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Voluntary Safety Management System in the Manufacturing Industry – To What Extent does OHSAS 18001 Certification Help?

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***Abstract* – Occupational risk prevention can be managed in several ways. Voluntary safety management standard OHSAS 18001 is a tool, which is considered to give contribution in effective risk management in the manufacturing industry. The current paper examines the benefits of OHSAS 18001 based on the statistical analysis. MISHA method is used for safety audit in 16 Estonian enterprises. The results demonstrate the objectives why companies implement or are willing to implement OHSAS 18001, bring out differences in safety activities for 3 types of companies and determine correlations among different safety activity areas. The information is valuable for enterprises that are willing to improve their safety activities via a voluntary safety management system.**

***Keywords* – Health and safety audit, MISHA method, occupational health and safety management system, OHSAS 18001 certification.**

I. Introduction

The aim of the safety management systems is to manage the planning and implementation of a company's safety policy. A safety management system usually includes the setting and prioritising of safety goals and development of safety programmes. Different management tools can be used to fulfil legislation needs and company's demands in order to mitigate workplace risks effectively.

The literature on OHSMSs (Occupational Health and Safety Management Systems) often distinguishes mandatory OHSMSs from voluntary systems [1]–[6].

Mandatory OHSMS emerges from legislative requirements and sets core principles for the management of OHS (Occupational Health and Safety) to be implemented by employers. The most well-known European mandatory OHSMS is the Framework Directive 89/391/EEC [7], which defines employers' responsibilities in the management of OHS and requires insurance of safety and health of workers in every aspect related to their work. This directive sets general obligations: to conduct risk assessment at workplaces, to implement safety measures and to train and inform employees on the OHS hazards.

Voluntary OHSMSs are not state-regulated. These systems were first encouraged by commercial organisations, corporations and associations (e.g., industry associations). Voluntary OHSMSs tend to be more complex than regulatory systems, and more formalised in terms of specifications. According to Frick and Wren [4], the detailed specification of these systems helps to ensure the good integration of OHS policy into the management processes of enterprises. Voluntary OHSMSs are generally in the form of standards or guidelines, providing requirements for certification or giving simple guidance on good management practice for OHS. These standards or guidelines are international (e.g., ILO-OSH 2001) [8], national (e.g., BS 8800:2004 or OSHAS 18001:2007) [9]–[11], and sectorial (e.g., MASE, DT 78) [12], [13].

Organisations are increasingly concerned with achieving and demonstrating sound OHS performance by controlling their OHS risks, consistent with their OHS policy and objectives [14], [15]. In order to provide a recognisable OHSMS standard against which company's management system can be assessed and verified, the OHSAS 18001 standard has been developed. The OHSAS standards covering OHS management are intended to provide organisations with the elements of an effective OHS management system that can be integrated with other management requirements and help organisations achieve OHS and economic objectives [10], [11]. An effective OHSAS 18001 management system may contribute to the following: (1) Providing a structured approach for managing OHS; (2) Establishing and maintaining a strong commitment to OHS; (3) Promoting organisational structures with clear and unequivocal roles and responsibilities, (4) Ensuring strong levels of trust and communication, (5) Developing a continuously improving safety culture; (6) Providing reduction in incident and accident levels with increased measures of performance [16]–[19]. OHSAS 18001 intends to apply to all types and sizes of organisations and to accommodate diverse geographical, cultural and social conditions [10], [11].

The benefits of OHSAS 18001 have been studied by several authors in recent years [14]–[28]. Those studies demonstrate that the OHSAS 18001 improves the company's image and overall performance, integrates OHS into the company's management system, reduces the risk for accidents, improves the company's compliance with legal obligations, favours a learning process and helps to create a higher level of transparency. However, the OHSAS 18001 certification has also been criticised, especially having a tendency to increase the bureaucratisation of health and safety issues and, therefore, to discourage genuine worker involvement. This may shift the focus from health and safety issues towards paperwork control, which may diminish the activities dealing with OHS problems [24]–[26].

