



THE FORMATION OF A GOOD SAFETY CULTURE AT ENTERPRISE

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Abstract. The aim of the study is to show innovative possibilities for improvement of safety culture at enterprises through complex approach to occupational health and safety (OH&S). The knowledge of the leadership and workers in OH&S is not sufficient at present in Estonia, particularly in small and medium-sized enterprises (the number is 60 000). The small (up to 50 workers) or medium-sized enterprises (up to 150 workers) have no possibility to hire the working environment specialist who would deal only with OH&S problems. Usually obligations in the field of OH&S in small and medium-sized enterprises are delegated to one employee in addition to other responsibilities related to personnel, security, fire protection and environmental problems. Therefore, the complex approach to management of OH&S issues is needed in order to create a good safety culture and to achieve positive results in company safety performance. The complex method consists of risk assessment and determination of safety level. The authors offer possible tools – simple computer applications which are available for managers, interviews with employers, employees and occupational health specialists for development and dissemination of safety culture. The opinion of workers and occupational health specialists has been taken into consideration in the planning of improvements of working conditions by the employers. The economic issues of safety and health improvement measures are presented.

Keywords: occupational safety and health, safety level, safety culture, risk assessment, human factors, innovative research method.

1. Introduction

Safety culture is a key element in the development of complex models to explain or predict safety relevant outcomes, such as safety behaviour, safety compliance or accidents, and may help explain the “human factor” in relation to organisational safety issues and performance. These processes may be studied at different levels of analyses and even at different levels of analyses simultaneously (Cheyne *et al.* 2008). Safety culture contains three interacting elements: risk controls, attitudes and behaviour, and its effective development depends on good cooperation and communications between employers, employees and Occupational Health Services (OHS). In Estonia, the services provided by an occupational health physician, an occupational health nurse, an occupational hygienist, a psychologist or a specialist of ergonomics are considered to be OHS. These service providers are all called ‘occupational health specialists’ (OHsp). According to the Estonian Act on Occupational Health and Safety, only entrepreneurs or private medical companies may provide the OHS.

The benefits of OHS are obvious and objectively demonstrable. Economic evaluation (cost-benefit analysis, cost-effectiveness analysis, and cost utility analysis) of such service is thus important as a guide to rational choices, the dependency on the validity of assumptions made being the main limitation, along with the non-consideration of social and ethical objectives if decisions are based on costs and benefit alone. Ultimately, the formulation of policies on OHS must be both economically and ethically sound (Meng 2005; Grozdanovic 2001).

Work-related injuries and illnesses kill an estimated 1.2 million people around the world every year. 250 million work-related accidents and 160 million work-related illnesses occur annually (Somavia 2005) and these numbers translate into an annual economic loss of approximately 4% of the world gross national product (International ... 2001). Only an estimated 5-10% of the workers in developing countries and 20-50% of the workers in industrialized countries (85% in Finland, (Walters 1996) have access to adequate OHS. Relatively little information is available on the process and customers of OHS. The only indications of the

coverage and contents of OHS are obtained indirectly from the information labour inspectors gather annually from employers. In addition, only a minority (22%) of workers is covered by the OHS and has access to the occupational health physician in Estonia (Järvis and Tint 2007). Even in a developed country like the United States, approximately 70% of the 100 million workforce are not covered by OHS (Somavia 2005). The OHS have been endorsed by both the WHO and the ILO as a prescription for a healthier, happier, and more productive workforce.

Although a healthier workforce will almost certainly mean decreased absenteeism and increased workers' compensation claims, one must still weigh the benefits against the costs and seek the most cost-effective way of achieving the same results. In the estimation of the benefits, a monetary value is apportioned to the avoided consequences (for example costs of health care, rehabilitation, or workers' compensation). The analysis should also take into consideration the fact that costs and benefits may be generated over a period of time, the costs and benefits often occurring in different time periods. Because costs or benefits 10 years later are not directly comparable with their value today. The effects on productivity and reduced sickness absence can also be quantified and reflected as savings. More sophisticated forms of cost-benefit analyses would factor other intangible benefits into the equation. Providing employees with on-site primary health care may give them a sense of loyalty to the company because the company is demonstrating that it cares for its employees. The full economic losses due to accidents are not demonstrated clearly in Estonia. Data from the Health Insurance Fund (responsible for public health care in Estonia) have been publicly ac-

cessible only in two recent years. However, these data (Table 1) do not contain the indirect costs of accidents and diseases (the costs for hiring the substitute labour, training for the job, the lost or degraded production quality, etc.). At present, the coverage for occupational accidents and occupational diseases are integrated into the Estonian health insurance (temporary loss of work ability) and pension insurance (permanent loss of work ability) schemes. The system of occupational disability and occupational accidents insurance is voluntary in Estonia and not effective (Järvis and Tint 2007).

