

Risk Assessment Knowledge Relating to Occupational Health and Safety Risks: A Case Study of Five Finnish Companies

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Abstract. Conducting risk assessment in workplaces has proved to be demanding, even though it is essential in occupational health and safety promotion and accident prevention. To identify knowledge gaps regarding risk assessment in workplaces and related development needs in Finland, five medium- and large-sized Finnish companies were studied using semi-structured safety expert interviews. The interviewees (n = 10) highlighted the need to develop the assessment of the magnitude of the risk, the utilization of the risk assessment and residual risk, and the use of occupational health and safety systems. Further studies are needed to determine how to support risk assessment skills and evaluate the success of risk assessment in workplaces.

Keywords: Hazard Identification · Occupational Safety and Health · Risk Assessment · Risk Evaluation · Workplace Safety

1 Introduction

Risk assessment is an important factor in occupational health and safety (OHS) promotion and accident prevention. Nonetheless, in practice, it can be difficult to carry out a risk assessment, as identifying hazards and analyzing and evaluating risks in the workplace is challenging. Certain hazards are identified and not as well-managed as others [1]. Poor risk assessment and failure to identify hazards has been attributed to various factors, including subjectivity and skill gaps [2], [3], [4]. However, studies have shown that risk assessment skills can be developed, for example, through training and internships [5], [6], [7].

Teaching methods and commitment have emerged in the literature as important factors for the development of risk assessment skills. According to Albert and Hallowel [8], not all traditional pedagogical teaching methods are suitable for adults because they have different needs and expectations relating to teaching and learning compared to children. Hence, a learner-centric andragogical method has been developed for them [8]. In their study, Zuluaga et al. [9] found association between high-engaging training methods and higher hazard recognition level. The methods differ, for example, in terms of the need for knowledge, self-study, study experience, readiness to learn, and

motivation. In addition to the training method, training transfer factors such as upper management commitment, supervisor support, safety culture, and different feedback have a major impact on better hazard recognition [10]. According to Namian et al. [10], the use of more engaging and more expensive training methods may not provide a better level of hazard recognition compared with traditional low-engaging methods if the level of training transfer is low. Hashem et al. [11] also found that methods of delivering safety training (such as text, lecture, and video) do not affect knowledge retention.

In Finland, according to the Occupational Safety and Health Act, employers have an obligation to take care of the health and safety of their employees [12]. Identifying hazards and potentially harmful effects is part of an employer's duty of care. The Finnish Ministry of Social Affairs and Health (MSAH) published *The Risk Assessment in Workplaces Workbook* [13], which is widely used. The MSAH Workbook offers a framework and guidelines for identifying hazards in OHS risk assessment. Checklists for various hazards (such as physical factors, ergonomics, chemical factors, psychosocial factors, and the risk of injuries) are included in the MSAH Workbook. Generally, companies have updated their checklists to suit their operations. The aim of this study was to identify knowledge gaps relating to risk assessment and related development needs in Finnish workplaces.

2 Methods and Materials

To facilitate a more in-depth understanding of the risk assessment knowledge gaps in five Finnish companies, a qualitative interview study was conducted. A semi-structured interview was used to collect the data, using a form with preprepared topics as a guide. The preprepared topics focused on the use of the MSAH workbook, the method used for risk assessment, employees' risk assessment skills, and how to develop risk assessment skills. The topics included questions such as the following: Who conducts the risk assessments? Which methods are used in risk assessments? What kind of risk assessment skills does the personnel have? How are the risk assessment skills evaluated? How is the success of the risk assessment evaluated? The semi-structured interview form was based on a previous study [1] and current research questions. The interviews were recorded and analyzed by categorizing the themes that emerged.

The companies represent the following industries: 1) manufacturing; 2) transportation and storage; 3) electrical power generation, transmission, and distribution; and 4) other technical testing and analysis field. Four of the companies are large, while one is medium-sized, employing about 200 people. In addition, the companies employ subcontractors. The companies were chosen based on their needs and interests to develop their risk assessment processes.

A total of five interviews were conducted. The job titles of the interviewees ($n = 10$) in the companies varied from safety engineer to health, safety, environment, and quality managers. Hereinafter, they will be referred to as safety experts. All the interviews were held in autumn 2020. Table 1 summarizes the distribution of the companies, the interviewees, and the interviews.

Table 1. Background information about the interviews (n = 5) and interviewees (n = 10).

Companies industry	Manufacturing (companies A and D); transportation and storage (company C); electrical power generation, transmission and distribution (company B); and other technical testing and analysis field (company E)
Interviewees per company	Company A (n = 2), company B (n = 1), company C (n = 3), company D (n = 3), and company E (n = 1)
Interview medium	Teams interviews (n = 5)
Interview type	Individual interviews (40%), group interviews (60%)
Duration of the interviews	Average: 73 minutes, range: 63–84 minutes
Experience in occupational safety	Average: 7 years, range: 2–15 years

3 Results

The participated companies mainly used electronic checklists customized for their use. Almost all of them used a matrix to determine the magnitude of risk. The checklists and risk matrices were mainly based on the MSAH workbook. The risk assessments involved the supervisor and the employee(s), the OHS officer and in some cases the safety/quality manager, and an expert. The companies did not evaluate the risk assessment skills of those who were performing the risk assessment or the success of the risk assessment.