The objective of the current paper is to study how the OHSAS 18001 certification influences safety activities and their improvement in Estonian manufacturing companies and to determine whether a noncertified company with a strong management support in safety is able to perform equally in OHS matters compared with the OHSAS 18001-certified organisations.

II. Material and Methods

On the basis of critical overview of the existing auditing methods, the MISHA method (Method for Industrial Safety and Health Activity Assessment) [29] as the most innovative one has been chosen for the current study. The Technical Research Centre of Finland (VTT) developed this audit tool in 2000 [29]. The MISHA method is primarily designed to be used in medium- and large-sized industrial companies in the manufacturing and process industry. The MISHA method considers the following area of industrial activities: A. organisation and administration (safety policy and safety activities in practice, personnel management); B. participation, communication, and training; C. work environment (physical work environment, psychological working conditions, hazard analysis procedures); D. follow-up (occupational accidents and illnesses, workability of the employees, psychological workability). Benefits of using the MISHA method include the relatively small amount of resources and time needed and inclusion of occupational health aspects relating to the ability to work [30]. The audit process using the MISHA method should have a leader who can be either internal or external to the organisation subject to the audit. Auditors should have prior experience in health and safety activities and carefully examine the application of the method prior to the audit [29].

To select industrial companies for the research, the database of Estonian Association for Quality (2014) [31] has been scanned. By January 2014, 178 Estonian companies have owned the OHSAS 18001 certification. The scan has shown that 32 % of certified firms come from the manufacturing sector. The authors have contacted each of these firms and explained briefly the purpose and the scope of the research. Finally, eight companies (representing main manufacturing areas in Estonia such as printing, textile, metal, food industry etc.) have agreed to participate. In order to compare the results with non-certified organisations, eight companies with similar background have been selected – 4 represented organisations that belong to a larger corporation or concern but are not OHSAS 18001-certified and 4 – non-certified, locally established and owned companies. Altogether, 25 interviews with employers, middle-level safety personnel and safety responsible persons have been conducted. During the interviews 55 questions (the validated MISHA method) have been asked to each of the person interviewed by the experienced health and safety auditor. After necessary coding and transcription, the results have been discussed with 4 experts on OHS to come to an agreement whether the results are interpreted correctly. Table IV presents shortly the characteristics of the examined enterprises – the activity area, type and size.

The analyses have been prepared using IBM SPSS Statistics 22.0 and R 2.15.2. The following statistical methods have been used: correlation, MANOVA, factor analysis, principal component method, independent T-test for hypotheses [32].

III. Proposed Conceptual Benefits of the OHSAS 18001: Hypotheses

The OHSAS 18001 offers a number of benefits to companies as the standard should promote and increase the quality of management in OHS discussed in previous sections. Before conducting the research, the OHSAS 18001 certified organisations have been asked about the reasons for adopting the standard and perceived benefits from the certification. The results are provided in Tables I and II, where a five-point Likert scale has been used [33] in order to measure objectives to adopt the OHSAS 18001 and perceived benefits from it.

TABLE I

Results of the Objectives to Apply for the OHSAS 18001 Certification among Estonian Manufacturing Companies

Objective to adopt OHSAS 18001	Mean	Not at all important, %	Very important, %	Extremely important, %
Improvement of the company's image in the society	4.50	0.0	25.0	62.5
Prevention of accidents and incidents	4.50	0.0	25.0	62.5
Maintenance of sector leadership in safety	4.13	12.5	12.5	62.5
Integration of safety into a corporate strategy	4.13	0.0	12.5	50.0
Maintenance of socially responsible behaviour	4.00	12.5	25.0	50.0
Satisfaction with customer demands	3.88	0.0	37.5	37.5
Improvement of employees' well-being	3.71	0.0	37.5	12.5
Pressure to follow competitors	3.50	25.0	12.5	50.0
Satisfaction with supplier/ subcontractor and/ or contractor demands	3.50	25.0	25.0	37.5
Reducing operational costs	3.00	25.0	25.0	12.5
Improvement of employee motivation	3.00	12.5	50.0	0.0
Enhancement of relations with public authorities	2.88	12.5	37.5	0.0
Improvement of company's competitive advantage	2.50	50.0	25.0	12.5
Compliance with legislation	2.50	50.0	0.0	25.0
Labour union pressure avoidance	1.25	87.5	0.0	0.0
Other reason(s)				50.0*

* Other reasons mentioned: very good offer from a certification body; to ease up relations with concern; decision making on a corporation level.

