observations/annotations: A condition that is not directly related to the performance standards, but is still important					If there are any groups at higher risk, identified through GWBQ * or

to highlight in order to attend to the health and safety of employees.	high level of health complaints** /**** GWB above 18 is cause of concern

* index in questionnaire
** from interviews/information provided in the process
*** risk analysis of questionnaire data in SPSS
**** questionnaire – frequencies of exposure

6.1.6 Use of tools to check compliance with performance standards

In order to check compliance with the established performance standards, it was decided to use both qualitative and quantitative assessment tools: semi-structured interviews; a tailor made working environment questionnaire; the General Well-being questionnaire (GWBQ); and a health symptoms profile (the use of these tools is described by Cox, Griffiths & Randall, 2003):

Semi-structured interviews are used in order to obtain data related to the psychosocial work environment in the audited unit. Prior to the interviews, the participants received information about the process and a short description about the content of the interview. They were also informed about the assessment process, including that it was voluntary and confidential.

The interviewees are experts on their own work environment and are encouraged to share their viewpoints and experiences of the psychosocial work environment. The following aspects are included in the interview guide (see appendix 9 for entire interview guide):

- Workload and work pace
- Work schedule
- Communication in the unit and between the shifts
- Role and responsibilities
- Training and competence development
- Social relationship, including leadership and colleague support

Interviewees are assured of confidentiality, anonymity and informed consent.

If interviewees report critical conditions, this is reported immediately to their line management. An example may be reported bullying cases: bullying is considered a serious breach of internal and external requirements. Furthermore, it is considered a serious threat to health. As such, any unattended cases of bullying are considered a critical condition (Table 6.6 red condition).

The questionnaire is used to obtain proof of compliance or non-conformance with the performance standards (Table 6.6). It includes the following:

Demographics: Demographics are used to identify groups at risk and in order to collect valuable information about exposure to psychosocial risks.

Psychosocial work environment items: This section of the survey is tailor made on the basis of the data collected through the interview stage described earlier. For the audited unit, a questionnaire measure of exposure to potential psychosocial hazards (possible sources of stress) is developed. This questionnaire measures employees' own experience/perception of the psychosocial working environment. The questionnaire items are designed to cover all potential psychosocial hazards identified during familiarization and interviews as concisely as possible. Employees evaluate the adequacy of each aspect of their work by ticking a box on a 5-point likert scale, ranging from poor to excellent. The survey was distributed to 446 employees (all employees at the installation). As part of the survey, the participants received information about the aim of the survey, how the results would be utilized and confidentiality issues. The participants were also informed that their participation was voluntary.

Work-related health items: It was decided to include measures of both the experience and consequences of work-related stress. Consequences of stress may manifest themselves in e.g. poor well-being, musculoskeletal pain. These can be explored with reliable and valid measures.

Feeling worn out i measured through the General Well-being Questionnaire (GWBQ) (Cox & Gotts, 1987) which is a validated questionnaire developed at the University of Nottingham that is used in the company in order to assess important symptoms of work-related stress. Employees evaluate the adequacy of each aspect of their work by ticking a box on a 5-point likert scale, ranging from never to all the time. The GWBQ was chosen for this study because: 1) GWBQ was part of the company's risk assessment tools in the PRIMA method and as such preferred tool for internal stakeholders, i.e. was perceived as a measurement that had been successfully used as part of improving the working environment across the organisation; 2) GWBQ was a standardized and validated measurement that includes predefined cut-off scores; 3) GWBQ was already an integrated part of the company's management system and the organisation was familiar with the measurement.

The use of this instrument is particularly useful to assist with separation of cause and effect relationships in stress pathways. Cut-off scores have been established for the GWBQ and these validated scores are used as a point of reference for the purpose of deciding

criticality and condition (Cox & Gotts, 1987; Cox, Thirlaway, Gotts & Cox, 1983). An average score is produced for the whole group of employees. Average scores of 18 and upwards indicate that a group is more worn out than the average. Average scores higher than 20-21 indicate a relatively high level of worn out symptoms. Cut-off scores for professional and factory workers have also been produced; Professionals 15.87 and Factory workers 14.16.

The GWBQ scores are used in determining which psychosocial hazards are more likely to cause ill-health and accidents of workers. This is calculated by performing a Likelihood Ratio/Odds Ratio analysis between GWBQ scores and working environment items. Furthermore, the frequency of reporting a poor working environment is part of determining the criticality of condition. The same validated assessment process/procedure is described in detail by Cox et al. (2002).

The level of consensus or agreement on the presence of a stressor, e.g. the proportion of staff reporting an aspect of their work to be inadequate, is used to achieve this. A starting point would be to consider those stress-related hazards that are agreed by the majority of employees (>50%) as being problematic. Similarly, the aspects of work reported as satisfactory or good by >75% of employees are presented as features to maintain or strengthen.

Work stress may also lead to tension in the muscles – thus increasing 'wear and tear' on the working muscles. It may also be linked to impairments in the body's ability to repair its muscles and joints after exertion (Leka & Jain, 2010). As such, items on (occurrence and frequency of) musculoskeletal pain (headache, neck pain, shoulder pain, back pain) are included in the survey as a measure of the possible consequences of work stress.

The process of evaluating the results and reaching conclusion with regards to the Performance Standards is shown in Table 6.6.

The final aspect that needed consideration was how to report the findings in the internal IT tool audit management system. This tool is used for the planning, administration and follow-up of all internal monitoring and external supervision in the company. As such, this system needed adaptations in order to be used for the planning and follow-up of the verification of psychosocial risks. This represents minor changes into the existing system, where the performance standards for psychosocial work environment need to be implemented.

6.2 Results

6.2.1 Interviews

In total 21 employees were interviewed. The interviews did not reveal findings that needed immediate actions from line management. Examples of aspects that were highlighted by interviewees are: lack of unified communication from the management team; employees also reported workload issues e.g. support when experiencing excessive work pressure; work practice and organisation e.g. unrealistic time estimates and prioritization of work; and good relationships between colleges.

As described in the method section the data from the interviews was used as input to the design of the survey and contributed to the analysis of the survey.

6.2.2 Survey

The survey was distributed to 446 employees and 303 returned a complete survey. Table 6.3 shows the breakdown of the survey respondents from each sub-group at the platform. Results also showed that 20% of employees reported intention to leave. Compared to other units in the company, this is within the expected result.

Table 6-3: Survey respondents: Sub-groups at the platform, number of employees and GWB score

Sub-groups at the platform	Number of employees	GWB score
Management	15	12.00
Operation and Maintenance	59	15.80
Planned Maintenance	43	14.30
Logistics	32	14.30
Housekeeping	27	14.70
Insulation, Scaffolding and Finishing treatment	52	12.10
Maintenance and modification	48	13.30
Inspection	12	11.70
Drilling	15	14.30

6.2.3 Work-related health

The GWB score for the total sample was 13.8. The score for the sub-groups varied from 11.7 to 15.8. None of the sub-groups scored higher than 18 and compared to the norms, this does not pose a cause of concern (see Table 6.4).

Table 6.4 shows that the reported musculoskeletal pain from the survey group is below 50%. This is considered to be within acceptable level compared to other units in the company. The sub-groups were also checked and no risk groups were identified.

Table 6-4: Musculoskeletal pain reported in the past year

Musculoskeletal pain	% reporting pain in the past year
Headache	36
Neck	27
Shoulder	36
Back	33

The percentage of workers reporting poor working conditions was identified. The level of consensus or agreement on the presence of a stressor (e.g. the proportion of staff reporting an aspect of their work to be inadequate) did not exceeded 50% on any of the items. The analysis of the combined data from the GWB scale and the identification of potential sources of work stress (psychosocial work environment items) aimed to identify likely risks. Likelihood ratio analysis was used to establish these associations (Wang, Eddy & Fitzhugh, 1995). 16, which is the standardized cut-off score for professionals, was used as the threshold score for identifying poor well-being in the analysis (Cox & Griffiths, 2005; Cox, Thirlaway, Gotts & Cox, 1983). 19 items with higher Likelihood ratio (>1) were identified. Likelihood ratio and the percentage of workers reporting poor psychosocial work conditions are listed in Table 6.5.

Table 6-5: Odds ratios of psychosocial work environment factors and GWB and percentage of workers reporting poor psychosocial work conditions

Psychosocial work environment items	Likelihood ratio	% of workers reporting poor psychosocial work conditions
The balance between planned maintenance and urgent task	7	11
Your workload	10	13
The possibility to work in pairs when performing your job	11	12
The balance between administration and field work	13	14
The quality of the training provided to new employees	14	11
The correspondence between time estimates and the actual time spent on completing tasks	14	21
The resolution of conflict situations on-site	15	11
Co-ordination of your leaders in the communication of established practice	15	22
Clear communication of prioritization of job tasks	18	12
The practical value of HSE meetings	18	13
The possibility to ask for assistance or relief when workload is too high	18	16
The practical value of addressing issues with management on-site	21	11
Your competence level related to the use of computers at work	21	12
The possibility to have work tasks adjusted to your individual health situation	21	13
The clarity of the leading advisor's role and responsibilities	22	13
Your possibility to work at one task at a time	23	23
The utilization of your competence on the platform	28	12
The availability of information related to your work tasks	44	10
Your possibility to ask other colleagues for help	-	2
The possibility to raise concerns with your colleagues	-	2
The social environment at the platform	-	5
The possibility to receive support from your line manager	-	6
Your possibility to learn from other's experience	-	4
Your possibility to share experience with others	-	4

*p < 0.05, **p < 0.01, ***p < 0.001

6.2.4 Findings and classifications

The results from the pilot group have been classified according to the evaluation criteria. Four were evaluated as yellow and two were evaluated as white.

The following is an example to demonstrate how the audit team used input from interviews and the survey to conclude on non-conformance to the performance standards (PS).

The process of evaluating the results and reaching a conclusion with regards to the PSs is shown in Figure 6.6.

The first yellow finding is within the PS.01. Job demands. This performance standard relates employee's job demands and covers issues such as having achievable and adequate demands; skills and abilities are matched to the job requirements; comprehensive communication of work expectations.

In the interviews employees described a work situation with varied intensity with regards to workload and work pace. The interviewees described how job demand issues were related to the unit's plans for executing and organize the work tasks. It included the management and organisation of work on a day to day basis at the platform as well as the coordination between offshore and onshore staff. Examples that were provided from the interviewees were the effect of having an imbalance between planned maintenance and urgent task. Furthermore, employees reported that the demands for using computers in order to solve tasks in their daily work had increased over the last years. The employees that described this as a problem reported that periods with high workload and pace also affected their sleep pattern and ability to concentrate at work.

The observations/results from the interview were further strengthened through the findings in the survey. The items are identified as psychosocial working conditions related to job demands with high potential of causing ill-health e.g. Likelihood ratio >1. The survey showed that employees experience an imbalance between administrative tasks and work performed in the field and time estimates do not always correspond to actual time spent on tasks. Furthermore, results showed that it is difficult to adjust work tasks to individuals' health situation. Nine items related to job demand issues showed a higher likelihood ratio, see Table 6.5, item 1, 2, 4, 6, 11, 13 and 16.

The same process was used for evaluating all the performance standards. Table 6.6 summarizes the conformance and non-conformance to the performance standards.

Table 6-6: Pilot results: Criticality, standard and evaluation of condition/proof

Criticality	Condition/proof	Standard
Yellow	Employees are exposed to high workload and high intensity of work pace. This relates to the unit's plans for executing and organizing work tasks. There is an imbalance between administrative tasks and work performed in the field. Employees lack competence in order to use IT tools.	PS.01. Job demand
Yellow	Employees are exposed to inconsistent communication from management regarding expectations to their job performance. New employees do not receive adequate training. Role of leading advisor are unclear with regards to mandate, authority and responsibilities.	PS.02. Role and responsibility
Yellow	Employees find it difficult to have an overview of the tasks at hand, important requirements for their jobs and they lack clear prioritization of job tasks. Employee's competence is not utilized well enough at the platform.	PS.03. Job control
Yellow	The practical value of addressing work related problems with local management on-site is poor. Conflict situations are not always followed-up and handled on-site.	PS.05. Interpersonal relationships
White	The social environment is very good. All employees receive good support from each other; also across disciplines. The employees share information across the shifts in predefined meetings and protocols.	PS.04. Social support
White	Employees have been invited to share experience and evaluate change initiatives.	PS.06. Change
Non-applicable	No issues (positive or negative) regarding work-life balance were identified in the assessments.	PS.07. Travel

6.3 Discussion

The auditing tool aims to secure high attention on the management of psychosocial risk in the company as part of the company's monitoring plan. Developing auditing tools that address psychosocial issues in addition to other aspects may further contribute to a more holistic occupational health and safety management perspective (Hasle & Zwetsloot, 2011; Hohnen & Hasle, 2011; HSE, 2007; Leka et al., 2011; WHO, 2010).

6.3.1 Evaluation of the auditing of psychosocial work environment as an audit tool

The auditing tool for psychosocial risk is a tool that confirms compliance to requirements in the management system. The auditing checks whether psychosocial barriers are in place and functioning. The quality of the auditing method can be evaluated according to a standard and generic list of requirements for measuring instruments in science (Hale, 2009).

Validity (does it measure what we want it to measure?)