Many companies have embarked on the road to establish safe working cultures in order to improve their safety performance. The so-called behaviour-based safety programs are the vehicles to achieve this desired outcome (Gadomski 2008). Indeed, some companies have experienced huge improvements in their safety performance while others, however, utterly failed (Pheiffer 2008). The behaviour-based safety program accepts that risk-taking is essential and fundamental to doing work and that no work at the workplace can ever be made risk-free. Therefore, the focus should be that employees become competent to identify and assess risks and act appropriately. This approach specifically targets the complacency factor, which is a natural result if people perceive their work environments and procedures to be safe. One of the tools in achieving safety is to focus on employees' behaviour and attitudes. In order to encourage the employees to achieve high safety standards the managers must lead by the models of the behaviour that include risk awareness tools, motivational tools and behaviour observations. Over the years companies have installed many programs and processes to prevent incidents and to control losses. According to Germain *et al.* (1998) some

Table 1. Number of workdays lost and expenses incurred due to occupational accidents (Ministry ... 2006)

	1995	2000	2002	2003	2004	2006
Number of workdays lost due to the occupational accidents	83 643	157 051	171 850	146 411	118 941	125 314
Percentage of workdays lost due to occupational accidents in the total number of sick-leave days	.....	3.1	3.7	3.1	3.7	2.3
Occupational accident benefit, million EEK/ million EURO	6.3/0.4	19.5/1.23	25.2/1.6	23.1/1.47	20.4/1.3	22.9/1.46
Number of certificates of incapacity for work	2783	6921	7572	6871	5863	5996
Compensation for damages related to occupational accidents and diseases, million EEK/million EURO	....	21.6/1.38	34.6/2.2	36.9/2.35	38.3/2.44	36.0/2.20
Number of people receiving compensation for damages	....	1111	1553	1646	1745	2216

companies believe that the best way to achieve incident control is through additional regulations, focusing on prescriptive and technological approach, there is also a merging willingness by people in industry and business to try a new and complementary approach. This approach is then effective safety management through good management systems. It is clear that there is a direct link between good safety management systems and good business management (Wallace 1995). Organisations with high safety standards are those with high operational standards because the management actions necessary to achieve safety are the same which are required to achieve business efficiency. Over time various safety approaches were indeed developed and implemented by companies to assist them in the managing of safety and include engineering design, legal approach, safety systems, risk management and more recently behaviour-based safety. The aim is to change employees' perception and attitudes (at all levels) towards safety behaviour, so that they understand the role and impact of their own behaviours on safety. The way, in which employees understand risks, their attitudes towards safety and taking the responsibility of safety of the person himself and the others are important factors in good safety culture. There are three major factors which influence employee behaviour: the company safety culture, which should promote involvement and commitment to the company goals and standards; the job itself; the strengths and weaknesses of the employee, which include habits, attitudes, personality and current stresses (Wallace 1995). New demands from the companies' environment entail that work safety becomes strategically more important for management (Järvis and Tint 2007; Reinhold and Tint 2007). The safety management system consists of the

following elements (thematic areas): management and leadership, training of management and personnel, operations, maintenance, risk assessment, emergency planning, monitoring of performance and audit (Machaira *et al.* 2008).

2. Material and methods

1) Management of hazards at workplace- following Fig. 1; 2) A simple risk assessment method (Reinhold *et al.* 2006), described on p. 4; 3) For the determination of safety level at the six enterprises, the modified Diekemper & Spartz method (Kuusisto 2000) was used, also described on p. 5; 4) The questioning of managers about their activities and willingness to carry out improvements in the field of OH&S (p. 7); 5) The questioning of workers for taking into consideration their opinion in working out plans for positive changes in the working environment (p. 6); 6) The questioning of occupational health specialists (doctors and nurses) for clearing-up the possibilities to increase their role in improvement of safety culture at enterprises (p. 9).

The investigated enterprises were from manufacturing: printing, mechanical, plastics, wood processing, textile industry and the water purification plant (Cases I-VI).

3. Risk assessment at the workplace based on a simple risk assessment method

A computerized version of the simple/flexible risk assessment method (Reinhold *et al.* 2006) is shown in Fig. 2. The method gives four risk levels (negligible, justified, inadmissible, intolerable risk) and enables to show graphically the level of risk according to the measurements in the work environment (Table 2).