Companies are motivated to adopt OHSAS 18001 mainly to enhance the company's social image and reputation, and also to ensure a leading position in safety in the manufacturing industry.Companies also expect that adopting OHSAS 18001 the number of accidents and incidents occurring at the workplace will decrease. The Labour Union seems to have less influence in that matter, and the close relationship between the standard and legislative regulations are not seen.

Table II shows company's perceptions of the OHSAS 18001 standard benefits. All companies have functioned under the OHSAS 18001 compliance from 3 to 9 years. The most valuable aspect that companies see is a better organised safety documentation system. The second benefit is seen in the improved company's image, which is usually one of the main motivations for implementation OHSAS 18001. Even when not being one of the most important reasons to adopt the standard, OHSAS 18001 makes it easier to comply with safety legislation, which later gives a value for the companies.

TABLE II

RESULTS OF THE OBJECTIVES TO APPLY FOR THE OHSAS 18001 CERTIFICATION

Perceived benefits from OHSAS 18001	Mean	Not at all important, %	Very important, %	Extremely important, %
Improved organisation & documentation systems	4.88	0.0	12.5	87.5
Improved company's image	4.25	0.0	25.0	50.0
Improved company's compliance with legal obligations	4.13	0.0	25.0	50.0
Improved working conditions	3.88	0.0	25.0	37.5
Improved customer satisfaction	3.75	12.5	25.0	37.5
Improved employee satisfaction	3.63	0.0	37.5	25.0
Improved relations with suppliers & contractors	3.38	25.0	37.5	25.0
Improved relations with public authorities	3.38	25.0	25.0	37.5
Improved production times	3.25	25.0	25.0	25.0
Improved employee motivation	3.13	12.5	50.0	0.0
Improved product quality	2.88	37.5	12.5	25.0
Waste reduction	2.38	37.5	12.5	12.5
Improved company's profitability	2.75	37.5	0.0	25.0
Increased sales	2.13	37.5	0.0	0.0

The authors have put forward 11 hypotheses that can be derived as benefits. All of them are possible to be examined statistically by the MISHA method.

The hypotheses are the following:

Hypothesis H1. OHSAS 18001 helps to disseminate the information on all levels of organisation.

Hypothesis H2. Written safety policy plays an important role in the OHS management.

Hypothesis H3. OHSAS 18001 helps more effectively to organise OHS activities in the companies.

Hypothesis H4. OHSAS 18001 promotes interaction between supervisors and employees.

Hypothesis H5. The employees are better trained in OHS in OHSAS 18011-certified companies.

Hypothesis H6. OHSAS 18001 improves the development of the physical working conditions.

Hypothesis H7. There is a difference in psychosocial climate for OHSAS 18001-certified and non-certified organisations.

Hypothesis H8. Occupational health service activities are better organised in OHSAS 18001-certified organisations.

Hypothesis H9. OHSAS 18001 favours the registration and investigation of accidents, illnesses and near misses.

Hypothesis H10. Physical workability is more appreciated in OHSAS 18001-certified organisations.

Hypothesis H11. Social work environment is regularly monitored in OHSAS 18001-certified organisations.

IV. RESULTS

Hypotheses have been tested using Hotelling's T-square test statistic [32]. Sampling adequacy has been controlled by Kaiser–Meyer–Olkin (KMO) measure [32]. For these data, the KMO value is 0.83, which falls into the range of being great, so we should be confident that the sample size is adequate for the factor analysis.