It is important that the auditing tool for psychosocial work environment tool is able to assess whether the unit being audited is organized in a way that prevents employees from being exposed to psychosocial hazards with risks to health and safety.

Because psychosocial hazards are situation specific, the audit assessment has to consider the particular context of work (e.g. by examining the workplace, type of worker, work process etc.). In order to do this, the identification of psychosocial risks relies on the expert judgment of groups of relevant working people about the adequacy of the design and management of their work. The knowledge and expertise of working people in relation to their jobs is recognized and treated as valuable evidence. This information is treated at the group level and consensus is measured in those expert judgments on working conditions. The information about the possible outcomes of work-related stress is collected from the assessment. This information is used to determine which of the psychosocial hazards actually affects the health of those exposed to them or the healthiness of their organisation and, in turn, provide proof of compliance or non-conformance.

By following this logic, the auditor can go beyond checking whether the organisation has systems in place to manage psychosocial work environment but verify whether the systems work as intended. This is important because experience over the years has shown that having a system for occupational health and safety risk does not necessarily provide better health and safety to workers (Blewett & O'Keeffe, 2011; Hasle & Zwetsloot, 2011; Robson et al., 2007).

Reliability (does it give the same measurement when used by different people or on different occasions?) and sensitivity (does it respond to changes in what it is measuring?)

The design and management of work, and the nature of working conditions, differs between jobs, workplaces and organisations. Different groups have different problems that manifest themselves in different ways. The auditing tool for psychosocial work environment allows for these differences by applying tools which are designed in a way that capture specific contextual situation. As such, some of the tools used as part of the audit tool for psychosocial work environment are flexible and are tailored to meet the needs of the group of staff involved, e.g. tailored items in survey based on interviews. However, other tools are standardized and pre-defined. All units being audited will be subjected to interviews and data collection through surveys. Furthermore, the performance standards, condition and criteria are pre-defined and there are a set of pre-qualifications for auditors with auditing training and experience, knowledge of psychosocial work environment, practical skills in how to assess the

psychosocial work environment by using various tools and methods. This ensures that the measurements are applied in a similar way by different people or on different occasions.

Representativeness (does it cover all aspects which are relevant?)

When developing the auditing tool for psychosocial work environment tool it was extremely important to work within a number of well-defined guiding principles based on research. Firstly, the performance standards are based on well-established knowledge on how various psychosocial hazards effect health. Exposure to psychosocial hazards can result in the experience of work-related stress with negative impacts that can be psychological, cognitive, social, and physiological and can potentially affect both health and safety in any business context (Griffin & Clarke, 2011; WHO, 2010). An extensive number of articles have been published on stress and how they correlate with psychological and physiological outcomes. In the oil and gas industry psychosocial risks can cause ill-health for individuals or groups due to long time exposure to poor working conditions (Cox et al., 2000a; Maslach et al., 2001; Mearns, 2001; Schaufeli & Enzmann, 1998; WHO, 2010).

Furthermore, the auditing tools used are founded on acknowledged approaches for identifying, assessing and obtaining proofs, including the use of standardized tools developed specifically for psychosocial risk assessments (Cox, Griffiths & Randall, 2003; Leka, Cox & Zwetsloot, 2008).

Openness to bias (can it be manipulated?)

The auditing tool for the psychosocial work environment is based on the process of triangulation. In the social sciences, triangulation is a powerful technique that facilitates validation of data through cross verification from more than two sources. In particular, it refers to the application and combination of several research methodologies in the study of the same phenomenon (Bogdan & Biklen, 2006). The idea is that one can be more confident with a result if different methods lead to the same result.

In the article by Blewett and O'Keeffe (2011) it is argued that audit methodology needs to take into account the multiplicity of views available within an organisation in order to triangulate the audit data and reach an adequate picture of the situation. In line with the authors' recommendations, the auditing tool for the psychosocial work environment seeks out to assess the views of employees at relevant levels in the organisation. For example, the auditor talks independently to management and employees. However, in order to avoid being manipulated by the views of a selected few interview objects, the auditing tool uses a range of different methods and data to assess and grade the status of the performance standards,

including document reviews, analyses of existing HSE data, interviews, field observations and questionnaire. This makes the tool results robust against manipulation.

Cost-effectiveness (does it cost more to collect the data than would be lost without the information from the auditing to assist decisions?)

One argument against methods like the auditing tool for the psychosocial work environment is that it is time consuming and demands resources. Performing the assessments including interviews and designing working environment questions takes more time than utilizing simple checklists.

However, there are several reasons why it may be beneficial for the business to use multi-method auditing tools like the current one to support decisions. Psychosocial issues are complex and not straight forward and management may risk missing critical information/details when making decisions related to the management of the psychosocial work environment. Work-related stress is expensive for companies (EU-OSHA, 2014). Tackling stress and psychosocial risks by conducting audits can be viewed as too costly, but the reality is that it costs more to ignore them. Stress affects performance and may lead to absence from work and if prolonged it may result in serious health problems. The European Agency for Safety and Health at Work has published a report summarizing studies focused on calculating costs of work-related stress and psychosocial risks. Organisations are affected by costs related to absenteeism, presenteeism, reduced productivity or high staff turnover. In addition, health care costs and poorer business outcomes ultimately affect national economies and society (Hassard et al., 2014).

The verification of the psychosocial barriers through the auditing tool is highly relevant for the prevention of ill-health and can provide essential information to assist management decisions with regards to improvements. Of course, the efforts and resources allocated to the follow-up of audit findings are targeted at the most critical issues.

Because the tool is more complex and resource demanding than traditional auditing practices, it is important that its utilization is part of a risk based initiative and not solely on a periodic cycle. As such, it is important to have established indicator models that will show when it is appropriate for the organisation to audit the psychosocial work environment. By implementing a risk based audit program, the organisation will be able to initiate an auditing process regardless of periodic schedule.

6.3.2 Limitations

There are several authors that have addressed drawbacks or limitations of auditing, e.g. in Michael Power's 'The audit society' (1997) it is argued that if everything is measured and audited, only things that are easily measured and audited are regarded as important. Many intangible aspects of life and work are difficult to audit, and may be further neglected if auditing becomes the normal practice (Hohnen & Hasle, 2011; Power, 1997). With regards to the psychosocial work environment, organisations can perform audits in order to check compliance with the risk management principles. However, just because an organisation can document that they follow a recognized OHSM Standard, like OHSAS18001 (to be replaced by ISO 45001), it does not mean that the assessments and follow-up of psychosocial risk have a "real" impact on reducing ill-health among employees. The pilot has gone one step further than other auditing tools and used the evaluation of employee well-being and its relationship to the working environment as a basis for considering how well the management and systems in place function. This was done by establishing performance standards and incorporating pre-existing tools and principles into the audit process, which allowed for the consideration of working environment conditions and their criticality.

It is important to highlight that the pilot only represents one audit process of a single installation. The auditing tool is as such adapted to the internal auditing system of this particular company. Even though the audits cannot be used directly by other companies within the industry, it is important to highlight that the overall approach should be of valuable knowledge to other organisations and the industry as a whole.

Further studies should focus on extended testing of the tools applied in this pilot. The survey should clearly reflect the established psychosocial performance standards. The effects on the organisation should be evaluated in order to determine if an auditing tool represents a meaningful addition to the auditing process in general and to the management of psychosocial risk.

One could argue that this auditing tool mainly focuses on the negative deviation from the performance standards. However, the auditing tool also identified positive findings in the audit process. This is demonstrated through the identification of conditions that are in accordance ("white criticality") with the psychosocial performance standards.

It is important to note that in this company auditing represents only one of several efforts/initiatives to control psychosocial risk. In order to effectively prevent negative health and safety outcomes due to psychosocial issues, a system for managing psychosocial risk needs to be integrated into the organisation's operational model, e.g. performance

management system, governing documents, risk management processes, leadership development programmes and auditing system (Bergh et al., 2014; Rick et al., 2001). According to the report “A critical review of psychosocial hazard measures” (Rick et al., 2001), organisations should ensure that assessments and follow-up of psychosocial hazards are integrated into existing practices. This company has over the last 10 years worked on implementing a system for managing psychosocial work environment as part of the already existing business process and NOT as separate issue with its separate processes (Bergh et al., 2014a). As such the organisation was ready to test an auditing tool for the psychosocial work environment.

6.4 Conclusion

Psychosocial risks have an important effect on organisations through employees’ health and behaviour, both of which are linked to several organisational outcomes. As such, it is important that organisations have methods and tools to deal with this type of risk, implemented and integrated into their performance management systems. As auditing is an important measure used by companies to control risk, it was important to pilot a tool for auditing the psychosocial work environment. In this context it was necessary to develop an auditing tool to check whether systems are in place for risk management, also evaluating employee well-being and its relationship to the psychosocial working environment. This article describes a pilot for performing audits of the psychosocial work environment with the purpose of preventing work-related stress and ill-health. The auditing tool is a systematic and independent assessment of the status of psychosocial barriers. It reveals non-compliance to requirements and best practice within different relevant levels in an organisation and is suitable as a basis for the development of risk reducing measures. This pilot study provides an additional perspective to auditing tools related to health and safety.

As previously mentioned, the tested auditing tool represents only one of several initiatives to manage psychosocial risk. One of these initiatives is the use of in-depth risk assessments in the various part of the business. As such, the risk assessments are often initiated as a follow-up of high risk, indicated by PRI. In order for the company to promote organisational learning it was decided to conduct a fourth study (described in chapter 7). The results would then feed back to the performance management system, the monitoring system and the procedure of conducting risk assessments of psychosocial work environment. This final study is described in the following chapter.

7 Chapter: Tailoring psychosocial risk assessment in the oil and gas industry

The work context differs in the oil and gas industry depending on whether it is onshore or offshore. As such, the risks and their impact on health and well-being are also different, e.g. offshore work is physically demanding, employees are exposed to hazards such as noise, vibrations, shiftwork, long working days, and chemical exposure (Lie, Arneberg, Goffeng, Gravseth, Lie, Lojså & Matre, 2014). A study conducted by Bjerkan (2011) showed that offshore workers perceived significantly more hazards associated with their work and experienced less control over their work pace compared to onshore workers. Onshore workers experienced significantly more pressure at work and perceived their work tasks as being more repetitive. Differences in health perceptions were identified in terms of job type in the onshore and offshore groups respectively (Bjerkan, 2011).

In addition, the management and development of employees are now recognized as one of the main success criteria for organisational performance. A successful organisation identifies the importance of investing in the human resource (Oakland, 2004). An important contributor to this knowledge is the increasing amount of research exploring the link between job engagement and potential positive consequences on health, productivity, quality and motivation. The Job Demands-Resources (JD-R) model was introduced as an alternative model of employee well-being, to established models such as the job demand-control model and the effort-reward imbalance model (Bakker & Demerouti, 2007). In the JD-R model, working environment factors are divided into job resources and job demands (Schaufeli & Bakker, 2010). Job demands refer to physical, psychological, mental, and/or psychological costs (e.g. work overload, job insecurity, role ambiguity etc.). Job resources refer to physical, psychological, social, or organisational features of a job which help achieve goals at work, reduce job demands, and stimulate employee growth and development (Schaufeli & Bakker, 2010).

The purpose of this study was to explore available risk data collected through the psychosocial risk management process in the company over the last 8 years in order to explore specific and common psychosocial risks to the oil and gas industry. This study is currently under review in the journal Safety and Health at Work.

Based on the JD-R theoretical model and empirical findings related to psychosocial factors, work-related stress and its impact on health (Leka & Jain, 2010), the following four hypotheses were formulated:

Hypothesis 1: There will be differences in the psychosocial risk factors experienced by onshore and offshore workers.

Hypothesis 2: There will be differences in the symptoms of work-related stress experienced by onshore and offshore workers.

Hypothesis 3: There will be a significant correlation between job resources and symptoms of work-related stress, so that increased job resources will be associated with decreased symptoms of work-related stress.

Hypothesis 4: There will be a significant correlation between job demands and symptoms of work-related stress, so that increased job demands will be associated with increased symptoms of work-related stress.

7.1 Methods

As mentioned in previous studies in this thesis, the company's psychosocial risk management framework is based on the principle of prevention in line with the control cycle, and it aims at risk reduction. It is a systematic process by which hazards are identified, risks analyzed and managed, and workers protected (BSI, 2011). The risk assessments and follow-up are applied in order to get a more complete risk picture and enable the organisation to implement improvement initiatives. The risk assessments assess psychosocial risk factors that may cause work-related stress and ill-health. They utilize various tools, both tailor made and standardized. A questionnaire survey provides quantifiable data on the antecedents and consequences of work stress. It contains both tailored measures of work organisation and practices, and standardized measures of symptoms of general well-being. The risk assessment mainly covers two parts: 1) assesses the possible sources of work stress; 2) measures the possible consequences of a poor working environment i.e. symptoms of work-related stress (Cox & Griffiths, 2005). Based on the results from the risk assessment, mitigating actions are initiated and followed up in the respective units.

7.1.1 Sample

Data selection included 12 different samples from different risk assessments and different locations (offshore and onshore). The sample size varied in the different samples, ranging from 50-351 employees. From these 12 samples, there are 5 offshore (788 respondents) and 7 onshore (1024 respondents) datasets. In total, there are 1812 respondents. The risk data has been stored in a company-internal database over the last 8 years.

