SAFETY CHALLENGES WHEN MANAGING SHIFT WORK IN THE SWEDISH FOREST INDUSTRY: SOLUTIONS BASED ON MORE THAN 700 YEARS OF WORK EXPERIENCE

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ABSTRACT

The purpose of this study is to explore the safety challenges managing shift work in the Swedish forest industry. There are several factors that can affect safety in working life. In general, previous research shows that managerial and leadership behaviours affect safety and well-being regardless of the type of industry. A leadership with a focus on safety affects the safety climate and the outcome in the form of accidents in an organisation. The interaction between managers and employees regarding safety issues also has a positive effect on safety. Leaders who are instead passive regarding safety issues have significant negative effects on safety, contribute to an increased number of accidents and reduce safety-related behaviour in the organisation. This means that employees with passive leaders themselves become less interested in engaging in safety activities. Shift work has also been shown to affect the health and safety of employees. For example, studies show that higher sickness absence is associated with three-shift rotation compared to two-shift rotation and that fatigue and insomnia may be an effect of shift work. Further, research also shows a link between fatigue and a higher frequency of accidents. In this paper, we use a co-creation approach to capture the safety challenges related to shift work. The overall methodological approach in this study is action-oriented research. The empirical data is collected with interviews and focus groups which altogether include 56 respondents with more than 700 years of joint work experiences from shift work in the forest industry. Preliminary results show the importance of creating a safety culture where both the management and the employees take active part and responsibility in solutions. The managers have the formal responsibility, including law and regulation related to safety aspects. The employees in turn have the responsibility for their own choices and behaviours not least related to food, sleep, and training.
Keywords: safety challenges, shift work, forest industry.

1 INTRODUCTION

The purpose of this study is to explore the safety challenges managing shift work in the Swedish forest industry. This is important for several reasons. The forest industry is one of the industries that have a high proportion of workplace accidents. In Sweden the forest industry has had the most workplace incidents with a fatal outcome during the last decade [1]. The Swedish government has formulated an updated work environment strategy for the future for the period 2021–2025 [2]. The Government states that the occupational injuries entail severe financial consequences at the individual and societal level as well as personal suffering for those affected. The work environment strategy for 2021–2025 focuses on the sub-goals (i) a sustainable working life – everyone must be able, strong, and willing to work a full working life; (ii) a healthy working life – working life must contribute to development and well-being; (iii) a secure working life – none should risk life or health due to the job; and (iv) a labour market without crime and cheating. However, the Swedish Work Environment Authority believes that fatal incidents should be greatly reduced by companies developing a good safety culture and functioning systematic work related to the security aspects in the industry.

There are several factors that affects safety in working life. In general, previous research shows that *managerial and leadership behaviours* affect safety and well-being regardless of the type of industry [3]. A leadership with a focus on safety also have an impact on the safety climate and the outcome in the form of accidents in an organisation [4], [5]. Working in businesses with high risks requires leaders to act proactively when it comes to risk management. Previous research shows that in cases where leaders worked to analyse previous events and learned from them, had a positive effect on the management of future crises or accidents [6], [7]. Leaders who are instead passive about security issues have significant negative effects on safety, contribute to an increased number of accidents [8] and reduce safety-related behaviour in the organisation [9]. This means that employees with passive leaders themselves become less interested in engaging in safety activities. Leadership training, not only for formal managers but also for employees, has proven to be positive for both employee well-being and efficiency [10].

The *interaction* between managers and employees regarding security issues also positively impacts security [11]. Previous research in the forest industry in Sweden has shown that if employers and employees have a consensus on e.g., safety culture, it is beneficial towards employee's well-being [12]. Studies from the Finnish forest industry show that employee well-being is also positively affected by being able to participate in change work in relation to one's own work situation [13], [14]. Further, it has positive effects to work together with environmental issues, for example managers, employees, representatives from the unions and health representatives [15].

Shift work has also been shown to affect the health and safety of employees. For example, studies show that higher sickness absence is associated with three-shift rotation compared to two-shift rotation [16] and that fatigue and insomnia may be an effect of shift work [17]. Further, research also shows a link between fatigue and a higher frequency of accidents [18], [19]. Health issues related to shift work also has been shown to include problems with blood pressure [20] and even mortality [21] together with coronary heart disease [22]. In addition, Mylek and Schirmer [23] highlight the importance to broaden employee's wellbeing by implementing workplace strategies that includes not only the physical safety to create a culture of wellbeing in the industry.