Looking at the results (Table III), we can provide support for all hypotheses except H7 and H10, while comparing OHSAS 18001-certified (OHSAS) organisations with non-certified, locally established and owned (OHSASL) companies. The explanation behind H7 may be the fact that OHSAS 18001 does not emphasise psychosocial climate as one of its key elements. The study has shown that most of the companies examined irrespective of owning an OHSAS 18001 certificate have little knowledge and conception how to deal with psychosocial hazards. Hypothesis H10 is not supported while the study has revealed that physical workability irrespective of a company type is not assessed as there is generally no policy how to measure and deal with employees' workability. Comparing OHSAS 18001-certified organisations with organisations that belong to a larger corporation or concern but are not OHSAS 18001-certified (OHSASC), none of the hypotheses have been supported. This demonstrates that the level of OHS management in these companies is compatible with OHSAS 18001-certified companies as their safety activities are regular, properly established, monitored, revised etc.

Table IV represents the mean scores (0–3 scale) according to the activity area by the MISHA method. Each four-category framework element consists of 3 activity areas, which are examined by specific 55 items in the form of various interview questions/considerations. OHSAS 18001 requires preparation and implementation of safety policy (A1). The results of our study have shown that all OHSAS companies possess a safety policy. Similarly, slightly lower results have been gained by NOHSASC companies, which shows the awareness of the importance of engaging OHS activities in general organisational procedures. However, all investigated

NOHSASL companies strongly lack any activities in the area of safety policy.

The research has revealed that safety activities in practice (A2) do not strongly depend on the company type – NOHSASC companies have equal or even higher scores, some local companies have earned equally high points as well. In all types of companies, safety personnel and their responsibilities are usually designated. In smaller companies, no full-time safety manager is hired; often a production manager or personnel manager fulfils the duties during the working hours. All companies have elected a working environment representatives according to the OHS Act [34]. In most of the companies, short-term plans about human resources are made; but no long-term views are generated. The interviewees have explained it with the fact that everyday life has shown that market needs change quickly [35]. No changes have been detected between OHSAS and NOHSASC, but NOHSASL have gained considerably lower sores while they deal with personnel management ad hoc.

TABLE III

STATISTICAL ANALYSIS OF HYPOTHESES

Hypothesis*		Hotelling's T-square test statistic	P-value	Confidence intervals	
				lower	upper
H1: OHSAS 18001 helps to disseminate the information at all levels of organisation.	OHSAS VS NOHSASL	11.128	0.008	14.825	51.152
	OHSAS VS NOHSASC	0.280	0.608	−25.029	18.092
H2: Written safety policy plays an important role in OHS management.	OHSAS VS NOHSASL	259.461	0.000	68.870	90.982
	OHSAS VS NOHSASC	0.621	0.449	−5.997	12.565
H3: OHSAS 18001 helps more effectively to organise OHS activities in the companies.	OHSAS VS NOHSASL	8.944	0.014	7.701	52.714
	OHSAS VS NOHSASC	0.193	0.670	−18.963	12.713
H4: OHSAS 18001 promotes the interaction between supervisors and employees.	OHSAS VS NOHSASL	5.132	0.047	0.456	55.099
	OHSAS VS NOHSASC	0.310	0.590	−34.747	20.857
H5: The employees are better trained in OHS at OHSAS 18011-certified companies.	OHSAS VS NOHSASL	23.3383	0.001	19.644	53.278
	OHSAS VS NOHSASC	0.145	0.711	−7.136	5.053
H6: OHSAS 18001 improves the development of the physical working conditions.	OHSAS VS NOHSASL	15.167	0.003	9.046	33.237
	OHSAS VS NOHSASC	0.267	0.617	−9.854	6.146
H7: There is a difference in psychosocial climate for OHSAS 18001-certified and non-certified organisations.	OHSAS VS NOHSASL	2.076	0.180	−7.842	36.552
	OHSAS VS NOHSASC	2.593	0.138	−33.104	5.329
H8: Occupational health service activities are better organised in OHSAS 18001-certified organisations.	OHSAS VS NOHSASL	11.128	0.008	9.686	48.654
	OHSAS VS NOHSASC	0.280	0.608	−14.473	8.918
H9: OHSAS 18001 favours the registration and investigation of accidents, illnesses and near misses.	OHSAS VS NOHSASL	25.783	0.000	30.919	79.271
	OHSAS VS NOHSASC	0.207	0.659	−24.558	16.229
H10: Physical workability is more appreciated in OHSAS 18001-certified organisations.	OHSAS VS NOHSASL	1.808	0.208	−29.522	7.302
	OHSAS VS NOHSASC	0.044	0.839	−24.337	20.167
H11: Social work environment is regularly monitored in OHSAS 18001-certified organisations.	OHSAS VS NOHSASL	32.523	0.000	48.236	110.099
	OHSAS VS NOHSASC	0.968	0.348	−40.813	15.813