7.1.2 Measures

The risk data had been accumulated through surveys and were already stored in SPSS files. They were analyzed by using both qualitative and quantitative methods. The analyses utilized data from tailor made working environment questions and the standardized General Well-Being Questionnaire (GWBQ) (Cox & Gotts, 1987). The tailor made questionnaire assesses employees' experience of their working environment (job demands and job resources) and GWBQ measures the possible consequences of a poor working environment i.e. symptoms of work-related stress. These two questionnaires are described further below.

The Psychosocial Working Environment Questionnaire:

The psychosocial work environment questions were tailor-made on the basis of data collected through interviews in each work group to be able to capture the nature of work in each case. They provided information about the employees' experience of their psychosocial working environment (job demands and job resources) onshore and offshore. The questionnaire items were designed to cover all potential psychosocial hazards identified during familiarization and interviews with the working groups as concisely as possible. Employees evaluated the adequacy of each aspect of their work on a 5-point Likert scale. As far as possible the tailored made items followed the psychosocial factor categorization utilized in definitions put forward by WHO, PRIMA-EF and PAS1010. The categories cover the two dimensions included in the JD-R model. Examples of job demands are work content and workload issues, and of job resources are control and support issues.

Symptoms of work-related stress – General Well-Being Questionnaire:

In order to gather information on work-related stress symptoms onshore and offshore it was decided to use historical data collected through the General Wellbeing Questionnaire (GWBQ) (31). The GWBQ is a validated instrument that is used in the company in order to assess important symptoms of work-related stress. The short version of the GWBQ consists of the worn-out scale comprising 12 questions (Cox & Gotts, 1987). These relate to symptoms of tiredness, emotional liability, and cognitive confusion. Full details of the scale itself and its development can be found in Cox and Griffiths (1995).

A 5-point Likert response scale is used from 0=never to 4=always. Cut-off scores have been established for the GWBQ and these validated scores are used as a point of reference for the purpose of deciding criticality and condition (Bergh, et al., 2014; Gardner, 2003). An average score is produced for the whole group of employees. Average scores of 18 and upwards indicate that a group is more worn out than the average. Average scores higher than

20-21 indicate a relatively high level of worn out symptoms. Cut-off scores for professional and factory workers have also been produced (Professionals: 15.87 and Factory workers: 14.16) (Cox & Gotts, 1987).

7.1.3 Qualitative analysis

A qualitative analysis of the tailor-made psychosocial work environment questions from all the samples was performed. In order to handle the large dataset practically, it was decided to categorize the working environment questions into main categories. The categorization was performed by using thematic analysis. The analysis first identified the main themes reported through the various questions in the samples, grouping similar questions together, according to good practice on the basis of key guidance (Leka & Jain, 2010; WHO, 2010).

The questions from risk assessments were clustered according to the underlying psychosocial hazard dimension they corresponded to according to scientific evidence (WHO, 2010). Questions related to the main psychosocial hazard dimensions of: job demands; job control; interpersonal relationships; social support; and role clarity.

Three experts in the area were involved in the thematic analysis conducted to ensure inter-rater reliability and reduce bias. Where disagreements arose, a fourth expert in the area but independent to the organisation was consulted.

7.1.4 Quantitative analysis

The results from the qualitative analysis were used as input to the quantitative analysis. In order to combine variables when performing the analysis, it was important to check the data with regards to reliability and random errors (Pallant, 2013). Cronbach's alpha for all the samples was therefore calculated to establish the internal reliability of scaled questions (Langdrigde, 2011).

Correlation analysis was subsequently conducted in order to assess the relationship between the various work environment categories (identified through the qualitative analysis) and General Well-Being (GWB) scores in each of the samples. Furthermore, mean GBW scores for offshore and onshore samples respectively, were calculated.

The various samples used different response scales on the working environment questions, however they were all linear. Due to the different scales used in the samples it was expected that the direction of the correlations would differ. The different scales used in the samples are provided in Table 7.1.

Table 7-1: Examples of scales for tailor-made items used in the various samples

1 = very unsatisfactory, 2 = unsatisfactory, 3 = neither or, 4 = satisfactory 5 = very satisfactory, 6 = not applicable
-1 = Not applicable; 0 = not answered, 1 = totally unsatisfactory, 2 = unsatisfactory, 3 = neither or neutral, 4 = unsatisfactory, 5 = totally satisfactory
1 = very poor, 2 = poor, 3 = neither / nor, 4 = good, 5 = very good
1 = very good, 2 = good, 3= neither / nor, 4 = poor, 5 = very poor

An independent t-test was subsequently conducted to examine whether there was a difference in the GWB score for onshore and offshore samples by merging SPSS files.

7.2 Results

7.2.1 Qualitative results

From the available samples, five main categories were identified. These categories were: Demands; Control; Role clarity; Support; and Social relationships. The demand category included questions related to working conditions and workload issues. All the samples (onshore and offshore) included issues related to workload and employees' ability to balance larger assignments and ad hoc tasks. However, for the offshore samples this balance is often described as the balance between planned maintenance and urgent tasks. For the offshore samples the demand category especially contains questions about how time-estimates match actual time spent on agreed tasks and the need for extending the offshore period. For the onshore samples the demand category also comprised questions related to employees' ability to perform tasks within normal working hours and the importance of having an alignment between the competence required and the job that needs to be executed. Table 7.2 shows the categories and examples of working environment questions related to job demands.

Table 7-2: Demands items

Demands	How do you rate the: balance between planned and unplanned tasks Ability to implement tasks during normal working hours Working beyond normal working hours

The control category included questions related to the individual's ability to influence their own work situation. The analysis of the working environment questions showed that all the samples contained questions that addressed the employee's ability to impact and prioritize own work tasks. This was observed in both the onshore and offshore samples. For the offshore samples, questions especially addressed the ability to understand the management system and requirements important for executing a job. For the onshore samples the control category included questions that related to job flexibility and predictability. Table 7.3 shows the categories and examples of working environment questions related to control.

Table 7-3: Control items

Control	Ability to control own work pace Ability to influence how work tasks should be done Ability to influence the units Key Performance Indicators (KPIs)

The support category included aspects related to support from both colleagues and leaders. Four types of support were included: emotional support; evaluation support; information support; and instrumental support. Within the support category analysis showed that all the samples contained questions related to leadership support. This included support related to solving daily tasks such as reducing high workload and the amount and quality of feedback. Questions related to professional support were also included in all the samples. Within offshore samples the support questions were often linked to established work practice, such as support with regards to work permits. The leaders' availability and willingness to help prioritize were particularly highlighted in the onshore samples. Table 7.4 shows the categories and examples of working environment questions related to support.

Table 7-4: Support items

Support	Ability to receive professional support from the professional network when needed That SAP, PIMS and ARENA supports your daily work The frequency of feedback from my line manager

The category for role in the organisation included questions that related to whether employees experience clarity with regards to their job profile and whether there is an alignment between the job requirements and prescribed role behaviour. Offshore role clarity related to

employees' ability to perform their responsibilities in line with their role description. As such, their ability to familiarize themselves with the requirements related to their role was highlighted as important. In the onshore samples clarity in relation to what employees have responsibility for was highlighted as particularly important. Table 7.5 shows the categories and examples of working environment questions related to control.

Table 7-5: Control items

Role in the organisation	The way tasks are distributed Clarification of roles and responsibilities before work commences The opportunity to understand why decisions are made

Finally, the questions included in the social aspect category related to organisational culture, interpersonal relationships and career development. All the samples included questions related to conflict handling, communication and collaboration/interface between units, projects and disciplines. In the offshore sample questions often describe issues related to the collaboration between onshore and the installation as well as the quality of the social environment. Questions related to changes were identified in both the offshore and onshore samples. However, the onshore samples had fewer questions than offshore. The questions related to how changes are communicated and whether employees are involved in changes that impact their own work situation. Because the samples varied with regards to how many questions they had related to change it was decided to include the change aspect into the category social aspects. Table 7.6 shows the categories and examples of working environment questions related to social aspects.

Table 7-6: Social aspects items

Social aspects	Collaboration between onshore and offshore The social environment onboard That the leaders are aligned when communicating changes

The results from the qualitative analysis supported hypothesis 1 stating that there will be a difference in how psychosocial factors are perceived onshore and offshore.

7.2.2 Quantitative results

Cronbach's alphas of all the questions in each category were checked to establish reliability and to decide whether all the questions should be included in the category (see Table 7.7 and 7.8). When there are few items in an index (variables that contain fewer than 10 questions) this may result in a low Cronbach's alpha (Pallant, 2013). This was observed in some of the samples and, in particular, this was the case for the job demand category. Due to the variation in number of questions in the indexes it was decided to use the variables in the analysis even though alpha values in some instances were lower than 0.7. The GWBQ (worn-out score) had a Cronbach's alpha value of 0.826.

Table 7-7: Cronbach's alpha - onshore results

Samples	Demands	Control	Support	Role	Social aspects
1-ON	.655	.729	.920	.753	.556
2-ON	.611	.753	.910	.752	.672
3-ON	.737	.709	.762	.801	.614
4-ON	.580	.566	.837	.541	.741
6-ON	.803	.714	.840	.776	.843
7-ON	.653	.703	.708	.847	.603

*p < 0.05, **p < 0.01, ***p < 0.001

Table 7-8: Cronbach's alpha - offshore results

Samples	Demands	Control	Support	Role	Social aspects
1-OFF	.538	.734	.856	.835	.853
2-OFF	.720	.800	.905	.811	.735
3-OFF	.659	.848	.919	.735	.702
4-OFF	.771	.908	.945	.796	.902
5-OFF	.780	.853	.932	.709	.675

*p < 0.05, **p < 0.01, ***p < 0.001

Table 7.9 shows the GWB (worn-out) scores for onshore and offshore. GWB scores varied between 13 and 15. The mean score for all offshore installations was 13.82. The mean score for onshore was 15.11. The GWB scores for offshore installations were right below the established cut-off score for factory workers (14.16). The mean scores for onshore workers

were just below the established cut-off score for professionals (15.87) (Cox, Thirlaway, Gotts & Cox, 1983; Cox & Griffiths, 2005).

Table 7-9: Mean GWB score - offshore and onshore

Sample	Mean	Std. Deviation
Onshore	15.11	5.84
Offshore	13.82	5.65
Total	14.38	5.77

*p < 0.05, **p < 0.01, ***p < 0.001

The analysis produced a t-value of 4.658 with an associated probability of 0.01. As such, the results from the analysis show that there were differences in GWB scores for the offshore and onshore samples. Table 7.10 shows the results of the analysis performed in order to compare and assess the differences between onshore and offshore samples. The second hypothesis stating that there will be differences in the symptoms of work-related stress experienced by onshore and offshore workers was therefore confirmed**.**

Table 7-10: Results from Independent Sampled t-test

		t-test for Equality of Means						
		t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
GWB Score	Equal variances assumed	4.78	1810	.000	1.30	.27	.76	1.82
	Equal variances not assumed	4.75	1665	.000	1.30	.27	.76	1.83

*p < 0.05, **p < 0.01, ***p < 0.001

Both job resources (e.g. social support, job control and role in the organisation) and job demands (e.g. workload) are important for employees' well-being and health. Correlation analysis was performed in order to highlight which working environment aspects are linked to symptoms of work-related stress (see Table 7.11). In the onshore samples, job demands seem to be a psychosocial risk factor that impacts employees' health negatively, e.g. higher demands

are linked to lower general well-being. In the offshore samples, there is a similar pattern where the job demand factor is significantly correlated with the GWB score. Demands offshore have the lowest correlation to GWB and demands onshore have a higher correlation to GWB compared to offshore. As such confirming hypothesis 4 that there will be a significant correlation between job demands and symptoms of work-related stress, so that increased job demands will be associated with increased symptoms of work-related stress.

Furthermore, the analysis shows that there is significant correlation between job control and the GWB score for both onshore and offshore samples. This indicates that employees who perceive a high degree of control at work also have a lower GWB score (e.g. higher overall well-being). It should be noted that for one of the samples (one onshore – sample 3 in Table 7.11) there is no significant correlation between control and GWB.

The analysis shows that there is a strong significant correlation between support at work and GWB. Social support is also an important factor that seems to have an impact on employee health. In all the offshore samples support is strongly correlated with GWB. For onshore samples results also show that support is correlated with GWB.

Employees' experience of having clear roles and responsibilities also seems to have an impact on their health. Results show that in several samples there is a significant correlation between role and GWB score. A significant correlation between role clarity and GWB can be found in both the offshore and onshore samples.

Social aspects seem to be more important for the GWB score in the offshore samples than the onshore samples. This may indicate that having good interpersonal relationships and a favourable organisational climate may prevent negative effects on employees' health and well-being. For two of the onshore samples (2 and 3 in Table 7.3) some of the work environment aspects related to control and social aspects were not significantly related to GWB. As such, confirming hypothesis 3 stating that there will be a significant correlation between job resources and symptoms of work-related stress, so that increased job resources will be associated with decreased symptoms of work-related stress.