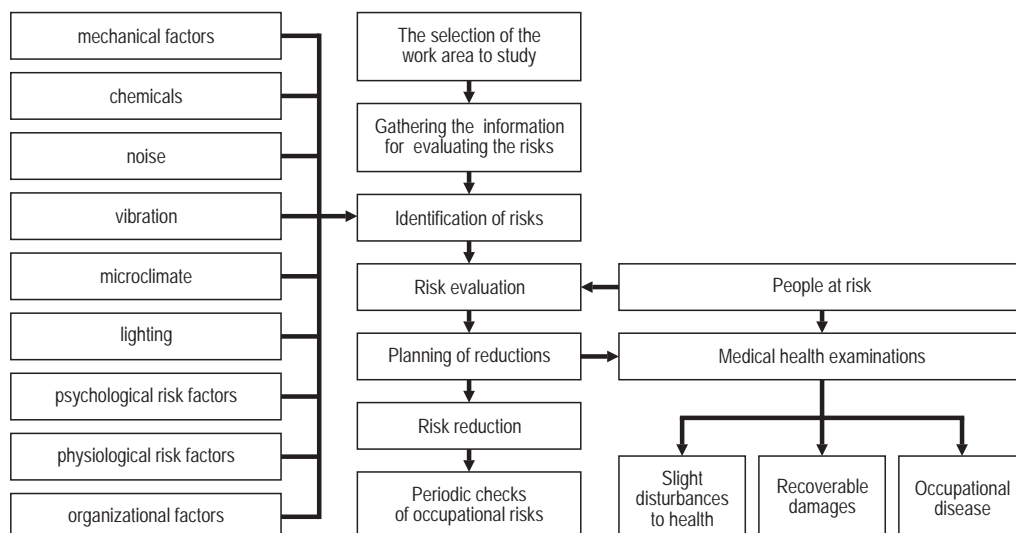


Fig. 1. The management of hazards at workplace

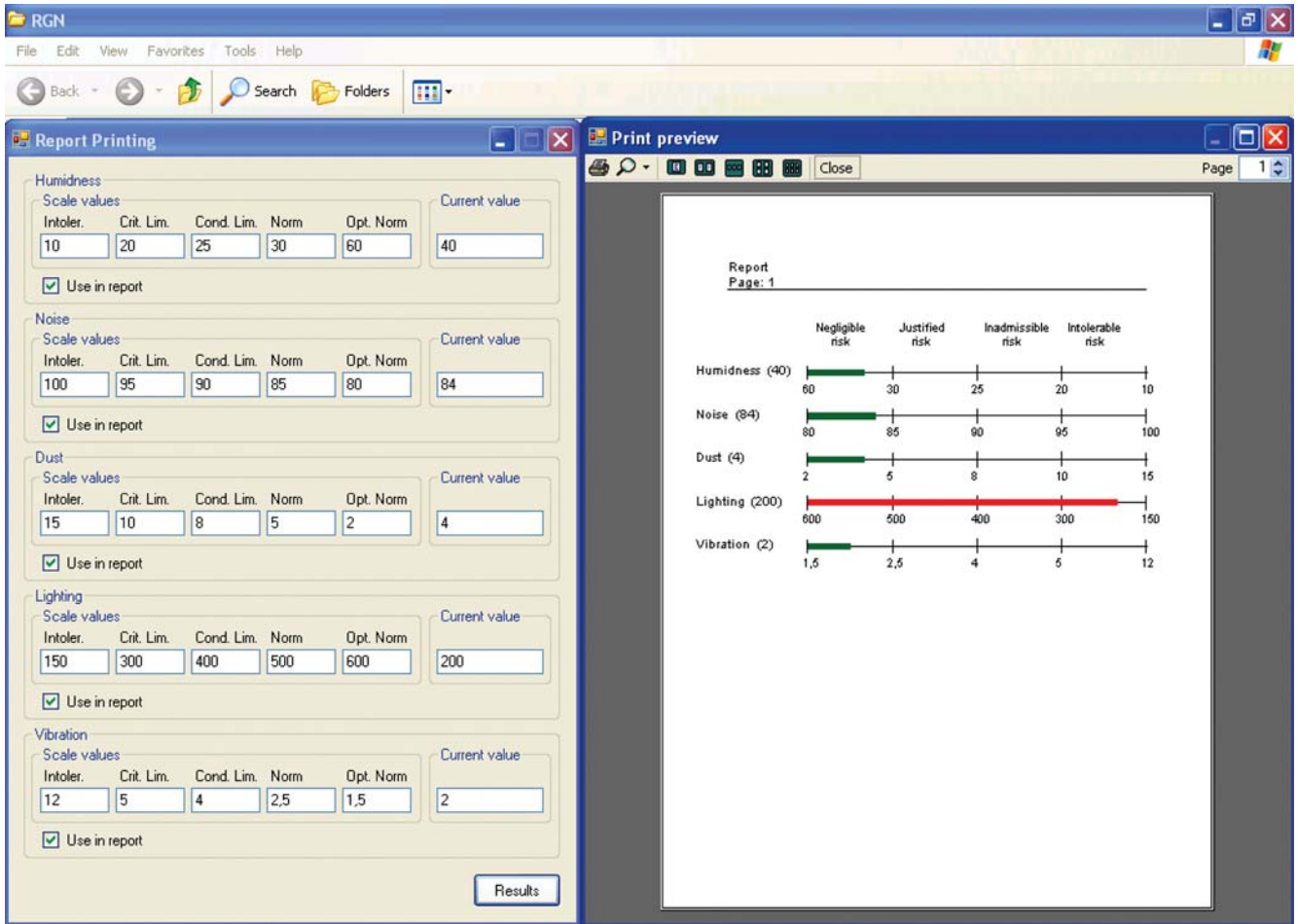


Fig. 2. The computerized method for risk assessment at workplace

Table 2. Overall results of measurements of working conditions in manufacturing (Reinhold and Tint 2009)