In this paper, we use a co-creation approach to capture the safety challenges related to shift work. We also focus specifically on "who can/should do what?" in terms of different perspectives on responsibilities, (i) the company; (ii) the employee; and (iii) the work together.

The paper is structured as follows. Firstly, a frame of reference is outlined with (i) the Swedish context and (ii) theories about co-creation. Secondly, the material and methods used in the paper will be described. Thereafter, the results and discussion are presented. The final part includes conclusions, implications, and future research avenues.

2 FRAMEWORK

2.1 The Swedish context

The Swedish' forest industry includes companies that work with processing the forest into bio-based products such as producers of pulp, paper, board and biofuel, also including sawmills. Of Sweden's total land area 70% is covered by forest and this is about 28 million hectares (of almost 41 million hectares) [24]. As previously mentioned, the forest industry in Sweden has had the most workplace incidents with a fatal outcome during the last decade

[1]. However, these could be reduced by companies developing a good safety culture and functioning systematic work related to the security aspects in the industry.

The law that governs work with work environment in Sweden is primarily the Work Environment Act [25]. According to the Work Environment Act all employees in Sweden have the right to a good work environment. The goal is to reduce risks for accidents and illness in health for the employees. The Act states, for example, that the company/employer and organisation is ultimately responsible for the work environment and thus must lead the work towards a good and better work environment. A special law regulates working hours – the Working Hours Act [26]. Here there is information about how much you can work per day, per week and per year, and to what extent you are entitled to breaks, breaks or meal breaks. The organisational and social aspects of the working environment is focused on in the Law for Organisational and Social Work Environment [27]. The purpose with the regulations is to promote a good working environment and prevent the risk of ill health due to organisational and social conditions in working environment. It relates to (i) the management and control; (ii) communication; (iii) participation, room for manoeuvre; (iv) work division; and (v) requirements, resources, and responsibilities. Beside the law, your work can also be regulated in a collective agreement which is an agreement between the employer and the union. If there is no collective agreement in your workplace only the law is applied.

2.2 Co-creation

In this context it is here argued that a co-creation approach could be of value when identifying risks and developing safe working environment. Co-creation allows involved stakeholders to create value through interactions. Prahalad and Ramaswamy [28] developed the method of DART (dialog, access, risk, and transparency), also used in the exploratory study by Ulvenblad and Barth [15].

Based on the initial work of Prahalad and Ramaswamy, four building blocks provide the pillars for co-creation method of DART namely, *dialog*, *access*, *risk,* and *transparency*. These building blocks challenge in many ways the traditional view managers have taken on issues as labelling laws, disclosure of risks, and transparency of financial statements. Firstly, a *dialog* is very important for the co-creation process to advance as it implies interactivity, deep engagement, and commitment, but also the ability and willingness to change and adapt. *Access* and *transparency* to information for employees as well as employers is necessary for meaningful dialog. More importantly, these building blocks can lead to a unified assessment of the risk-benefits of action and decision of potential HR practices.

Furthermore, the co-creation process is also viewed from a provider and user perspective, or rather employer/manager and employee perspective. This is done to provide information on contribution that is jointly as well as user specific in the co-creation process. Here we use the framework developed by Grönroos and Voima [29], which was originally designed based on buyer–seller integration. In this study we argue that the value creation sphere can be applied in the process of developing safe working environment. In this study we focus on the value creation in the spheres of the employer (including management teams) and employees (Fig. 1).

The firm is responsible for the production process and in the *provider sphere* it produces resources and processes for safety work. In this way the firm facilitates employees value creation. In the *joint sphere*, the role of the employees is twofold: co-producer of resources and processes individually (or jointly between employees) *and* value creator jointly with the
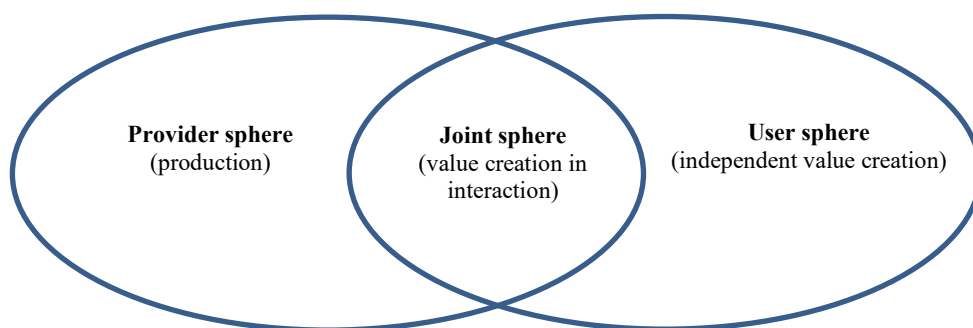
Figure 1:   Value creation spheres. Framework designed based on the work of Grönroos and Voima [29].

provider (employer representatives). In direct interactions with the employees, the management team may have an opportunity to engage with the employers' value creation process and take on the role of value co-creator. In the rest of the *employer sphere*, which is closed to the provider, the employers create value as value-in-use independently of the provider. Overall, the questions addressed in the process of developing safe working environment focus on – what can the employer do, what can the employees do, and what can they co-create together to develop safe working environment?