Table 7-11: Correlation analysis results for onshore (ON) and offshore (OFF) – Work environment aspects and GWB

GWB in each samples	Demand (Sig.)	Control (Sig.)	Social Support (Sig.)	Role (Sig.)	Social aspects (Sig.)
1-ON	-.473**(.000)	-.280**(.002)	-.330** (.000)	-.114 (.239)	-.280**(.003)
2-ON	.324**(.006)	.262**(.0)	.378**(.001)	.513**(.000)	.017 (.892)
3-ON	.299**(.014)	.210 (.091)	.291* (.018)	.304**(.012)	.194 (.119)
4-ON	-.449**(.000)	-.371**(.000)	-.298**(.000)	-.314**(.000)	-.299**(.000)
6-ON	-.535**(.000)	-.465**(.000)	-.416**(.000)	-.287**(.006)	-.490**(.000)
7-ON	.407**(.000)	.541**(.000)	.542**(.000)	.475**(.000)	.475**(.000)
8-OFF	-.448**(.000)	-.413**(.000)	-.465**(.000)	-.483**(.000)	-.452**(.000)
9-OFF	-.140**(.009)	-.308**(.000)	-.302**(.000)	-.228**(.000)	-.314**(.000)
10-OFF	-.382**(.000)	-.472**(.000)	-.457**(.000)	-.415**(.000)	-.403**(.000)
11-OFF	-.424**(.000)	-.490**(.000)	-.482**(.000)	-.493**(.000)	-.445**(.000)
12-OFF	-.322** (.21)	-.382**(.006)	-.495**(.000)	-.299*(.035)	-.389**(.005)

*p < 0.05, **p < 0.01, ***p < 0.001

7.3 Discussion

In order to have a robust risk management process it is important to be familiar with the factors that impact employees' health and well-being (Bergh, et al., 2014a, b, c; WHO, 2010). The results from this study describe the psychosocial factors that are particularly important to this company when they manage psychosocial risk to promote health and well-being among their employees.

All the hypotheses formulated in this study were confirmed. The analyses indicate that there are differences between onshore and offshore employees with regards to the various psychosocial risk factors. The two groups place emphasis to specific psychosocial risk factors. For example, the offshore samples appear to have a higher degree of job resources than onshore samples although job requirements seem to be higher offshore. Furthermore, it should be noted that the various working environment questions are expressed differently based on whether the location is onshore or offshore. For example, for the offshore samples workload issues is often described as the balance between planned maintenance and urgent tasks or time-estimates match actual time spent on agreed tasks and the need for extending the offshore period. On the other hand, for the onshore samples this aspect is often expressed as the ability to balance larger assignments and ad hoc tasks. In addition, to differences between onshore and offshore groups with regards tp psychososcial factors, the results also show differences with regards to symptoms of work-related stress. This indicates that psychosocial risk and its management is important both onshore and offshore.

In line with research on the Job Demand-Resources model, the analysis showed that both job resources (e.g. social support, job control and role in the organisation) and job demands (e.g. workload) are important for employees' well-being and health (Bakker & Demerouti, 2007; Karasek, Schwartz & Theorell, 1882) The qualitative analysis helped establish social support, control and role in the organisation as key working environment aspects since all the samples raised issues related to support, control and role in the organisation. Furthermore, the correlation analysis showed that employees that report good social support, clear roles and job control also report better well-being. Results showed that there is a significant relationship between job resources and symptoms of work-related stress, e.g. job support, control and role clarity are important for employee health and well-being. These results can also be found in other studies (e.g. EU-OSHA, 2009; Leka & Jain, 2010; STAMI, 2004). For example, a study performed Mache et al. (2014) showed that demands and the following resources: influence at work, opportunities for development, degree of freedom at work, sense of community, feedback, quality of leadership and social support, were significant predictors for work engagement (Mache, Vitzhum, Klapp & Danzer, 2014). As reported in the literature, support can also have a buffer effect and protect employees from experiencing work-related stress (Karasek, Schwartz & Theorell, 1982). Lack of social support leads to negative psychological conditions that can result in poor health either directly through physiological processes or through behaviour (Leka & Jain, 2010).

Furthermore, all the samples raised issues that related to job demands. In a workplace setting, high workload can be stressful and can cause ill-health in the workforce. This includes both quantitative workload or overload, qualitative workload and underload (Cox et al., 2000; Jones et al., 1998). Today it is well established that high job demands can lead to work-related stress and ill-health (Cox et al., 2000; EU-OSHA, 2009; Jemsen, 2004; Leka & Jain, 2010). It is particularly negative when employees experience high job demands in combination with lack of resources. If prolonged, this may result in reduced job engagement and burnout (Bakker & Demerouti, 2007). It should also be noted that role of job engagement, well-being and health complaints on action errors and rule violations has also been tested offshore. It was found that job engagement was associated with fewer reports of action errors and violations. Furthermore, findings indicated that job engagement mediated the relationship between well-being and reports of action errors and violations (Mathisen & Bergh, 2016).

7.3.1 Limitations

This study has utilized historical data from internal records in a company and as such, there are limitations that should be noted. Firstly, the total number of samples has been very large and each sample size has varied between 50-351 respondents. The variations in sample

size may affect the results from the correlation analysis, i.e. when the sample is small it is less likely that a significant result will be found than when the sample is large (Dancey, 2002). Moreover, the tailoring of the questions made it at times difficult to classify the questions according to categories defined by external frameworks and standards. Often industrial data do not fully meet the requirements of science, which means they are not used for research at all. From an industry perspective it also means that scientific data are difficult to compare with their own data, and therefore difficult to use in their practices. In this study, part of the struggle was to make use of existing industrial data in a scientifically sound way. Though this approach has its limitations, it implies a valuable attempt to make scientific use of the large reservoir of existing industry data, and to make industrial practice and scientific research more compatible.

Tailoring questions according to the local context can be an advantage with regards to highlighting particular risk factors for a unit (Rossi, Meurs, & Perrewe, 2014). However, it is difficult to conduct quantitative analysis of all the data, trying to identify more general patterns with regards to working environment risks in the company. Furthermore, the flexibility when it comes to designing working environment questions for each risk assessment has resulted in the use of different scales on the working environment questions in the various samples which has further complicated analysis.

Given that the data was cross sectional, we cannot draw conclusions about causal relationships. Thus, there is a possibility that poor psychosocial factors cause reduced general well-being among employees. A reciprocal relationship between the variables may of course also exist in that poor employee general well-being may cause a negative experience of their working environment, which in turn leads to even poorer general well-being. However, it is important to note that research over at least the last decade, including longitudinal studies, has shown that psychosocial hazards can have a negative impact on health (Jensen, 2004; Leka & Jain 2010; Mackey, Palverman Saul, Webster, & Packham, 2012).

In light of the limitations (i.e. having a procedure where the working environment questions are tailor-made for each unit) the company would benefit by standardizing the working environment questions. This would make it easier and more effective to compare and see the relationship between the various sites. However, knowledge from previous risk assessments should be used in order to identify and design the standardized questionnaire ensuring the utilization of local knowledge about specific tasks, jobs, and psychosocial hazards into the assessment process. As argued in the report from the UK regulator, the Health and Safety Executive, organisations need to be much more proactive in devising and thinking through their hazard assessments as only off the-shelf measures are likely to have limited

utility (Rick, Briner, Daniels, Perryman & Guppy, 2001). As such, it is important to balance these two perspectives. In this case this can be solved by using knowledge and information about internal psychosocial risk in order to create a standardized questionnaire to be used across the units.

7.3.2 Future directions

Currently the company is in the process of improving various parts of the management system and is looking at opportunities to simplify and streamline the risk assessment for the psychosocial work environment. The findings from these analyses may be used in order to revise and improve the psychosocial pre-existing risk assessment processes as well as the in-depth risk assessments in the company. As such, the risk data from risk assessments collected from various sections of the business, e.g. identification of psychosocial work environment factors and their effect on health will help build more robust tools and methods that are sensitive towards the changes that occur in the organisation over time (Rick et al., 2001; Øien, Utne, Tinmannsvik, & Massaiu, 2011). Risk management is an iterative process where the results from previous risk assessments are used as input to continuous improvements. Furthermore, these results support the implementation of the same or equivalent approaches for onshore and offshore groups with regards to following-up psychosocial risk assessment findings.

Moving forward it is important to ensure involvement, commitment and ownership from the employees of the various locations. Only relying on standardized methods and reducing involvement from employees can result in the development of a gap between procedures and practices. This gap could represent a threat to safety and the opportunity for learning (Tinmannsvik, 2008). To build organisational resilience and have robust psychosocial risk management, organisations must take into account the silent dialogue between practices and procedures (Rick et al., 2001). As such, it is still important to encourage a basic dialogue and employee involvement in the ongoing efforts to enhance the psychosocial work environment.

7.4 Conclusion

Psychosocial risks have an important effect on organisations through employee health and behavior, both of which are linked to several organisational outcomes. Therefore, it is important that organisations have methods and tools to deal with this type of risk and that the risk management process utilized is integrated into the company's existing management systems. The experience with using existing risk assessment tools and methods is utilized as a basis for learning and developing future risk assessment tools. As such, this study explored available quantitative and qualitative risk data collected through the PRIMA method over the

last 8 years in order to explore specific and common psychosocial risks in the oil and gas industry in particular. In this context the analyses in this study have provided meaningful and important information about the company specific psychosocial risk factors and their impact on health and well-being that can be used to further enhance psychosocial risk management processes in the future.

The final chapter of this thesis will review this research in its totality offering a critical appraisal and recommendations for future applied research in this area in organisational settings.

8 Chapter: Discussion and conclusion

This last chapter will review the key findings and conclusions outlined in the previous chapters and examine them with a view to the wider relevant literature. This chapter also discusses the strengths and limitations of this research and proposes a way forward for future research and action. Sections of this chapter have been published in a book chapter by Bergh et al. (2014a).

The main focus of this research was to explore how companies in the oil and gas industry can integrate a sustainable and comprehensive system for managing psychosocial risk. A summary of findings of the four studies conducted is provided below.

8.1 Summary of findings

Study one applied mixed methods to develop and test a performance indicator for psychosocial risk in the oil and gas industry. The study resulted in the establishment of a proactive exposure psychosocial risk indicator automatically published in the internal organisational performance management system of the organisation. This was accomplished by utilizing the evidence-based practice model. The study also addressed challenges encountered in the process and lessons learnt that can be useful for other organisations and the industry as a whole. This study has been published in the journal Safety Science (Bergh, Hinna, Leka, & Jain, 2014b).

Study two was a cross-sectional quantitative study exploring the relationship between the psychosocial risk indicator (PRI) and objective measures of health and major accident potential, such as hydrocarbon leaks. Results from regression analyses showed that only the psychosocial risk indicator significantly accounted for variation in hydrocarbon leaks. Only partial support was found for the relationship between technical factors and hydrocarbon leaks on the basis of correlation analysis. The study offers recommendations for the development of more robust indicator models to prevent hydrocarbon leaks in the oil and gas industry. This study has been published in the Journal of Cleaner Production (Bergh, Ringstad, Leka & Zwetsloot, 2014c).

Study three applied mixed methods to develop and pilot an internal audit tool of the psychosocial work environment in the oil and gas industry, focusing on offshore units. This resulted in a proactive method for monitoring the status of psychosocial factors influencing the risk of stress and ill-health in the oil and gas industry. It provides a systematic and independent assessment of the status of psychosocial factors and barriers, it reveals non-compliance with requirements and best practice within different relevant levels of the organisation, and is

suitable as a basis for the development of risk reduction measures. The method comprises performance standards that are linked to the company's internal organisational requirements related to the psychosocial work environment. This study has been published in the journal Safety Science (Bergh, Hinna, Leka & Zwetsloot, 2016).

Study four was a mixed method study exploring available quantitative and qualitative risk data collected through the PRIMA method over the last 8 years in the organisation to explore specific and common psychosocial risks in the oil and gas industry in particular. The results from the analyses confirmed the hypotheses: there was a significant correlation between job resources and symptoms of work-related stress; there was a significant correlation between job demands and symptoms of work-related stress; and there were differences in psychosocial risk factors and symptoms of work-related stress onshore and offshore. This study has been published in the journal Safety & Health at Work (Bergh et al., 2017).

8.2 Managing psychosocial risk in large and complex organisations

The current situation in the oil and gas industry, dominated by low oil and gas prices, has had profound effects on the revenues and profits of multinational enterprises and large national companies in the oil and gas industry (ILO, 2013). The implications of the economic situation coupled with rapid changes in these large and complex organisations contribute to increased psychosocial risk (ILO, 2013). As such, mention has already been made in this thesis regarding the implications of the modern workplace on the psychosocial work environment and the growing number of international best practice frameworks and standards available for governments and organisations (see chapters 1 and 2) to mitigate risks. In this context it is imperative that companies have in place psychosocial risk management systems that are both effective and efficient. In order to manage risk in large multinational companies the internal management systems and risk management processes need to allow for: 1) an overall and general approach fit for purpose at company level; 2) assessment of context specific and underlying causes; and 3) documentation and organisational learning. If companies address psychosocial risk it has been argued that they tend to focus on one or two aspects and often adopt off-the shelf tools (Rick et al., 2001). An important finding from this research is that companies and experts alike should focus on all three and ensure that they are fit for purpose in the company (integrated). Having just one or the other will not be sufficient in order to manage this risk in a sustainable manner.

In the next section, the relationship of the individual studies will be discussed. Furthermore, how they together relate to these three key aspects of managing the psychosocial work environment will be further explored and reflected upon.