Industry	Indoor air temperature, °C, U = 0.6 °C		Indoor air humidity, %, U = 2.0%		Dust, mg/m ³ U = 0.3 mg/m ³	Lighting, lx, U = 10.4% General lighting	Noise level, dB(A), U = 2.0 dB
	Cold season	Warm season	Cold season	Warm season			
Case I (printing)	21.7...22.4	22.5...24.3	38.2...52.2	44.2...62.4	0.7...2.5	264...1625	66.4...90.3
Case II (mechanical)	10.8...21.4	17.6...23.2	31.3...39.9	41.4...48.7	2.0...10.0	88...1256	73.0...97.5
Case III (plastic)	14.0...22.4	18.6...25.5	26.1...40.7	36.5...45.7	0.4... 1.0	138...742	61.1...83.8
Case IV (wood)	21.2...24.0	24.3...26.5	34.2...42.6	35.1...47.6	2.05...6.0	320...1050	84.2...94.4
Case V (textile)	20.3...23.5	22.7...25.6	44.4...53.0	48.2...53.0	1.2.... 4.4	525...2040	62.1...89.5
Case VI (water purification)	14.0...23.0	17.0...26.7	32.6...47.9	39.5...54.6	not measured	200....500	67.6....82.4

For example, lighting 200 lx in wood processing industry is inadmissible risk for work with saws and other tools and equipment for cutting wooden raw material and also in furniture industry (400–500 needed). Noise level 84 dB(A) is acceptable risk if earmuffs are used (85 dB(A) – the exposure limit for 8-hours work-day). Dust 4 mg/m³ is acceptable risk as the limit is 5 mg/m³ for inhalable dust and 10 mg/m³ for overall dust (2 mg/m³ for pure wood dust).

4. Safety management at the enterprise

Safety audits are a vital way of verifying that company's safety management is working properly. Several methods have been developed for supporting safety auditing: questionnaires, interviews, observations and document reviews. Safety management systems in 6 Estonian enterprises were assessed using Diekemper & Spartz (D&S) method, which was modified by Kuusisto considering the demands of the OH&S standard OHSAS 18001 (Diekemper and Spartz 1970). The investigated enterprises were selected from the manufacturing industries (Cases 1-VI).

The assessment in this method is carried out on four level systems: level 1 (poor); level 2 (fair); level 3 (good); level 4 (excellent) (example Table 3A).

The modified D&S method addresses 30 activities. These are categorized into the following activity areas:

A* – organization and administration (statement of policy, responsibilities assigned; direct management involvement; safety instructions to hazardous tasks; workplace design; health care).

B* – industrial hazard control (housekeeping-storage of materials; machine guarding; maintenance of equipment, guards, hand tools; material handling- manual and automated; and personal protective equipment).

C* – fire control and industrial hygiene (chemical hazard control references; storage of flammable and explosive materials; ventilation- fumes, smoke and

dust control; skin contamination control; fire control measures).

D* – supervisory participation, motivation and training, line supervisor safety training; training of new employees; job hazard analysis; training for specialized operations (fork trucks, grinding, punch presses, solvent handling, etc.); worker/manager safety contact and communication.

E* – accident investigation, statistics and reporting procedures, accident investigation by line personnel; accident cause analysis and statistics; near-accident investigation.

Case I (printing industry) was carried out at the enterprise with 162 employees. The factory has invested in a great deal to improve the status of premises. The manufacturing process operated in three shifts. The premises were new. The company had no safety manager; the duties were delegated to the personnel manager, who had the responsibility to deal not only with OH&S issues but also environmental and security management systems. The main types of accidents occurred in the company were slips, pinching of fingers and back injuries. The company's employees were rather experienced (half of them worked in the factory for 10–20 years).

The highest scores were given to part B – industrial hazard control (15: workers were equipped with personal protective equipment, good storage of materials, material handling – manual and automated, etc.), the lowest one (10) was given to part E (accident investigation). The E part was assessed low for all investigated companies (except Case VI) as the near-accident investigation was not performed in any of the companies (except Case VI). Part D obtained the score 11: safety training was carried out on a regular basis, but no written guidelines or programme for internal audits were presented. In most cases, new employees were trained by senior workers.

Table 3A. Modified Diekemper & Spartz method for assessment of safety system. Determination activities' safety level (area A)

A. Organization and administration

Activity	LEVEL 1 (Poor)	LEVEL 2 (Fair)	LEVEL 3 (Good)	LEVEL 4 (Excellent)
1. Statement of policy, responsibilities assigned	No statement of safety policy. Responsibility and accountability not assigned	A general understanding of safety, responsibilities and accountability, but not in written form	Safety policy responsibilities written and distributed to supervisors	In addition to previous items, safety policy is reviewed annually. Responsibility and accountability is emphasized in supervisory performance evaluations

Case II (mechanical industry) was carried out in a mechanical factory producing two-wheeled trailers for passenger cars. The number of workers is 136. The company is located in 3 different places: the sale department is situated in Tallinn and the manufacturing buildings about 25 km from the capital. The welding process (6 workplaces) was carried out in unsafe working conditions (in the building made of silica brick, without any ventilation). However, the number of occupational accidents showed a decreasing trend. The workers were complaining on back injuries caused by lifting tasks. These injuries were typically caused by sharp pieces of sheet metal. The interest from the side of management was obvious. The highest scores (10) were given to the parts A to C. The lowest score (8.3) was obtained for part E: neither accident statistics nor near-accident investigation took place in the company. Vast attempts were taken by the management to improve the ventilation in welding activities, but some rearrangements are still possible for cleaning the air in the breathing zone of workers. The respirators were used during the welding work.