*F critical value = 4.964603; Abbreviations: OHSAS – OHSAS 18001-certified companies, NOHSASL – Non-certified, locally established and owned companies, NOHSASC – Organisations that belong to a larger corporation or concern but are not OHSAS 18001-certified.

OHSAS and NOHSASC companies actively engage supervisors to communicate with employees and encourage employee participation to improve working environment conditions (B1). Both company types have gained high scores, while NOHSASL companies stand out with considerably lower scores. The same conclusion can be drawn for communication procedures (B2). OHSAS and NOHSASC companies have demonstrated exceptionally high result in personnel safety training (B3), while NOHSASL companies have gained lower points mainly because employees participate more seldom in drafting work instructions. There are not considerably high differences between company types while dealing with physical work environment (C1); however, OHSAS organisations have shown a very high level of assessment of chemical hazards and risk of major hazards. These factors have been explored thoroughly because of the integrated system – all interviewed OHSAS 18001-certified organisations are certified also after ISO 14001 [36] that pays special attention to chemicals used in the enterprise. One of the hypotheses not finding statistical support is H7 that concerns psychosocial hazards. The results in Table IV show that the scores for psychological working conditions are low and none of company types stand out. As mentioned before, the knowledge about psychosocial hazards among managers in Estonia is still low. Hazard analysis procedures (C3) have shown lower points for NOHSASL companies mainly due to lack of action plan after the risk assessment procedure and weak collaboration with OHS service providers. Almost all

OHSAS companies actively collect and analyse accident statistics as well as investigate accidents and near-accidents (D1). The same trend can be followed among NOHSASC companies as it is important for the corporation to compare different subdivisions and their safety activities. The lowest scores among all company types have been gained for workability of the employees (D2). None of the companies have a systematic view for the rehabilitation for persons, whose workability has decreased. There is generally no policy how to ensure elderly personnel's workability. In several companies, the work satisfaction survey is conducted regularly (usually outsourced), but psychological hazard questionnaires are hardly used. Some companies have stated that dealing with this issue depends strongly on the management attitudes and knowledge [35]. All NOHSASC companies stand out with assessing the social working environment through climate surveys. Most of OHSAS companies have gained the same results. Almost none of the NOHSASL companies conduct social climate surveys and, therefore, have gained considerably lower scores.