8.2.1 An overall and general approach fit for purpose at company level: The Psychosocial Risk Indicator (PRI)

From an industry or corporate point of view, there is usually a need to talk in terms of approaches that are sufficiently general and non-situation-specific. This is because they can then be readily applied across a wide range of operations in a company. When implementing a comprehensive and overall approach for managing psychosocial risk there are at least four key issues that are important. An overall approach and methodology needs to be 1) simple and user-friendly; 2) based on best practice and research; 3) be recognizable by stakeholders; and 4) integrated into systems that are used by management on a regular basis to manage their business. Hence, the company, where the studies presented in this thesis were performed, decided to develop a proactive exposure indicator called the Psychosocial Risk Indicator (PRI) (chapter 4). The indicator complied with these four key issues.

The intention of the indicator was to increase awareness in the organisation, especially to create commitment and ownership among leaders. Leaders are role models and key stakeholders in creating change in the organisation. Management commitment to safety is the central mechanism underlying a healthy and safe workplace (Dollard & Bakker, 2010; Flin & Yule, 2004; Zohar & Luria, 2005). For example, in the studies by Dollard and Bakker (2010), results showed that when senior managers failed to value worker well-being, this was evident in terms of increased demands leading to poor health. The same argument can be found within the safety climate literature. For example, in a studies results showed that transformational and transactional leadership styles act as antecedents of safety behaviours (Clarke, 2012; Zohar, 2002). Commitment from line leaders in the company was created by implementing the indicator into the internal performance management system, whereby their performance was linked to the indicator results.

Furthermore, the decision to develop a proactive exposure indicator in particular was based on the need for strengthening a holistic perspective in the internal risk management processes. This was important in order to balance the more traditional emphasis on physical and technical working environment factors. The current situation (e.g. economic constraints) in the industry also made it imperative that the overall tool implemented could identify and help leaders to prioritize risk and follow-up where needed across the organisation. Furthermore, the development of PRI was founded on an evidence based approach, ensuring input from both internal and external evidence (Briner, 2012; Briner, et al., 2014). The company's pre-existing practices related to other HSE indicators strongly influenced the way the indicator was established, which further resulted in a simple and automatically published indicator in the

management system. Stakeholder preferences and challenges related to implementing the indicator (in line with stakeholder preferences) were described and discussed in chapter 4.

Because the indicator was developed for a company in the oil and gas industry with high risk potential, it was decided to test and understand how the indicator correlated with hydrocarbon leaks. Therefore, the study in chapter 5 further explored the relationship between psychosocial risk, measured by the PRI and the number of hydrocarbon leaks on offshore installations on the Norwegian Continental Shelf. Besides being able to test the indicator in relation to more traditional safety indicators, this study also highlighted the importance of not using the indicator as only *one* source of information. As such, in the study in chapter 5 it was argued that the psychosocial risk indicator is used in combination with other sources of information in the risk management process in order to provide the business with a comprehensive risk picture. In this example, it is about understanding more about the relationship between the indicator for psychosocial risk and hydrocarbon leaks. If installations observe high psychosocial risk and frequent HC leaks, attention with regards to follow up should include a focus on how work is designed, managed and organized. Studies like this may also contribute to raising awareness and changing more traditional risk discussions in management teams, dominated by input in relation to technical and physical indicators only.

This study was important to conduct for several reasons. First of all, the psychosocial risk indicator used in this study may serve as a proactive measure, giving the company an overview of the units with higher risk. Secondly, these findings may increase the company's understanding of why and how companies can use proactive indicators (focused on exposure to poor working conditions) in their promotion of health-related issues as well as the prevention of poor HSE outcomes, such as HC leaks, promoting a holistic perspective when managing risk. Having a holistic approach is vital in order to promote a healthy and safe workplace. To be safe is to be protected from an event, or from exposure to circumstances that can lead to a non-desirable consequence such as the loss of possessions, health, or at worst, loss of life. The term holistic was summarized excellently by the philosopher Aristotle: "The whole is more than the sum of its parts." For example, over the last years, several serious incidents have highlighted the connections between factors which are important to both a good working environment and operational safety. Increased knowledge of the interaction between technical and organisational elements - and the people using these - is crucial in understanding the underlying causes of incidents (PSA, 2012). Increasing knowledge of the interaction between humans, technology and organisations through various indicators is central to promote better understanding of the underlying causes of incidents, and for success in preventive efforts. As such, the competence and knowledge related to the psychosocial work environment comprises

methods and knowledge that can be used to assess and improve the interaction between the individual, technology and organisation. The objective is to create a work situation which contributes as much as possible to realizing efficient and safe operations, and which takes into account people's opportunities, limitations and needs. In this context it is important for the business to understand the relationship among key indicators (e.g. technical as well as psychosocial and organisational). The results of this study were further described and discussed in chapter 5.

Because the indicator provides input to the overall risk map in the company, it has been important to also have tools and methods which allow for assessing context specific risks. Arguably the most important being their application to issues where subjective evaluation is important and that subjective evaluation is influenced by contextual factors. This is of outmost importance when dealing with psychosocial risks and, as discussed, although the indicator developed in this company is expressed numerically and aims at ranking and prioritising, it should be underlined that it is only part of the overall system of dealing with psychosocial risks within the organisation. Even though the PRI was developed through years of work with different teams and employees with diverse experience throughout the organisation, it is just part of a wider system with the focus being on the expert opinion of employees, with data collected through both quantitative and qualitative methods, and follow-up at the team/work unit level. As such, the study in chapter 6 described the development of an audit tool for psychosocial risk which assesses context specific issues in the organisation.

8.2.2 Assessment of context specific and underlying causes: Psychosocial work environment auditing tool

The methods and tools applied to assess context specific and underlying causes should ensure input from employees and use their expert opinion on how to make improvements. The psychosocial risk management approach principles adopted and integrated into this company highlight these (i.e. PAS1010 and PRIMA-EF). Furthermore, these principles also inspired, and provided input to, the development of the auditing tool for psychosocial risk described in chapter 6.

More specifically, chapter 6 described a pilot study for developing and testing an auditing tool for the psychosocial work environment. The aim was to explore how the company could practically integrate a proactive auditing tool of psychosocial risk into the pre-existing monitoring system. The psychosocial risk auditing tool assessed the status of psychosocial factors influencing the risk of stress and ill-health by actively utilizing the expert opinion and experience of employees. The systematic and independent assessment of the status of

psychosocial factors and barriers uses a multi-method approach, revealing non-compliance with requirements and best practice within different relevant levels of the organisation.

There are several reasons why it may be beneficial for the business to use multi-method auditing tools like the current one to support decisions. Psychosocial issues are complex and not straight forward and management may risk missing critical information/detail when making decisions related to the management of the psychosocial work environment. Tackling stress and psychosocial risks by conducting audits can be viewed as costly, but the reality is that it costs more to ignore them. In the oil and gas industry psychosocial risk factors are often addressed in HSE investigations. Some examples of recurring factors contributing to incidents are: communication, role and responsibility, control and leadership (Cullen, 1990; Reiners et al. 2012; PSA, 2012, 2014). Fatigue and stress have also been linked to safety outcomes in several studies (Bergh et al., 2014c; Cricthon, 2005; Mathisen & Bergh, 2016; Mearns, Flin, Gordon & Fleming, 2001; OESI, 2016; Olsen, Næss & Høyland, 2015). Stress affects performance and may lead to absence from work and if prolonged it may result in serious health problems. An EU-OSHA 2014 report showed that organisations are affected by costs related to absenteeism, presenteeism, reduced productivity or high staff turnover. In addition, health care costs and poorer business outcomes ultimately affect national economies and society (Hassard et al., 2014). This audit tool is highly relevant for the prevention of ill-health and can provide essential information to assist management decisions with regards to improvements.

Implementation of actions to improve the psychosocial work environment is a crucial phase and needs to be carefully managed (BSI, 2011; Leka, Cox & Zwetsloot, 2008). The actions are designed to attain the potential related to upside risk as well as mitigate and/or reduce downside risk (in this company, risk is defined as the deviation from a specified reference value and the associated uncertainty, that is, positive deviation = upside risk, and negative deviation = downside risk). Ownership and participation of managers and workers are essential for successful implementation of actions. The process of identifying interventions and actions should include all relevant personnel. This can be done by conducting workshops where employees are included in the dialogue. The management should provide mandates to narrow the scope for interventions and by this ensure that the proposed initiatives are easy to implement. When identifying the appropriate actions, it is important that they are flexible, are easy to follow up, give status and always support the strategic objectives, and, in addition, improve the probability of reaching the various indicator targets. For example, the interventions can be linked to initiatives/issues identified through PRIMA, PRI or other safety indicators.

In order to ensure commitment and ownership from line management, actions and interventions are documented and followed up as an integrated part of the Ambition to Action process. By linking the interventions into the Ambition to Action process, it is more likely that they are implemented into day-to-day work. It is important to evaluate whether the actions are implemented as discussed. Regular management meetings as well as unit meetings are an arena where progress is traced. If progress comes to a halt, it is important to re-establish discussions to detect why progress is lacking. Examples of why progress is lacking may be the following: the intervention is not directed at the underlying factor; the intervention is too complicated to implement; the solution lies at a different organisational level; and/or the underlying factor has already changed due to other change initiatives (Bergh et al., 2014a; Murta, Sanderson & Oldenburg, 2007) When the underlying causes are revealed, appropriate actions should be re-established and progress evaluated. These potential problems with the intervention process need to be anchored and handled by management. Hence, the Ambition to Action system in this company provides a tool for actions to be more systematically monitored and recorded (Bergh et al., 2014). As such, it is, as argued above, important to have established indicator models that will show when it is appropriate for the organisation to audit the psychosocial work environment.

8.2.3 Ensuring organisational learning: Assessing PRIMA data

Managing continuous improvement requires an organisational context that enables incremental development through organisational learning (Anand et al., 2009). Organisational learning encompasses the development of new knowledge, skills and behaviours; the rectification of errors and improvement of current practices; and the development of new routines (Daft & Weick, 1984, Gransrud & Rocha, 2011). Structured activities that support organisational learning may consist of the identification of improvements through measurement and documentation. This is linked to continuous improvement where employees' suggestions regarding the incremental development of different aspects of the existing practices (e.g. psychosocial risk management practices) is systematically incorporated into strategy and systems (Bessent, 2000).

With this in mind, the researcher decided to assess the psychosocial risk assessment data that had been collected from across the company for the last years (chapter 7). The results from this study describe the psychosocial factors that are particularly important to this company when managing psychosocial risk to promote health and well-being among their employees. The aim was to explore the common and specific psychosocial risks offshore and onshore; and for the company it was also important to provide a basis for improving standardized tools (e.g. PRI) and to make adjustments to best practice principles for risk

assessments. The rationale for performing this study was to ensure a robust risk management process rooted in the psychosocial factors that impact employees' health and well-being in this particular company (Bailey et al., 2014; BSI 2011).

At the time when this study was performed, the company was in the process of improving various parts of the management system and as such was looking at opportunities to simplify and streamline internal work processes. As such, the assessment data on psychosocial risk can also provide input to other planned or ongoing processes in the organisation, such as quality improvement processes, restructuring / change processes, health and safety investigations. Ensuring effective and high value input to consequence evaluation related to planned changes in organisations is critical. Having accurate information about psychosocial risk can support mitigating actions that will prevent ill-health when implementing restructuring processes (Mathisen, Brønnick, Arntzen & Bergh, in press). In line with research, the results showed that work-related stress was linked to both job resources and job demands for the offshore and onshore samples.

The results from chapter 7 were also used as input to a larger discussion in the company regarding increased use of a standardized instead of tailor-made questionnaire. Even though it is argued in the study that the company would benefit from standardizing the working environment questions, it is still important to ensure involvement, commitment and ownership from employees in the various locations. Only relying on standardized methods and reducing involvement from employees can result in the development of a gap between procedures and practices. As such, this will not help in diagnosing unique aspects of the unit's own culture. This gap could represent a threat to safety and the opportunity for learning (Tinmannsvik, 2008). To build organisational resilience and have robust psychosocial risk management, organisations must take into account the silent dialogue between practices and procedures (WHO, 2010). By only using a standardized survey, the organisation will get input regarding the criteria in the survey, and it might completely miss the key issues holding the company back from its potential if those issues are not included in the survey questions. In addition, emerging risks might be missed by relying on standardized instruments.

It is still important to encourage a basic dialogue and employee involvement in the ongoing efforts to enhance the psychosocial work environment. Organisational learning is the foundation for the improvement of practices and it happens at least at two levels in the company: 1) for the unit that has conducted the risk assessment and implemented the interventions; and 2) for the whole company, utilizing the collected data from all the risk assessments across the company. The entire psychosocial risk management process,

including the feedback loop for revising the psychosocial risk indicator is provided in Figure 8.1.