Case III (plastic industry) was carried out in the firm on Saaremaa island (located in the west of Estonia), which is producing rubber products for car industry situated outside of Estonia (Germany). The number of employees is 160. The quality control of these products (package rings included) needs very good eye-sight from workers. Therefore, only the girls at the age of 18–25 years old not wearing glasses were hired to perform this work. The plastic firm only planned to send the workers to the medical health examination after the reviewing of the risk assessments results. The highest score (12) in safety performance was obtained in part B (housekeeping, machine guarding, etc.) because almost all machines were new, premises good as the factory itself was only 2 years old. The lowest score (9) was obtained in part A, because there was absence

of safety policy and instructions as well as a lack of worker's health examinations.

Cases IV (wood processing industry) was performed in the enterprise with approximately 300 workers, which is located in a small town in the west of Estonia. This company produced furniture and used different volatile chemicals in lacquering process. The main occupational hazard was dust (5–10 mg/m³ in the air of the working environment). The safety training seemed to be performed and good, because earmuffs and plugs were used properly and most of the workers were aware of health risks. The safety manager has long-working experience.

Case V (textile industry, 400 employees, situated in Tallinn). The accidents were investigated in depth and relative corrective measures were effectively implemented. In textile industry, the workers were not keen on wearing the earplugs (all other personal protective equipment was used correctly). The safety manager has good safety training and therefore was able to carry out risk assessments at workplaces herself.

Case VI was performed in water purification plant in Tallinn (320 workers) which has an international occupational health and safety management system specification (OHSAS 18000). Nearly all of the parts of the audit (from A to E) were assessed as level "4" – excellent; only in part D there were some shortcomings (absence of written program outlining internal inspection guidelines, responsibilities, frequency and follow up). The results of the implementation of the D&S method for external safety audit are given in Table 3B and a computerized method for determination of safety level is presented in Fig. 3.

The investigation of safety level had the positive results in every company. The workers and the management of the companies had the possibility to perceive the problems that were essential parts of the working

Table 3B. Results of auditing of safety system in Estonian enterprises

Industry	A*	B*	C*	D*	E*	Total score
Case I (printing industry)	13	15	11	11	10	60
Case II (mechanical industry)	10	10	10	9	8.3	47.3
Case III (plastics industry)	9	12	10	11	11.6	53.6
Case IV (wood processing industry)	8	10	10	11	11.6	50.6
Case V (textile industry)	13	15	10	9	10	57
Case VI (water purification plant), OHSAS 18001 implemented	18	18	19	15	15	85

*Maximum score in each area (A, B, C, D, E) is 20. Maximum total score is 100.

1 - 4: 1 - bad, 2 - satisfactory, 3 - good, 4 - very good; Total 100

A. Organization and administration					
1. safety policy	2. Manager involvement	3. Safety instructions	4. Workplace design	5. Health care	TOTAL
1	2	3	3	2	11
B. Industrial hazard control					
1. storage of materials	2. Machine guarding	3. Caring of equipment	4. Manual lifting of loads	5. PPE	TOTAL
2	3	3	2	2	12
C. Fire control and industrial hygiene					
1. Chemical hazards	2. Flammable materials	3. Ventilation	4. Skin hazards	5. Fire control	TOTAL
2	3	2	3	3	13
D. Supervisory participation and training					
1. Line supervisor	2. New employees	3. Job hazards	4. Special operations	5. Communication W/M	TOTAL
2	2	1	3	1	9
E. Accident investigation, statistics and analysis					
1. Accidents investigation	2. Accident cause analysis	3. Near-Accident			TOTAL
3	2	1			10
					TOTAL
					55

Result

Fig. 3. A simple computerized method for determination of safety level at enterprise

environment before (noise, draught, etc.). The managers were satisfied with the database on legislation, proposed new methods for advanced learning in the field of OH&S and computerized method for risk assessment. The greatest problems in the implementation of the model came up in the communication between the worker and co-worker, and the worker and the first level foremen. Therefore a guide was elaborated for co-workers safety behaviour. The interviews with employers were carried out in the same enterprises where the safety level was assessed.

The original D&S method is a rough method, and it does not help the auditor to assess the individual safety activities very thoroughly and demands the high expertise of the auditor. The D&S method also suggests certain activities which may not always be the most suitable and relevant solutions for every company.

5. The worker's opinion about working conditions

The data were collected during 2002–2004. The objective of the questionnaire was to gather information about the workers' knowledge of the occupational risks connected with their occupation, possible work-related occupational hazards, and attitudes towards using personal protective equipment and safety routines. Ques-

tions about the workers' opinions and their perceptions about the exposure to occupational risks (noise, chemicals, vibration, bad microclimate, insufficient lighting, and ergonomics), experienced health symptoms and their awareness of the Occupational Health and Safety Act were also asked. The workers were randomly selected from textile, printing, mechanical, plastic, food processing industries and offices. A questionnaire was distributed to 412 workers in investigated industries. The average age was 43.6 years. Confidentiality of information was always maintained and only coded information was used in the analysis. Data collected on the questionnaire study was coded and then entered into the statistical software programme (Excel) for analyses. The investigation gave results as follows:

1. 65% of workers considered excessive exposure to noise, 60% bad microclimate (too cold workrooms), 54% bad lighting at workplaces; not-effective ventilation was the main occupational risk factor (75% of workplaces).
2. Only some of the workers (10%) answered that they know which information about the dangerousness of chemicals may be obtained from the chemical labels. Nobody of respondents pointed at the chemical safety data sheets as one of the important source of information.
3. Most of the workers (80%) reported that personal protective equipment (PPE) was accessible; however, the questionnaire did not show the attitudes towards using PPE. Some of the respondents (36%) pointed that the PPE disturbs the work; others mentioned (46%) that the quality of PPE is not very good.
4. In the present study, 63% of the workers reported that they were aware of the person who was the working environment specialist in their company. At the same time, only 20% of workers knew who was elected to be their working environment representative.
5. Different opinions were given on safety instructions and guidelines. In the present study, 25% of the workers reported that they had not received safety instructions and guidelines. The assessment of the safety instructions was made on a 6-point scale (from 0 to 5, where 0 was bad and 5 – very good). According to workers' opinion, the quality of accessed safety instruction was satisfactory (2.8 points).
6. The questionnaire revealed that only 25% were generally aware of the safety legislation.

The investigation of the workers' knowledge on the legislation in the field of OH&S was carried out by the authors also in September 2008 in four enterprises. The 422 questionnaires were received from different

branches of industry: 162 from the textile industry; 25 from the wood processing industry; 200 from the mechanical industry and 35 from the printing industry. The average age of the workers (N = 422) was 45 years. The results show that the workers are aware of their rights and responsibilities decreed by the OH&S regulations. Even, if workers know who their working environment representative is, in the case of shortages in the working environment, they prefer to turn to the direct foreman at their workplace, not to their working environment representative. The workers considered the insufficient lighting (82%), dust (34%), noise (75%) and vibration (45%) to be the main occupational risk factors in their workplaces.

In addition, half of the correspondents (50%) stated that they have to work in a stationary position.

On the basis of the investigation it could be concluded that the questionnaire for workers has to be rather short (10 questions, including list of hazards in the working environment and the scale has to be not more than 4 (from 1 as bad to 4 as very good working conditions). **The questionnaire for workers** has to include the following questions:

1. Do you know your working environment representative?
2. What kind of the following hazards disturbs you in the working environment: noise, vibration, insufficient or too strong lighting, cold or hot microclimate, too dry air, smell of chemicals, dust and how strongly? Do you lift heavy loads or work in the compulsory position?
3. What do you do with your co-workers and foreman? To whom do you approach with non-compliance in the working environment?
4. Are you supplied with the Chemical Data Sheets (CDS)? What information do you get from CDS? What are R- and S-phrases?
5. Have you the instructions for safe work methods in written form at your workplace?
6. Are you supplied with personal protective equipment (PPE)? Are these comfortable or does the PPE disturb your work? Do you wear PPE always when it is needed by the instructions?

6. The awareness of employers on OH&S matters in investigated companies

Semi-structured interviews with top management were carried out in 6 enterprises in order to gather information about their awareness in the field of OH&S. The management of 80% of the investigated companies (Cases I-VI) considered the role of working environ-

ment as an important. 30% of the interviewed companies had a certain plan of activities to improve working conditions, 15% of companies were composing the plan how to reduce the occupational risks. Psychological risk factors (also forced position, monotonous work) received the most negative assessment from different sides of working environment. It is understandable as the factor appears in the case of all fields of activities and different size of companies, when at the same time, for example, physical load of the job or its dangerousness appears only in the case of some field of activities or occupations (printing, wood processing). Attitudes to working conditions, design/furniture of the workplace and work related daily living conditions received less negative assessments. Respondents were asked also to evaluate on a 10-point scale their employees' risk to impair their health at work. Two thirds of respondents consider the risk to their employees' health sufficiently low (1–4 points). 15% of interviewed companies did not see any risk factors that would endanger employees' health. Industry managers mentioned as the main risk factors to the employees' health are noise (80%), vibration (70%), physical overload (50%), fluctuation of temperature (50%) and work monotonousness (50%). Despite the fact that companies from different field of activities evaluate risk factors to employees' health differently, there are no significant differences in assessment of employees' sickness problems. Occupational diseases and the other health problems were bothering factors only for some (30%) of the companies. In order to assess the persons, who follow the situation of the working environment, companies' management was asked about the existence of different specialists like working environment representative or council in their companies. Only in a half of the companies the working environment representative was elected and working environment specialists were working in 30% of companies. Looking at the evaluations of different persons' efficiency to the improvement of working environment, we can see that only some companies, where separately relevant persons exist, estimate their work as very efficient and half up to 2/3 of interviewed companies as sufficient. Therefore, the relevant specialists have not found sufficient employment in their positions. In addition to specialists who work inside the company, there is a possibility to include the agreement for carrying out the working environment investigations externally. 100% of investigated companies (Cases I-VI) used the last possibility. The external specialist's help has been mainly used for conducting workplace risk assessment (including hazards' measurements) and consulting companies in the field of OH&S.