TABLE IV

THE MEAN SCORES (0 –3 SCALE) ACCORDING TO THE ACTIVITY AREA BY THE MISHA METHOD

Type	Industry, id. of the company	Size, employees	A1*	A2*	A3*	B1*	B2*	B3*	C1*	C2*	C3*	D1*	D2*	D3*
			Organisation and administration			Training and motivation			Work environment			Follow up		
NOHSASL	Textile industry, K	50–249	0.36	1.63	1.50	1.67	1.50	2.00	2.22	1.33	1.00	1.33	1.50	1.00
	Printing industry, O	< 50	0.73	0.75	0.75	1.00	1.00	1.00	1.44	0.67	0.33	0.67	1.00	0.00
	Glass industry, Y	< 50	0.09	2.13	1.00	2.00	1.50	1.50	2.11	1.33	1.00	0.33	1.00	0.00
	Textile industry, Z	≥ 250	0.36	2.25	1.33	1.00	1.75	2.50	2.33	2.00	2.00	1.67	1.50	0.00
OHSAS	Plastic industry, L	50–249	2.58	2.67	2.25	1.56	1.75	2.75	2.59	1.78	1.56	1.67	0.33	2.00
	Furniture Industry, M	50–249	2.91	2.25	2.25	2.33	2.00	2.75	2.44	2.00	2.00	2.33	1.50	1.00
	Heat industry, N	50 – 249	3.00	3.00	2.50	2.67	2.25	3.00	2.67	2.33	1.67	2.33	1.00	3.00
	Elect-ronics industry, S	≥ 250	2.97	2.58	2.42	2.78	2.67	2.75	2.70	1.67	2.11	2.89	1.00	3.00
	Metal industry, T	≥ 250	2.82	2.88	2.00	2.67	2.25	3.00	2.67	1.33	2.00	3.00	1.50	3.00
	Food industry, U	≥ 250	2.64	2.50	2.25	1.33	2.75	2.75	2.44	1.00	2.33	3.00	0.50	3.00
	Wood processing industry, W	≥ 250	2.36	1.88	1.75	1.67	2.75	2.75	2.78	1.67	2.00	3.00	0.50	3.00
	Food industry, X	≥ 250	3.00	3.00	2.50	3.00	3.00	3.00	3.00	2.33	2.00	3.00	1.00	3.00
NOHSASC	Metal industry, P	≥ 250	2.68	2.63	2.38	2.83	2.88	3.00	2.94	2.50	2.17	2.33	1.25	3.00
	Elect-ronics industry, Q	≥ 250	2.71	2.67	2.42	2.78	3.00	3.00	2.70	2.11	2.00	3.00	1.50	3.00
	Food industry, R	≥ 250	2.76	2.46	2.25	2.56	2.50	2.75	2.56	1.78	1.67	2.78	0.17	3.00
	Metal industry, V	< 50	2.55	3.00	2.50	1.67	1.75	2.75	2.67	2.33	2.33	3.00	1.00	3.00

***A1:** Safety policy; **A2:** Safety activities in practice; **A3**: Personnel management; **B1**: Participation; **B2**: Communication; **B3:** Personnel safety training; **C1** Physical work environment; **C2**: Psychological working conditions; **C3**: Hazard analysis procedures; **D1**: Occupational accidents and illnesses; **D2**: Workability of the employees; **D3**: Social work environment.

Abbreviations: OHSAS – OHSAS 18001-certified companies, NOHSASL – Non-certified, locally established and owned companies, NOHSASC – Organisations that belong to a larger corporation or concern but are not OHSAS 18001-certified.

Tables V, VI and VII present statistical results of activity areas calculated by the MISHA method for OHSAS, NOHSASC and NOHSASL companies.

Table V shows that for OHSAS companies very strong correlations (above 0.85) are met between parameters A1–B1 and B2–D1; strong correlation coefficients (above 0.70) are met between parameters A1–A3, A2–A3, A2–B3, C3–D1 and

B1-D2 ($p < 0.05$). The very strong correlation between Safety Policy (A1) and Participation (B1) may be explained by the fact that a carefully prepared, comprehensively structured and well-considered safety policy that embraces various necessary elements of OHSMS may contribute to higher employee participation into the work place design and better supervisor/ employee communication where the feedback of quality of work is regularly and explicitly given.