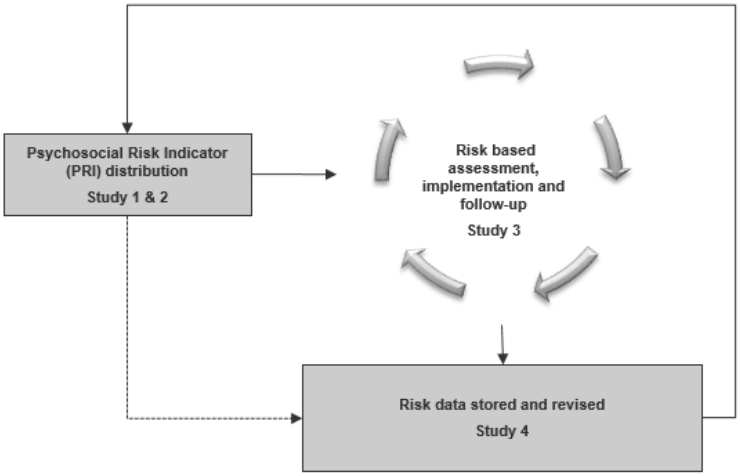


Figure 8.1: Psychosocial risk management at company level - Process for feedback and organisational learning

8.3 An integrated and evidence based practice – Is it necessary?

As discussed earlier in this thesis, international frameworks relevant to the psychosocial work environment are general descriptions of best practice and meant to be applicable in different contexts. In order to be able to use these frameworks, the content must be adjusted to the internal management systems of different occupational industries, such as the oil and gas industry. Due to the complexity of the processes and operations in the oil and gas industry, companies often have well-developed management systems in place. Management systems contain a set of principles, policies, processes and requirements that support the organisation in fulfilling the tasks required to achieve its objectives. Business performance, high quality decision making, fast and precise execution and continuous learning are supported by the management system, contributing to safe, reliable and efficient operations. Making sure processes and requirements in the management system are based on best practice is important and it ensures effective, safe and healthy workplaces. Furthermore, it is vital that companies implement and take ownership of the available information, ensuring it is fit-for purpose for their context (challenges and opportunities). There are different approaches that the company could take with regards to implementing best practice principles for psychosocial risk management.

One option is to implement best practice principles and standards "as is" from the literature. In this scenario the organisation does not do any large changes to the internal performance management processes, except for adding the external standard or guide. One example could be to implement the PAS1010. Doing this does have some positive aspects, for example it saves time and resources in adding the principles to the management system. On the other hand, there are some potential negative consequences related to taking this approach. For example: 1) due to unfamiliar language / wording of the external standard or guide there is a high probability that the practice is not translated and applied in day to day business; 2) because the standards and guides are more general approaches that are formulated in a way that should fit many industries and companies they will not be specific and practical enough; 3) the standard may not fit the complexity of the organisation at hand. This will leave the company vulnerable and less likely to prevent negative impact from psychosocial risk (Rick et al., 2001).

The preferred option is to fully integrate and translate the best practice principles to fit the internal management system. If psychosocial risk is an integrated part of the organisation's operational model it will be part of a sustainable and effective business practice. Integration is key for promoting safety performance through psychosocial risk management. This issue has also been put forward by researchers that argue that the integration of best practice principles into existing business practices is important in order to ensure effective prevention of ill-health and accidents due to psychosocial hazards (Rick et al., 2001).

As demonstrated in the work in this thesis, integrating psychosocial risk management principles is more than re-using pre-existing standards and frameworks. It entails aligning and integrating fully into governing documents, training initiatives, developing new tools (built according to stakeholder's preferences) and adjusting language (using company or industry specific words / terminology). For example, in the process of establishing psychosocial requirements into the company's corporate requirements, it was clear that individual treatment and follow-up was already addressed through existing company systems and occupational health services. However, there was a need for strengthening the requirements related to reducing risk at source. A focus on the design, management, and organisation of work needed to be incorporated into the existing requirements. It was seen as particularly important to describe the requirements for psychosocial risk in a similar way as for other HSE risk factors, such as chemicals or noise. Furthermore, this entailed following the same hierarchy of control measures in order to prevent harm to people. These corporate requirements are furthermore linked to the internal HSE risk management process. The psychosocial requirements that were added into the existing requirements included the following aspects: "Workplaces and work

processes should be organized in a way that prevents employees from being exposed to psychosocial hazards with risks of developing ill-health. Effort should be made to avoid work-related stress and ill-health due to the psychosocial working environment. Coarse psychosocial hazard identification should be performed regularly on an annual basis. Attention should be paid to determinants such as job content, workload and work schedule, job control, interpersonal relationships at work, role in organisation, bullying, home–work interface, and organisational change." (Bergh et al., 2014a). In order to fully integrate requirements for the psychosocial work environment into the management system, it was necessary to keep within the frames of the pre-existing HSE requirements. As such, the studies in this thesis showcase how companies can learn from established research within the field by re-interpreting and translating the frameworks and best practice principles for psychosocial risk management into the existing management systems.

In the current situation, dominated by the need for improved efficiency and cost-cuts in the industry, it is of outmost importance that psychosocial risk management is integrated into existing work processes and business practices. A fully integrated system for managing psychosocial risk may have a positive impact on the business bottom-line, by creating a culture where psychosocial risk is addressed in main work processes such as change processes, risk assessments, investigations and project execution.

Integrating management of the psychosocial work environment into the existing management system of a large business is a stepwise process that needs careful consideration. As such, some important aspects need to be addressed early on in the process.

8.3.1 Opportunities and challenges when integrating psychosocial risk management principles

Based on the experience from this process, several opportunities and challenges should be considered for companies, practitioners and researchers planning to integrate a system for managing psychosocial risk into an internal management system.

Providing training: When introducing concepts and systems for managing psychosocial risk, it is important to evaluate the current knowledge-base on psychosocial risk. Traditionally top management has often lacked sufficient understanding on how to manage the psychosocial work environment in a practical and effective manner which translates into poor management of the psychosocial work environment (EU-OSHA, 2012). Experience has shown that the management's competence with regard to the psychosocial work environment is key with regard to the promotion of health and safety. Research on psychosocial safety climate, for example, shows that top management commitment is linked to the health of employees in

the organisation (Dollard et al., 2012). In the case of this company, in order to increase managers' competence in relation to the psychosocial work environment, a training programme was established. The training programme covers different topics such as leadership teams working systematically to manage their own as well as their employee workload. Through the provision of training, the aim was to enable managers to have a higher awareness of psychosocial risks and work-related stress and, hence, better address these topics. The training programme was developed and is facilitated by occupational health and working environment professionals.

Establishing a business case: As previously discussed, to ensure management commitment, it is critical to establish a business case (Bergh et al., 2014a; Schmidt, 2002). The purpose of a business case is to describe the business rationale for starting a project (Schmidt, 2002). As such, the business case for strengthening the integration of the management of the psychosocial work environment needs to answer the question: what are the business reasons for encouraging line management to put effort into managing the psychosocial work environment? These can be financial reasons, non-financial reasons and a combination of the two, for example, how promotion of a good psychosocial work environment characterised by low sickness absence, acceptable turnover, safe behaviour and high work engagement is linked to achieving a cost-efficient and value-based operation. Business cases are created to help decision-makers ensure that the proposed initiative will add value and have priority (Bergh et al., 2014a).

The business case should be tailored to the size and risk of the organisation. For example, in the oil and gas industry, with its high-risk potential, it is critical to create a business case where the initiatives are linked to both the prevention of ill-health and the promotion of safe and reliable operations. In order to show the link between the psychosocial work environment, stress, ill-health, and safe and reliable operations, experiences from internal and external investigations and reports from the industry were utilized. These investigations and reports often highlight human and organisational factors as critical causes for preventing work-related illness as well as accidents. The business case should reflect a balance between knowledge from research, the internal experiences and context of the company, and its internal requirements. These sources should shape both the content and construction of the business case and workplace interventions, ensuring commitment from the managers in the organisation. By doing this, the business case will be recognizable as well as the key elements in the case proposed will be justified. As such, a business case for a multinational oil and gas company, with pressure from governmental regulations as well as high HSE and reputational risk, will differ from a business case developed for a small company in, for example, the media

industry. In retrospection, the researcher believes that the research process would have benefited from communicating an even stronger and clearer business case from the start. In a complex organisation with multiple stakeholders (each with their own agenda), stakeholder management is crucial for the success of research. In fact, as the research progressed, the commitment and ownership from top management increased.

Context specific language: The language used should not be underestimated; the proposed business case and initiatives must be understandable. From early on in the process it was decided that the tools and methods developed would be adjusted in language and terminology to fit the existing management system in the organisation. If an organisation has a tradition of using risk management principles as a cornerstone in their decision-making process related to HSE issues, it is important to use the same concepts when preparing the business case for managing the psychosocial work environment. For example, the risk management of chemicals is a familiar concept within the oil and gas industry, so when describing the business case related to the psychosocial work environment, the same terminology should be applied: identification of psychosocial hazards, likelihood of developing ill-health and other outcomes, severity of exposure, mitigation actions, residual risk etc. As the research process progressed, the level of adjustments to the risk management language increased (became even stronger). For example, it was a deliberate decision to call the indicator for psychosocial risk, Psychosocial Risk Indicator (PRI). Using the risk management language was important for ensuring buy-in in the operations. In order to highlight the logic behind a holistic HSE risk management and fully integrate the psychosocial work environment into the risk management loop, the keywords “psychosocial” and “risk” were included into the new tools and methods. The term “psychosocial” was therefore introduced into the pre-existing internal risk management framework. Furthermore, there should be a clear description of how the business managers need to proceed in order to initiate relevant efforts concerning the management of the psychosocial work environment. In this particular company, the business case was written as a memo to the senior management team and it was based on pre-existing HSE policy with a goal of not harming people and assets.

Practical tools and providing internal support: As mentioned previously, in order to ensure good business practice, it is important to provide the organisation with easy access to practical tools and methods that are applicable into daily operations. As such, the process of translating international frameworks into the company specific context has contributed to the establishment of practical tools and methods that are accessible to line management. Even though having user-friendly tools that leaders can access easily on demand is important, it is also important to assess whether the organisation has access to professional support with in-

depth knowledge about psychosocial risk management. Professionals are important when integrating the management of the psychosocial work environment into the management system. It is equally important to ensure professional support to line management in the follow-up of the psychosocial work environment. In this company, in-house professionals have the necessary competence to advise and facilitate management on how to implement an integrated system as well as conducting risk assessment processes (as emphasized by Nielsen et al., 2010).

Utilizing established research: Utilization of available research, experience and best practice principles as main input to the integration into the existing management system provided quality and helped setting up a convincing business case. As discussed in chapter 2, it is crucial for business owners as well as practitioners to pay close attention to updated and current knowledge when making business decisions. Not doing so, may result in poor decisions based on practices that may have worked before or unsupported beliefs and trends. As part of the integration process, it was helpful to: 1) link the management of the psychosocial work environment to business requirements and law; and 2) describe and show a clear link between the management of psychosocial risk and business outcomes. This is perhaps even more important in the oil and gas industry where companies must follow strict requirements set forward by the government. Looking back, the link between company risk and legal requirements could have been used to an even greater extent in the beginning of the research.

Cooperation with other disciplines: In order to integrate the principles for psychosocial risk management it must be part of *other* main processes in the company. As such, learning from and cooperating with other relevant disciplines, such as quality management and safety technology. For example, cooperating with personnel from performance management resulted in the decision to have a psychosocial risk indicator that was: 1) published as one score; and 2) communicated alongside other safety indicators in the performance management system. Furthermore, the study in chapter 6 is also an example where the practices from the auditing function / procedures were used as the basis for the auditing tool for psychosocial risk.

Stakeholder management: As highlighted in earlier chapters, there are clear advantages of ensuring an evidence-based approach. However, there are also some challenges. As a researcher it is demanding to manage the different needs from the various stakeholders, i.e. often the stakeholder preferences do not coincide with each other. This can result in changes that are not ideal from the scientific perspective. For example, with regards to the indicator, a 5- point response scale would ideally have been preferred. However, due to the annual working environment survey using a 6-point response scale and the stakeholders

not permitting items with a 5-point response scale, it was decided to use a 6-point scale. In order to establish the corporate indicator, it was imperative to use the existing annual survey. Ideally, the indicator index would also have consisted of items related to organisational change, but again due to stakeholder preferences this was not included. As discussed in chapter 4, the establishment of the indicator created some resistance in the organisation. In particular, this related to how the organisation previously had distributed and followed-up annual working environment survey results. Traditionally the results from the annual working environment survey were not shared openly among leaders and units. This meant that an automatic and open publication of PRI in the management system required maturation and a change in shareholder perception of this issue. In fact, the development and implementation process over the years have increased stakeholder awareness of this area.

Establishing an overview of internal activities: When starting up a process of integrating a system for psychosocial risk management, it is important to have realistic expectations concerning other on-going or planned initiatives. As such, it is advantageous to carefully consider the various stakeholders' needs and/or perspectives. Furthermore, it is essential to explore if there are any shared interests and/or interfacing initiatives. This proved to be a challenge in this thesis, because this company is a highly complex and large organisation operating in over 30 countries across the globe. As such, it required the researcher to have a good understanding of the totality of the activities in the company as well as having a widespread network of stakeholders across various functions. Within the oil and gas industry, human factor and organisational safety initiatives often have interfacing interest in promoting good management of issues related to the design, organisation and management of work. Furthermore, restructuring is a more or less permanent feature of daily operations. As such, it is important to be aware that restructuring processes can affect the process as well as the effectiveness of psychosocial risk management interventions, since these are usually tailored to specific work group needs that may change in composition following restructuring processes. If these issues are not managed properly, it can become very time consuming and, in the worst-case scenario, a 'show-stopper'.