7. The assessment of economic losses connected with lack of safety performance

The most deep working environment survey including economic side of OHS in Estonian enterprises and firms was carried out by TNS Emor in March 2000 (Working ... 2000). TNS Emor is the largest full service marketing research and consulting company in Estonia. One of the parts of the survey also concluded the employers' survey (402 successful interviews).

Only 8% of companies had tried to evaluate the economic loss that had been caused by the employees' sicknesses. Bigger companies, with more than 150 employees, have done it more frequently than the average (19%), but 67% of all those who have tried to evaluate that, were not able to give the concrete amount of money spent in 2000. That is why it was also impossible to estimate companies' economic loss, caused by employees' sicknesses. Nine companies estimated the economic losses caused by employees sicknesses of approximately 39 000 EEK (1 EUR = 15.6 EEK) per one year. In addition to the abovementioned sicknesses, also work-related accidents during the last three years were observed in the survey. In total, in 12% of companies, that operate in Estonia work-related accidents had taken place. More frequently than the average the accidents had appeared in industrial, construction and transportation companies.

The overview of different types of expenditures made by companies on their employees and the working environment: on average, each company had made different types of expenditures during 2000: 4.2 times. The majority of companies had made expenditures on improvement of working and work-related daily living conditions and purchase of working clothes and PPE. The expenditures, made during 2000 by companies that operate in Estonia, on improvement of working environment in total amount estimation together with probability limits. The highest expenditures were related to improvement of working conditions: between 1.13–3.06 billion EEK ($p < 0.05$), it was followed by the expenditures on improvement of work-related daily living conditions – between 0.49–0.72 billion EEK and on working clothes and personal protection equipment – 0.22–0.4 billion EEK. The expenditures made by companies in connection with employees' health: the biggest amounts had been spent on employees' sporting possibilities: 113–215 million EEK ($p < 0.05$), it was followed by almost the same level expenditures on health control, occupational health and safety training and making of health insurance contracts. In total, the expenditures made by the companies on improve-

ment of working environment per one year were between 3.45–4.47 billion EEK ($p < 0.05$). Depending on the type of expenditures, they apply to 15–81% of companies. Of those companies, who had not made any certain type of expenditures on working environment or employees' health-related factors during 2000, were asked how necessary would they evaluate that the employer makes such kind of expenditures. Three-quarters of companies, who did not make expenditures on improvement of working and work-related daily living conditions during the previous year, considered the expenditures necessary. Also, explanation of occupational safety questions to employees was evaluated as very necessary.

The respondents were also asked to name concrete factors that need to be improved in their company's working environment. 44% of respondents brought out different factors. The abovementioned improvements presume relatively big investments. Respondents gave sums between 2000 EEK and up to 20-30 million EEK. The last one means practically constructing a new building. Considering partially very approximately given assessments by respondents and also the fact that 67% of all interviewed companies were not able to name a certain number that they would spend on making changes in the working environment, it is not correct to extend the results in order to find out the investment needs of all companies that operate in Estonia.

As a result of the investigation the proposal for self-assessment questionnaire for employers is presented:

1. How much do your company's working conditions correspond to the requirements set by the law of occupational health and safety?
2. Have you composed the plan of activities to improve the working conditions in your company/institution?
3. How much do you take into consideration the proposals that employees make for improving the working conditions?
4. Has the National Labour Inspectorate inspected your company/institution? What were the results of the inspecting?
5. Please give your assessments on a 10-point scale, how big is your employees' risk to impair their health at work?
6. Which of the following hazards in the working environment (dust, noise, vibration, bad lighting, lack of ventilation, temperature, dangerous chemicals, forced position, monotonous work, physical load, mental stress) do you estimate as risk factors to your employees' health?

7. How much do the employees' illnesses bother your company's/institution's activities?
8. Have you evaluated economic loss caused by employees' sicknesses – lost working time, undone work?
9. Have you spent money during the previous year on employees' vaccination, employees' health control, offering sporting opportunities to employees, making insurance contracts to employees on company's/institution's initiative, working environment specialist and representative training and advance training, first-aid training, measuring the working environment risk factors, improving working conditions, improving work-related daily living conditions, working clothes and personal protection equipment?
10. Does a working environment specialist work in your company/institution, has the working environment representative been chosen among the employees, does the working environment council operate?
11. Have you included Occupational Health Service or an occupational health specialist (medical doctor, nurse) into the working condition analyses?

8. Survey of occupational health and safety professionals in Estonia

As part of the Estonian-Finnish Twinning Project on Occupational Health it was decided to carry out a survey of occupational health and safety practices and development needs in Estonia. The aim of the survey was to get knowledge of the current practices, main priorities and major problems, attitudes, professional skills and perceived needs for further education among OH&S professionals. The study was carried out using a questionnaire designed for the occupational health and safety professionals. The target group for the survey were all the 103 OH&S professionals (occupational health physicians (OH physicians), OH nurses, hygienists, ergonomists, psychologists) who were practising as occupational health and safety professionals at the time of the data collection in Estonia (Kempinen and Sarap 2002). Although the response rate was low, 40%, the size of the study group was large enough to assess the major problems in the field of occupational health and safety and to describe the occupational health and safety professionals' attitudes, level of education and knowledge. However, statistical analysis for the differences between the groups could not be done. The work experience in the field of OH&S of the participants in the survey varied between the professional