In the interviews, four categories emerged as the main areas for development. The categories were related to difficulties in estimating the magnitude of the risk, the utilization of the risk assessment and residual risk assessment, and the OHS systems used. There also arose a question of how the results of the risk assessment should be discussed with the employees. Table 2 presents the four categories and explanations.

According to the interview results, assessing the magnitude of risk is difficult. The interviewees mentioned, for example, the varying views of experts, supervisors, and employees on the consequence and probability of the risks. The training provided by the companies to support risk assessment varied widely. Orientation for new employees includes information on safe work methods. Certain jobs require special qualifications, and in that context, OHS is also discussed. In addition, there were various in-house training videos, guides, and thematic training. As an example of management's commitment to safety, one company sent a group of safety experts to introduce a new OHS system to supervisors at their work sites. Moreover, it was found that although staff is trained, their ability to carry out risk assessments is not assessed or tested.

Even though the interviewees stated that discussing residual risks with employees can improve risk awareness, not all companies carried out a residual risk assessment. Some of the companies evaluated residual risk before corrective actions are completed, while some evaluated it after corrective measures. One issue relating to the utilization of residual risk assessment was measuring how often work needs to be rethought because the original plan would cause an occupational safety risk. In addition, it was argued that an audit-type residual risk assessment after corrective measures would also act as a quality assessment. Several interviewees shared the view that the results of both

the risk assessment and the residual risk should be used more in orientations and training.

Using OHS systems requires instructions that are simple enough. Based on the interviews, there were differences in defining the consequences of hazards. Not all the systems provided sufficient guidance on hazard characterization. Because of that and not being aware of the principles of risk assessment, the employees were not able to determine what the possible consequences would be if the hazard is realized. As a result, the corrective action did not necessarily respond to the hazard originally identified. All the companies had an electronic risk assessment system configured for their use. In principle, the systems had similar functions. In this study, the systems themselves were not further examined. However, in general, some systems were perceived as complex. It was hoped that the system would guide the user through the risk assessment and would be easy to use. It was noted that the employees did not always know how to write all the considered matters clearly enough.

Table 2. Identified knowledge gaps and development needs relating to risk assessment.

Category	Details
Assessing the magnitude of risks is challenging	<ul style="list-style-type: none"> - Due to the subjective view, a matrix may not be the best solution for assessing the magnitude of risk - Supervisors' view of risks may differ from employees' view
Utilization of risk assessment	<ul style="list-style-type: none"> - Results of the risk assessment should be used more in training and orientation - A tool for supervisors to develop operations
Utilization of residual risk	<ul style="list-style-type: none"> - Quality assessment - Discussion with employees - In orientation materials
Using the OHS-systems (for example, SaaS, PaaS, or intra-net)	<ul style="list-style-type: none"> - Instructions need to be simple enough - Identified hazard and predicted consequence do not always meet

4 Discussion

In this study, insight into knowledge gaps in risk assessment in Finnish workplaces was given. Four main needs were identified to develop the risk assessment concerning difficulties in assessing the magnitude of the risk, the utilization of risk assessment and residual risk, and difficulties when using the OHS system. Nenonen et al. [14], in previous research among Finnish companies, found that the companies' risk assessment process is mainly based on the MSAH workbook, which is usually applied strictly. Even though companies adapt the checklists and risk matrices to suit their use, their use was perceived as problematic due to a subjective perspective. Others felt that the numerical assessment facilitated the prioritization and proper implementation of corrective actions.

The results of this study are in agreement with previous studies that have evaluated risk assessment in other industries. For example, Wijeratne et al. [15] studied maintenance activities in three organizations, and their findings on the subjectivity of risk

assessment supported the results of this study, as the lack of standards has been found to complicate an objective analysis of the severity and likelihood of hazards. Furthermore, the use of risk matrices in risk assessments has received criticism [16], [17]. Likewise, in this study, the interviewees were not satisfied with the use, results, or guidance in using risk matrices. The focus was too much on the numeric evaluation based on individuals' opinions of the magnitude of the risks.

Based on previous studies, the utilization of risk assessment needs to be developed [4]. Similarly, the interviewees revealed that risk assessment is not fully utilized, for example, in improving an organization's operations or orientating new employees. Finally, in this study, it was found that risk assessment skills need to be further developed and evaluated. Training relating to safety was provided in the companies by various methods. Namian et al. [10] stated that the commitment of the management is one of the important training transfer factors. In this study, the interviewees were quite satisfied with the management's commitment to safety. However, the training should begin at educational institutions to ensure basic knowledge in OHS and risk assessment [18], [19].

Further research is needed to explore how to support the employees' risk assessment skills and how to evaluate the success of the risk assessment process. To determine the objective level of risk, the use and development of risk matrices need to be further studied to decrease the identified difficulties in risk assessment.

The limitations of the study include a limited number of respondents for qualitative interviews as well as a fairly homogeneous research sample. The backgrounds, education, and work experience of the interviewees varied considerably. The responses began to present similar issues. Consequently, saturation was achieved, which indicated that the study had a satisfactory number of interviews.

In addition, the interaction between the researcher and the interviewee may affect the conduct of the interview. The interviewee may feel uncomfortable or the interview may digress from the original topic [20]. These possibilities have been taken into account in the study when designing the interviews. Semi-structured interviews ensured that all topics were discussed. At the same time, it provided an opportunity to discuss more freely and deeply when necessary.

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