Despite the various challenges and the need to accommodate stakeholder preferences and demands, the success in this research lays in the willingness to continue the dialogue and make necessary adjustments along the way and allow for 'imperfect' and good enough solutions. Implementing psychosocial risk management principles is a transformation process that takes time to accomplish. For many organisations, this transformation also involves a cultural change where the psychosocial aspects are included as equal / important factors. As such, organisations that are able and willing to apply an iterative process and learn as the

process ‘goes along’ have a higher likelihood of being successful in integrating sustainable psychosocial risk management in their company.

Summing up the experiences related to integrating psychosocial risk management into the existing management system, it is essential to have an organisation with high awareness of the importance of health and safety issues. For the oil and gas industry, health and safety issues have been a vital part of company’s ‘license to operate’. The fact that the company already had a high awareness of health and safety in general at the time when the research stared made it easier to get access to participants and data.

8.4 Limitations

The question of generalization is important to address for the studies performed as part of this thesis. Many scientific disciplines, especially the social sciences, face a long battle to prove that their findings represent the wider population in real world situations. In chapters 4 and 5, the psychosocial risk indicator was tailored to fit the specific organisational context, particularly with regards to the specific items, the weighting and the cut-off criteria. As such, the indicator has been influenced by research on psychosocial risks, company specific requirements, internal risk data and internal HSE experts. As a consequence, the indicator should not be directly adapted to other company settings. However, the experience from this process should be of valuable knowledge to other organisations and the industry as a whole. For example, the implementation of a psychosocial risk indicator as an integrated part of the balanced scorecard system and the use of an indicator for preventing ill-health as well as serious incidents and accidents may be of such value. This is also relevant for the study in chapter 6 describing the audit process. This may provide particularly valuable insights for companies that use principles described in standards such as the ISO 9000 series.

Issues concerning causal relationships are also important in this thesis. When assessing the relationship between the variables tested it was essential to look at the nature of the relationship or the pattern of it (Vaus, 2014). While all relationships tell us something about the correspondence between variables, there is a special type of relationship that holds that the two variables are not only in correspondence, but that one causes the other. This is the crucial difference between a simple correlational relationship and a causal relationship. A correlational relationship only demonstrates that two conditions/variables perform in a synchronized manner. However, knowing that two variables are correlated does not tell us whether one causes the other (Vaus, 2014). For example, even though the study (chapter 5) on the psychosocial risk indicator and hydrocarbon leaks found a systematic significant relationship between measures of psychosocial risk and hydrocarbon leaks by exploring independent and

dependent variables, the question of causality cannot be resolved by this research design alone. It is possible that some other variables influence both psychosocial risk and hydrocarbon leaks. This leads to consideration of what is often termed the third variable problem, which is a third variable that is causing the observed correlation (Dancey & Reidy, 2002). Using the results from the study on psychosocial risk and hydrocarbon leaks, the quality of management and subsequent planning, coordination and improvement activities could be examples of such variables.

Furthermore, in chapter 7, the data was cross sectional and as such cannot draw conclusions about causal relationships. Thus, there is a possibility that poor psychosocial factors cause reduced general well-being among employees. A reciprocal relationship between the variables may of course also exist in that poor employee general well-being may cause a negative experience of their working environment, which in turn leads to even poorer general well-being.

The studies conducted in this thesis are cross-sectional and they provide a snapshot of a particular group (e.g. onshore, offshore, an installation) at a given time. In research, cross-sectional studies are used in order to determine prevalence. Cross sectional studies are the best way to determine prevalence and are useful at identifying associations that can then be more rigorously studied using a cohort study or randomized controlled study (Mann, 2003). In this thesis cross-sectional study design was used in order to determine prevailing characteristics in the particular oil and gas company. However, it is important to note that research over at least the last decade, including longitudinal studies, has shown that psychosocial hazards can have a negative impact on health. In the way forward, it may be useful to replicate the findings and conduct longitudinal studies of the studies in this thesis.

The possible practical use of the overall approaches (i.e. the tools and methods developed tested and implemented in this company) remains valid. Particularly the implementation and introduction of psychosocial risk management principles into the company's management system should be of valuable knowledge to other organisations and the industry as a whole. In order to expand our knowledge about how psychosocial risk management can be implemented and integrated into companies "real-life" / complex situation it may be necessary to reconsider the types of evidence that are feasible and relevant, and to acknowledge the limitations of what is often regarded as the gold standard for scientific evidence, such as for example randomized control trails and experimental research. Fox (1996) claims that the exercise of strict scientific paradigms could impair public confidence in psychology. Scientism, as suggested by Fox, is where psychology should only use methods

that can be explicitly stated and scientifically validated through strict experimental control. There are several objections to this way of carrying out studies: firstly, in many circumstances using strictly scientific methods would prove futile when attempting to answer societal problems. Secondly, by following rigorous scientific models and theories the role of professionals is limited to that of a technician. This proves difficult because research is based on complex human interactions often forcing the researcher to use flexible problem-solving (Fox, 1996).

The gold standard of scientific evidence is not fully complied with in this thesis. However, several researchers have questioned the realism, as well as ethics, of applying usual experimental criteria such as randomization or isolation of confounding factors, and ensuring that the intervention is independent from other external changes (Pawson & Tilley, 2004; Pedersen, Nielsen, & Kines, 2012). They suggest that 'realistic intervention' is a more viable way to design organisational interventions. The key element of realistic intervention is to "identify what works for whom, under what circumstances, in what respects and how" (p.49). Thus, instead of trying to control for real-life phenomena, realistic interventions attempt to learn from them. Thus, performing a study of the introduction of psychosocial risk management in a real organisation going through real changes enhances the ecological validity of the research. As argued by Zwetsloot (2014) randomized control trials are at best only partially applicable to complex social systems in organisations. They may in fact lead to a bias towards instrumental interventions rather than processes of organisational development or change. In line with Prilleltensky's (1997) views on research in society, dilemmas related to implementing a sustainable psychosocial risk management in companies need to be perceived as a whole, where various problems cannot be solved independently but rather as part of a larger entity.

For this thesis, the evidence linked to the implementation, development and testing of psychosocial risk management practices was based on a combination of scientific and practical evidence. Table 8.1 below shows the complementary aspects of traditional and practical evidence.

Table 8-1: The complementary characteristics of traditional scientific and practical evidence

Traditional scientific evidence	*Practical evidence*
Based on experimental research	Based on practical experimentation or learning from experience
e.g. Randomized controlled trials	e. g. Case studies
Theory based	Practice based
Potentially universal knowledge	Local and context dependent knowledge
Not always practically applicable	Not always theoretically sound
Ideally the basis for practical implementation	Often precedes scientific knowledge
Useful for 'normal problems'	Useful for 'wicked problems'
High credibility for researchers	High credibility for practitioner

Source: Adapted from Zwetsloot (2014)

8.4 Research process and methodology: Reflections about implementation

Apart from limitations of the research design, data sources and strategies for analysis, some additional aspects emerged during and after the research process. These aspects related particularly to the experiences when integrating psychosocial risk management principles into a company setting. These observations and learnings may be of relevance for other companies who choose to integrate psychosocial risk principles into their management system.

8.5 Way Forward – ensuring a sustainable business performance

In chapters, 1 and 2 a wealth of evidence was presented to illustrate the importance of ensuring an effective management of the psychosocial work environment. Despite the large amount of evidence and best practice principles available, one of the biggest challenges for practitioners is to ensure that research is continually translated into workplace interventions.

Practitioners should be curious about current research and actively search for ways to translate research into practice. Practitioners need to be well informed and up-to-date with the newest knowledge in order to best serve the business and remain professionally relevant. Internal professionals have a clear advantage in that they have hands-on knowledge of the internal challenges as well as the company jargon. Being able to navigate in the various company risks and stakeholder preferences is key to having a robust and sustainable risk management system that will promote health and safety.

Employers and business owners should not rely solely on external resources to support them in managing psychosocial risk. For business owners it is vital to see psychosocial risk

management in light of selecting and implementing an organisational strategy. For example, in the article published in The Harvard Business Review, the authors review 125,000 profiles representing 1,000 companies to conclude that the four building blocks of successful strategy implementation are: clarifying decision rights; designing information flows; aligning motivators; and making changes to structure (Neilson, Martin, & Powers, 2008). These elements are all closely related to psychosocial factors such as roles and responsibilities, social relations, career development; and work organisation. The psychosocial work environment is important for the organisation's long term planning through its links to organisational strategy. Psychosocial risk management through risk identification, assessment and prioritization including allocation of resources to minimize, monitor, and control negative impact from occurring support the organisation's strategic objectives (Langenhan, Leka, & Jain, 2013). Another way of saying this is 'good psychosocial risk management is good business', increasing the company's productivity, quality of products and services, attractiveness in the labour market, and greater capabilities for innovation. As with health and safety in general, the successful promotion of psychosocial risk management requires integration into daily work processes, avoiding treating it as a separate project. At last, employers must ensure the interventions implemented should target the work environment as well as the individual, in order to create healthier workplaces and to improve the capacity of workers to protect their safety and health and to maximize their overall effectiveness.

Policy makers should promote an evidence-based approach when policy, standards and frameworks are developed. It is particularly important that the development processes include experiences from practice, focusing on what works well and what it actually takes to implement and integrate a comprehensive approach into a company context. As such, policy makers should ensure standards and best practice frameworks are user-friendly and simple enough. Furthermore, policy makers should be cautious with relying mainly on input from research that is based on experimental design. This can, in a worst case scenario, produce policy, standards and frameworks that are not practically applicable nor credible for practitioners and employers, which again will reduce the likelihood of practical solutions being implemented in organisations.

Industries, ranging from services, healthcare, to oil and gas, are in many respects very different with regards to context and risk picture. As such, policy makers should also ensure the promotion and establishment of industry specific standards and best practice frameworks. This may furthermore increase the likelihood that organisations will use established knowledge of how to manage psychosocial risk. Drawing on the experience from this research, some of the tools developed (e.g. PRI and the auditing tool) can also be adapted in other industries.

For example, a simple and user-friendly indicator such as PRI could be developed, adapted and applied in smaller and medium-sized companies in order to create an overview of risk areas and means for prioritizing follow-up.

Researchers and other experts should embrace the development of new and innovative types of measures and methods of hazard identification and assessment. As such, there are numerous reasons, as described earlier, to support the notion that hazards should not be measured in isolation rather as part of a larger process such as risk management. More attention should be paid to these processes so that information gathered about hazards and harm can be better integrated, and the actions taken as a consequence of gathering such information can then be evaluated. Although the reliability and validity of hazard identification measures is important, their final utility can only be assessed in the context of the processes in which the measures are used. As such, it should be noted that within the oil and gas industry there are hardly any practical descriptions and examples of good practice from companies in the area of psychosocial risk management. Furthermore, researchers should be even more concerned with conducting and producing research that is clearly recognized and understood by leaders in organisations. If researchers seek to have an impact on the way psychosocial risk is managed in organisations they need to continually strive towards simple and user-friendly ways of communicating research results.

As a researcher, I have learned a lot about the importance of having an in-depth understanding of the context where the research is undertaken. Without detailed understanding and knowledge about the existing company culture and management systems, this type of research would be very difficult to conduct. Therefore, for external experts and researchers to learn more about how psychosocial risk is integrated into company contexts they must work closely with internal professionals and sensibly allow for stakeholders' views and preferences. To accomplish evidence-based practice in complex organisations it is vital to have internal professionals who can translate principles into business operations. Knowledge about the internal culture and business should in this respect never be underestimated. As such, it is crucial to avoid designing the entire interventions without close involvement of internal resources. The nature (language and type of tools) of the intervention implemented must be context sensitive.

8.6 Conclusion

Overall, this thesis has put forward the broader importance of integrating and adopting psychosocial risk management to the context specific situation in an organisation. During the last years this company has implemented best practice principles and developed tools and

methods for the management of psychosocial work environment risk. The tools and methods developed and tested as part of this thesis are today extensively used across the various operations in the company.

Psychosocial factors such as workload, perception of control and mastering, and social support at work constitute some of the major risks to health, well-being and workforce retention in modern work life. As performance shaping factors, they also have significant impact on operational safety and excellence. Business areas publish the psychosocial risk indicator in the performance management system and use the results as part of their risk management process. Large scale change initiatives have also used the indicator as an input to their risk follow-up. Furthermore, the indicator has stimulated dialogue and collaboration between the health and safety and human resource functions in supporting the business as "one business partner".

On the basis of the results from the auditing tool, the company has chosen to include and integrate the psychosocial risk perspective into the overall health and safety audits, thus ensuring a more holistic perspective when monitoring risk in the business. The psychosocial risk assessments as part of PRIMA are used in order to follow up units. The risk assessment is used both offshore, onshore and in projects to identify underlying factors that may cause ill-health if not handled properly. As such, both the indicator, the psychosocial risk assessments and the training initiatives targeting leaders and employees, are fundamental contributors in the company's efforts to achieve safe and efficient operations, highly relevant in light of the changed business context in the company. Simplification, cost efficiency, accessibility and integration into the management system are key elements for achieving sustainable business practices through risk management.