groups. OH physicians had longer work experience (the average 21.4 years) than other specialists. 60% of OH physicians and 80% of nurses worked in health care centres where they performed OHS besides other medical services. The main tasks of OH&S professionals consisted of risk assessments, workplace surveys, health examinations, advice related to work, but also health promotion activities. Most of the respondents were experienced professionals, with high level of training. The professionals stated that occupational diseases and work-related diseases (diagnostic and prevention), rehabilitation and/or promotion of work ability were the main subjects for need in further training. Also, a need for clarifying guidelines of Occupational Health and Safety, legislation and regulations in Estonia was identified. 90% of OH physicians stated that they can understand Estonian, 42% of OH physicians can speak Russian; 27% can speak English and most of the physicians reported that they understand the Finnish language. Access to Internet was available for 82% of the respondents, and most of them used it for information search, on average 5 hours/week. All of the occupational health physicians and nurses answered that workers told them about work-related health problems at least weekly. Two thirds of the respondents considered, that the workers were not afraid of telling about these problems to them (Kempinen and Sarap 2002). According to OH&S professionals' responses, there are the following main priorities and major problems in the OH&S practice in Estonia:

1. The absence of Insurance Act of Occupational Accidents and Diseases.
2. The absence of the Governmental participation in the field of occupational health and safety (Governmental financial support).
3. It is impossible to analyse sensitive personal data.
4. The absence of an agreement between OH physicians and Health Insurance Fund in order to provide financial support for the rehabilitation services.
5. There is a lack of OHS in Estonia (low coverage of the OHS services offered to employees).
6. There is insufficient work collaboration between Occupational Health and Safety Institutions in Estonia.
7. Lack of knowledge among employers and workers concerning the Estonian National Policy on the working environment and their awareness of OH&S is insufficient.
8. Lack of the OH&S professionals and of the research activities in Estonia (Kempinen and Sarap 2002).

9. Discussion and conclusions

As the conclusion of the investigation, the following scheme can be drawn for the improvement of safety culture at the enterprise (Fig. 4). The most important issue at companies is the collective awareness of safety learning necessity (Kumpikaitė 2008; Kumpikaitė and Čiarnienė 2008). Instructions and rules are the key ways of achieving a healthy working environment and risk control. There is a concentration on observable action, both human and social. The machinery or the rules may not be flexible when changes in production are required. It is likely that production would come out victorious in any such conflict. The occupational disease develops by stages (Fig. 1): some complaints, recoverable disease, non-recoverable disease. The cooperation between the employer, worker and occupational health physicians is urgent in order to achieve the positive safety culture and high safety performance at the enterprise. At present, most of the occupational diseases are diagnosed at the very last stage in Estonia. The diagnoses of occupational diseases as well as maintenance of work ability are still in the need for development in Estonian OH&S system.

The knowledge about safety and health is very different in different companies. Some of the managers are competent, but the workers' knowledge of OH&S is low because they do not receive proper safety training and there is a lack of guidelines. Only workers involved in very dangerous operations are instructed and trained regularly.

Further research is needed in order to understand the factors involved in safety culture and safety manage-

ment system at the enterprise, how OH&S knowledge is disseminated and translated into practice, especially focusing on knowledge management for young workers, non-Estonian speaking, for employers and employees in small business. There is also a need for strengthening of national OH&S system in Estonia as well as awareness of the public through tripartite collaboration, and this includes legal provisions, enforcement, compliance and labour inspection capacity and capability, knowledge management strategy, information exchange, research and support services.

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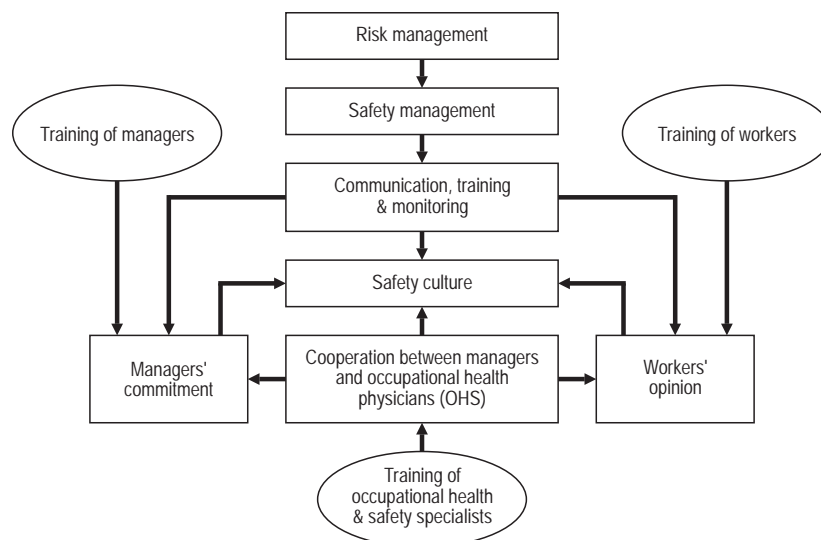


Fig. 4. The influence of different parties on OH&S at workplaces

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