3 MATERIALS AND METHODS

3.1 The research project

This article's empirical data is included in a research and development project. The case included in the study is a company in the forest industry situated in an industrial community in Sweden. The research project, which began in the autumn of 2019, was inspired by the need for development of work environment safety and health in the forest industry. The authors of this article have followed the project from the beginning and conducted a formative evaluation of the project during the process [30]. The project will continue 2020–2022.

The whole project consists of the following three parts: (1) current situation analysis; (2) development work; and (3) final evaluation:

1. *Current situation analysis* – the researchers map the current situation. The company makes an initial action plan based on the needs and interests of both employers, trade unions and occupational health care.
2. *Development work* – the company's own project develops as knowledge and insights grow and are based on an action plan with activities. The researchers are following and supporting the development process.
3. *Final evaluation* – the researchers summarise the project's results together with the project's actors.

The part of the data presented in this paper is included in part 1 entitled *Current situation analysis* and was collected during spring 2021.

3.2 Overall research design

The overall methodological approach in this study is action-oriented research. Participatory action research includes three integrated aspects, namely participation, action, and research [31]. The participation includes several different stakeholders, such as managers as well as representatives from the unions, key persons identified in the process and business health representative. The two authors to this paper have been present in each activity, making it possible to participate actively and at the same time make necessary documentations.

3.3 Data collection and analysis

The empirical data has been collected with interviews and focus groups which altogether include 56 respondents with more than 700 years of joint work experiences from shift work in the forest industry. The respondents were chosen with the help from the company based on two criteria: (1) the respondents should include different stakeholder groups; managers, employees, union, occupational health care etc.; and (2) the group of respondents should include respondents with experiences of shift work. The focus in the interviews were to capture strengths and weaknesses in the work environment as well as possibilities to act and work in new ways. The focus was also especially on (i) what the company can/should do; (ii) what the employee can/should do; and (iii) what areas in the work environment would benefit from working together with different competencies, experiences, and functions.

In the data analysis a content analysis has been employed focusing to compare similarities, and patterns in the data material to make it possible to extract data into the three areas (spheres) of interest and relevance in the study: (i) employer sphere; (ii) employee sphere; and (iii) joint sphere.

4 RESULTS AND DISCUSSION

The results show the importance of creating a safety culture where both the management and the employees take active part and responsibility in solutions. The managers have the formal responsibility including to follow the law related to safety and work environmental aspects. For example, the Work Environment Act [25], the Working Hours Act [26] with regulations focusing working hours and by these possibilities in creating a shift-schedule. Another example is the Law for Organisational and Social Work Environment [27]. The social parts are, among other things, about feeling safe at work and not being exposed to abusive discrimination. It is also about feeling included in the group at the workplace. The employer has challenges regarding for example information between shifts and is working to find solutions by both sending out newsletters and spreading information on regular morning meetings. However, at the morning meetings not all are included because of the shift work. There have also been discussions about delegating responsibility also to the shift-teams and this work is on-going.

The employees in turn have the responsibility for their own choices and behaviours not the least related to, food, sleep, and training. It is obvious that some of the employees with long experience working shift have found their own models to handle both the food during the shift, the sleeping habits related to the shift and the training being able to live a healthy life. We know from previous research that the health issues are of importance related to shift work [20]–[22]. In addition, research has shown a link between fatigue and a higher frequency of accidents [18], [19].

The *employer sphere* focuses on procedures, documentation, and risk analysis (Table 1). The management team also need to address work related information between the different

Table 1: Examples of illustrative quotes for each sphere selected from the 56 interviews.