Due to work within this area, the company has cooperated and shared experience with international stakeholders in developing international frameworks and standards. We have particularly contributed and shared experiences in the development of: the European Framework for Psychosocial Risk Management (PRIMA-EF), the World Health Organisation's (WHO) Global Framework for Healthy Workplaces, the BSI standard on psychosocial risk management in the form of a publicly available specification (PAS1010). The company's application of these principles in the organisation have been shared with various stakeholders within the oil and gas industry. Some examples are the collaboration with the Society of Petroleum Engineers (SPE) and the International Association for Oil and Gas Producers. The work has included activities such as setting up workshops focused on psychosocial risk management and developing oil and gas producers' guidelines for managing psychosocial risk

for expatriates. Over the years the company has also been invited to several large multinational oil and gas companies for experience transfer. The effort that the company has put into the psychosocial risk management activities has also allowed us to conduct further analysis and research which have increased the company's understanding of how to effectively manage this type of risk.

The work to develop and implement psychosocial risk management principles into a large multinational enterprise has required stamina and a strong will to succeed over years in building and implementing a methodology to improve control of risks that are widely recognized to have large cost impacts at the individual as well as the company and societal levels. It is hoped that this thesis will be helpful to others embarking on similar initiatives.

9 Appendix

9.1 Chapter 4: Pilot questionnaire, PRI index and interview guide

9.1.1 PRI pilot questionnaire

Introduction letter:

Psychosocial Risk management is a continuous process and as part of the decision-making process, relevant psychosocial risk factors must be identified and assessed in line with other HSE risks. In order to further strengthen the internal psychosocial risk management in the company, we have invited the HSE competence center to develop and pilot a short survey on psychosocial risk for us.

The results from this pilot will secure both the documentation of key psychosocial risks and strengthen our follow-up initiatives.

It is important that everyone who has the opportunity to participate do so. As such, we will be able to get as good basis for improving our working environment.

Sincerely
Xxxxxxxxxx (contact person)

The pilot consists of a section with questions that will be used for testing and select final questions for the psychosocial risk survey. In order for us to be able to identify the best possible questions, it is very essential that you participate and that the answers given reflect your everyday life.

The pilot consists of 26 questions and it will take about 5-10 minutes to answer the questions and we hope you take time for this.

Furthermore, the survey is anonymous, following the ethical guidelines for conducting risk assessments in the company, and is part of the Health and Work Environment Department responsibility, who also performs all the analyses. Your participation is voluntary and it will not be possible to track individual answers back to the individual.

The anonymous results of the survey will form the basis for further work on the psychosocial risk survey.

If you are not satisfied with the manner in which this assessment is being conducted or you require additional information, please contact the Health and Work environment responsible listed below.

Deadline for reply is set to the following date:

By clicking here you are consenting to participate and start the survey: <LINK>

The questionnaire

How do you experience:

Poor	Unsatisfactory	Neither nor (neutral response)	Satisfactory	Excellent	Not applicable
(1)	(2)	(3)	(4)	(5)	(6)

1	…..your possibility of knowing what tasks to prioritise
2	….the degree of influence concerning your work
3	….your possibility to plan your own working day
4	….the degree of influence on the amount of work assigned to you
5	….your possibility to be sufficiently involved in decisions that concern your work
6	….the degree of influence on what you do at work
7	….your possibility to set your own work pace
8	….your possibility to decide when to take breaks
9	….your possibility to get help to prioritise the tasks
10	….the degree of influence over the way you work
11	….your possibility of keeping up with tasks
12	….the level of your workload
13	….the level of your work intensity
14	….amount of tasks compared to the resources available
15	…..he congruence between your skills and the job to be performed
16	….your capacity to deliver according to demands
17	….the clarity of the areas of your responsibility
18	….the clarity of what is expected of you at work
19	….the clarity of planned goals and objectives for your job
20	….the support from your immediate superior
21	….the availability of your colleagues
22	….the availability of your immediate manager

23	….the support from your colleagues
24	….the quality of relationships in your entity
25	….the level of co-operation in your entity
26	….the level of communication in your entity

9.1.2 PRI Index

The PRI index is an integrated part of the annual employee survey in the company.

Fully dissatisfactory					Fully satisfactory
(1)	(2)	(3)	(4)	(5)	(6)

Single questions
Your possibility to ask managers about changes at work
Your involvement in changes related to your job
Your possibility to be involved in decisions that concern your work
The degree of influence on your own work
Your possibility of keeping up with tasks
The level of your workload
The support from your immediate superior
The accessibility of your immediate superior
The support from your colleagues
The level of cooperation in your entity
The level of communication in you entity
The clarity of planned goals and objectives for your job
The clarity of what is expected of you at work

9.1.3 Semi-structured interview guide

Introduction letter:

PRI is being developed as a tool that can be applied by risk owners. As part of this development it has been decided to initiate an evaluation of the indicator, were the overall aim is to decide whether to launch the indicator for psychosocial work environment as monitoring report in the performance management system.

In connection to this evaluation, we are inviting approximately 17 people from line management, HR and HSE department to participate in an in-depth interview. You are selected randomly from the test group and reference group, based on criteria to ensure as representative a selection as possible.

The interviews are confidential, and a representative from the HSE competence center, health and working environment will conduct the interviews and analysis. It is important that everyone contributes to the interviews, providing as comprehensive picture of the indicator usability and tool for prioritizing and initiating follow-up as possible. All information provided will be treated anonymously and confidentially.

If you agree to participate, you will be contacted about the date and time of the interview by the HSE coordinator.

We will ask questions regarding your experience of using the indicator - both the positive and negative aspects, and it is important that you reflect on this before the interview.

If at any time you do not feel comfortable, you are free to cancel or stop the interview.

More information about the method can be found here: link

If you have questions about the actual in-depth interview, these can be addressed to:

Xxxxxxxx (contact person)

- Can you describe the role and responsibility of the unit you lead?
- Tell me about how you usually follow-up the psychosocial work environment (in the unit you lead)?
- Can you describe how you manage and follow-up the psychosocial work environment?
- Are there any challenges with following-up the psychosocial work environment?
- When and how were you initially familiarised with PRI?
- Describe how you have used PRI?
- Does the PRI results match your experience of the work environment? If so, how? If not, how?
- In your words, what are the important aspect when communicating PRI?
- What support do you need in order to follow-up PRI in the unit you lead?
- In your experience, how can the company ensure efficient and responsible follow-up of psychosocial risk across?

9.2 Chapter 6: Interview guide and pilot questionnaire

9.2.1 Interview guide

Introduction letter:

In connection with mapping of the psychosocial working environment at the installation, we are inviting a selection of employees and managers to participate in an in-depth interview. You are selected randomly, based on criteria to ensure as representative a selection as possible. Approximately 20 people, broken down by all shifts, position, experience and departmental affiliation are selected.

In order to map the working environment at the installation, first in-depth interviews are used as data retrieval tools. They serve as the basis for the design of a questionnaire which will then be sent to all members of the installation. The interviews are confidential, and a representative from the HSE competence center, health and working environment will conduct the interviews and analysis. It is important that everyone contributes to the interviews giving as comprehensive a picture of the working environment as possible. All information provided will be treated anonymously and confidentially.

If you agree to participate, you will be contacted about the date and time of the interview by the HSE coordinator.

We will ask questions regarding your work environment - both the positive and negative aspects, and it is important that you reflect on this before the interview. Some keywords are:organization of work; workload; management; communication; roles and responsibilities; support from colleagues and managers; relationships.

If at any time you do not feel comfortable, you are free to cancel or stop the interview.

More information about the method can be found here: link

If you have questions about the actual in-depth interview, these can be addressed to:

Xxxxxxxx (contact person)

- Tell me about your daily work on the installation? How long have you been working for this company?
- Can you describe the installation organisation and your role and responsibility in your own words?
- Can you describe how a typical work-week looks like for you and who you normally cooperate with?
- Workload issues:
    - Job requirements / workload
    - Working hours and overtime
    - What contributes to strain in the job
- Job control issues
    - Time
    - Complexity of the tasks
    - Resources
    - Work Processes
- Roles and responsibilities
    - Role clarity
    - Interfaces with other units or positions

    - Management
- Collaboration and interface issues
    - Communication and experience transfer
    - Collaboration across the shifts
    - Cooperation with the onshore organisation
- Support at work
    - Systems that support work tasks
    - Opportunities to seek advice from IT solutions regarding collabouration tools
    - Colleagues (social)
    - Professional support
    - Management support
- Change and Change
    - Involvement
    - Communication
    - Leader availability
- Do you feel appreciated at work? If so, how is that expressed?
- Can you describe the three most negative work environment factors? Is there something that must or should be changed?
- Can you describe the three most positive workplace factors? Why do you think this works well?

9.2.2 Tailor-made survey

Introduction letter:

In order to follow up and improve the psychosocial working environment at the installation, we have invited the HSE competence center to conduct a survey for us. Mapping will help us to identify focus areas for action. The questionnaire goes to all who are associated with the installation over time.

It is important that everyone who has the opportunity to participate do so. As such, we will be able to get as good basis for improving our working environment.

Sincerely
Xxxxxxxxxx (contact person)

Risk assessment of the working environment at the installation.

This part of the risk assessment consists of a questionnaire section that contributes to the identification of psychosocial risk factors:

Symptom profile:
Health complaints
Absenteeism
Early symptoms of stress

Work environment:
Customized questions for the installation, based on interviews with employees

In order for us to be able to find the best possible areas for improvement in the working environment, it is very essential that you participate and that the answers given reflect your everyday life.

It will take about 10-15 minutes to answer the questions and we hope you take time for this.

The survey is anonymous, following the ethical guidelines for conducting risk assessments in the company, and is part of the Health and Work Environment Department responsibility, who also performs all the analyses. Your participation is voluntary and it will not be possible to track individual answers back to the individual.

The anonymous results of the survey will be returned in the respective units and will form the basis for further work on the psychosocial working environment at the installation.

Deadline for reply is set to the following date.

By clicking here you are consenting to participate and start the survey: <LINK>

Survey:

Where are you employed?

Operating company (1)

Contractor (2)

If opertaing company is ticked:

Position:

Are you a leader?

Yes

No

If Yes is ticked:

Are you:

Line manager (1)

Discipline Lead (2)

How many hours do you work overtime each trip?

<5 h (1)

6-10h (2)

11-15h (3)

16-20h (4)

21-25h (5)

26-30h (6)

>30h (7)

Which shift do you belong to?

Shift 1 (1)

Shift 2 (2)

Shift 3 (3)

Shift 4 (4)

Shift 5 (5)

Shift 6 (6)

Not relevant (7)

How long have you worked for this installation?

Less than 3 years

3 - 10 Years

Moe than 10 years

How long have you worked Offshore?

Less than 3 years

3 - 10 Years

Moe than 10 years

What is your age?

< 30 years

30-39 years

40-49 years

50-59 years

=/>60 år

Have you had any sick leave during the last year

Yes (1)

No (2)

If Yes is ticked:

How many days (approx)?

Do you have intention to leave your current position?

Yes

No

Health complaints

During the last 6 months, have you experienced any;

	Yes	No
Headache	□	□
Neck pain	□	□
Shoulder pain	□	□
Elbow pain	□	□
Back pain	□	□
Digestion problems	□	□

General Well-being

Please read each of the questions carefully and decide how often, **over the last six months,** you have experienced the various symptoms that are listed.

	Never	Rarely	Some times	Often	All the time
Become easily bored?	☐	☐	☐	☐	☐
Become easily tired?	☐	☐	☐	☐	☐
Become easily annoyed or irritated?	☐	☐	☐	☐	☐
Had to clear your throat for no apparent reason?	☐	☐	☐	☐	☐
Got mixed up in your thinking when you have had to do things quickly?	☐	☐	☐	☐	☐
Done things rashly or on impulse?	☐	☐	☐	☐	☐
Been forgetful?	☐	☐	☐	☐	☐
Found things getting on your nerves and wearing you out?	☐	☐	☐	☐	☐
Become flushed / hot in the face for no apparent reason?	☐	☐	☐	☐	☐
Had difficulty in falling or staying asleep?	☐	☐	☐	☐	☐
Found your feelings easily hurt?	☐	☐	☐	☐	☐
Found it hard to make up your mind?	☐	☐	☐	☐	☐

Tailored Working environment items:

How do you experience

Poor	Unsatisfactory	Neither nor (neutral response)	Satisfactory	Excellent	Not applicable
(1)	(2)	(3)	(4)	(5)	(6)

The balance between planned maintenance and urgent task
Your workload
The possibility to work in pairs when performing your job
The balance between administration and field work
The quality of the training provided to new employees
The correspondence between time estimates and the actual time spent on completing tasks
The resolution of conflict situations on-site
Co-ordination of your leaders in the communication of established practice
Clear communication of prioritization of job tasks
The practical value of HSE meetings
The possibility to ask for assistance or relief when workload is too high
The practical value of addressing issues with management on-site
Your competence level related to the use of computers at work
The possibility to have work tasks adjusted to your individual health situation
The clarity of the leading advisor's role and responsibilities
Your possibility to work at one task at a time
The utilization of your competence on the platform
The availability of information related to your work tasks
Your possibility to ask other colleagues for help
The possibility to raise concerns with your colleagues
The social environment at the platform

The possibility to receive support from your line manager
Your possibility to learn from other's experience
Your possibility to share experience with others

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