Employer sphere	Joint sphere	Employees' sphere
Big differences between shift work at daytime and night-time. More to do during daytime. Difficult to make sure that information and communication is provided between the shifts.	We now have a cooperation established; a new co-operation model has been agreed on.	Difficult for the family to understand that I need time to adjust after shift work, I need to rest and sleep…
We act on serious things from the staff survey that we do every year, for example regarding discrimination. Every department receive information and support to make changes.	We have a collegial atmosphere that works very well, "you are more than colleagues", we cover for each other if needed.	Older people have more difficulties doing shift work, they tend to develop diabetes.
We provide information every week on the development and changes to all the employees, like a newsletter. So, everyone knows what is going on.	We have a forum to discuss mutual working aspects – the working environment committee. Cooperation is something we are good at, we are "one big family", good working climate.	It is important that you are fit and healthy, since you are away 48 h every other week. Even if you think that is working for you, you need to be open for signs like depression or anxiety
Usually, the colleagues come to my office, but after the Covid restrictions, we do all the morning meetings online now.	Leisure and work – it feels like the shift teams that have activities together after shifts, feel good.	Do not eat lunch boxes at night, I had to stop drinking coffee "learning by doing".
We have talked a lot about delegating responsibility, those who have the competence, they should work with problem solving, they should get more challenges.	We got a challenge, how do we reduce the workforce we tested and saved 10 in the staff, we have a good negotiating climate.	At night I eat lighter food.
Ok rehabilitation good will in the company, they are good at finding temporary solutions	At every reorganisation we are included, we watch.	One should not change the diet (during the shift)

shifts and provide a system of communication and reporting between the employees. This should include all aspects of safety work environment such as reporting, communication, health, cultural aspects etc.

The *employees sphere* address concerns about health and living conditions when not at work but could lead to risks at work if the employee do not follow these guidelines and recommendations. This also draw the attention to team building and awareness of potential individual problems need to be addressed.

The joint sphere address concerns about developing guidelines for awareness and knowledge when it comes to health issues, support, and system for alerting management team when signs of health or other issues prevail with members in the group.

To summarise, many different challenges need to be addressed when working with safety work environment. Some of these aspects can be related to the management sphere like regulation and law procedures, while other type of risks relates to employees living conditions and recovery-time that need to be addressed and planed for off-work. Furthermore, some of these challenges are best developed jointly to find models and systems to co-create inclusive solutions of how to develop safe working conditions, see Fig. 2.
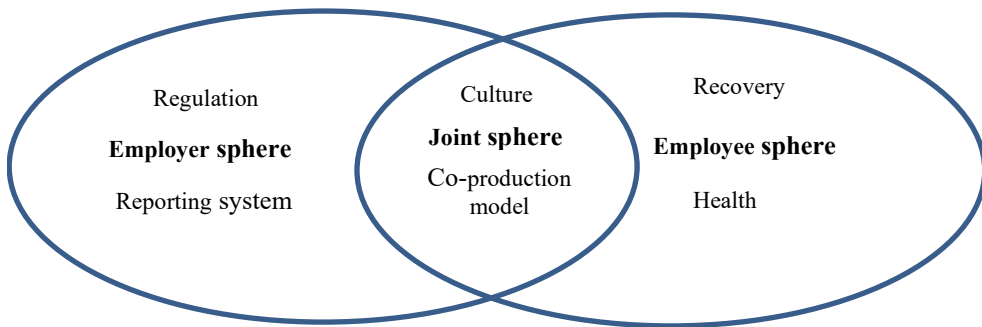

Figure 2:   Employer/Joint/Employee spheres in developing a safety culture and work environment.

5 CONCLUSIONS

At least two aspects need to be considered when developing safety work. First, it is important to involve all the members of the organisation. This could be complexed and time-consuming for larger organisation, why small groups could be of interest to work with together with key representatives. This is important as many different features are included and related to safety work. For example, some aspects could be directly linked to work procedures and routines to eliminate risk of accidents. This type of safety procedures could be developed by company representatives like safety managers addressing risk analysis and regulation that need to be followed and reported, which also need to be handled by management team. However, risk is also associated with aspects that is outside of the control and responsibility of the management team, such as the living habits. For example, it is of importance that shift workers have time to recover and, also use that time in a responsible way.

Second, the process of developing safety work needs to be transparent, open, and inclusive. The management team must enforce safety regulations, but this also involves employees when it comes to indirect aspects such as health and living conditions that also could be related to risks and accidents.

There are implications for both employers and employees in co-creating a safety culture and work environment based on inclusion and mutual responsibility. It is also of importance to include stakeholders such as occupational health care to take part with their competence. Future research avenues will benefit from continuing the studies of co-creation in the process of creating a safety culture and work environment. Among other things it is of relevance to capture how to spread the information about working shift in a systematic way from the experienced shift workers to the beginners.

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