TABLE V

MEANS, DEVIATIONS AND CORRELATIONS BETWEEN ACTIVITY AREAS, OHSAS CERTIFIED ORGANISATIONS

	Mean	Deviation	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
A1	92.80	7.83												
A2	86.46	12.96	.690***											
A3	74.65	8.59	.804*	.700***										
B1	75.00	21.30	.856**	.582	.492									
B2	80.90	14.35	.040	–.048	.028	.186								
B3	94.79	4.31	.547	.777*	.301	.684***	.140							
C1	88.73	6.03	.177	.299	.103	.546	.567	.530						
C2	58.80	15.39	.518	.321	.510	.581	–.079	.423	.499					
C3	65.28	8.15	–.020	–.301	–.155	–.071	.671***	–.235	–.125	–.584				
D1	88.43	16.50	.037	–.102	–.240	.241	.857**	.209	.367	–.341	.811*			
D2	30.56	14.85	.686***	.269	.147	.734*	–.129	.465	–.016	.225	.134	.210		
D3	87.50	24.80	–.034	.304	–.023	.159	.683***	.417	.536	–.202	.251	.630***	–.251	

Abbreviations: ***A1:** Safety policy; **A2:** Safety activities in practice; **A3**: Personnel management; **B1**: Participation; **B2**: Communication; **B3:** Personnel safety training; **C1:** Physical work environment; **C2**: Psychological working conditions; **C3**: Hazard analysis procedures; **D1**: Occupational accidents and illnesses; **D2**: Workability of the employees; **D3**: Social work environment.
* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.
*** Correlation is significant at the 0.1 level.

The very strong correlation between Communication (B2) and Accidents and Illnesses (D1) are explained by the fact that SMEs do not prioritise to record, keep and present regular statistics on occupational accidents and illnesses, they tend to organise less regular health and safety campaigns, or if they do it lacks the focus on essential and emerging hazards in the company. Due to OHSAS 18001 requirements in OHS activities, OHSAS companies score generally higher points (often maximum) than other companies. Therefore, it is challenging to see all possible correlations between the elements due to the inconsiderable variability in scores between different OHSAS companies.

TABLE VI

MEANS, DEVIATIONS AND CORRELATIONS BETWEEN ACTIVITY AREAS, NOHSASC ORGANISATIONS

	Mean	Deviation	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
A1	89.52	3.33												
A2	89.58	7.56	–.904*											
A3	79.51	3.47	–.752	.942*										
B1	81.94	18.04	.859***	–.813***	–.578									
B2	84.38	18.75	.828***	–.700	–.422	.979*								
B3	95.83	4.81	.394	–.212	.115	.741	.834***							
C1	90.59	5.46	–.130	.066	.260	.395	.421	.751						
C2	72.69	10.41	–.604	.572	.682	–.123	–.056	.462	.853***					
C3	68.06	9.49	–.835***	.878***	.917*	–.506	–.401	.169	.535	.894***				
D1	92.59	10.48	–.143	.433	.377	–.532	–.419	–.408	–.746	–.419	.000			
D2	32.64	19.30	–.144	.418	.696	.183	.355	.790	.650	.702	.653	.000		
D3	100.00	0.00	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	

Abbreviations: ***A1:** Safety policy; **A2:** Safety activities in practice; **A3**: Personnel management; **B1**: Participation; **B2**: Communication; **B3:** Personnel safety training; **C1:** Physical work environment; **C2**: Psychological working conditions; **C3**: Hazard analysis procedures; **D1**: Occupational accidents and illnesses; **D2**: Workability of the employees; **D3**: Social work environment.
* Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.
*** Correlation is significant at the 0.1 level.
.[b] Cannot be computed because at least one of the variables is constant.

Table VI indicates a very strong positive correlation (above 0.85) for NOHSASC companies at a significance level of 0.05 between variables B1–B2. Interestingly, NOHSASC companies have gained slightly higher points in Participation (B1) than OHSAS companies. Presumably, NOHSASC companies, due to the pressure from headquarters, emphasise strong priority on safety issues, well-regulated and effective communication procedures, information dissemination and up-to-date regular safety campaigns. Firm communication principles promote better employee and supervisor participation. Therefore, there is a very strong correlation between Communication (B2) and Participation (B1). At a significance level of 0.01, there is a very strong downhill (negative) relationship between variables A1–A2. In NOHSASC companies, a safety policy is often implemented in unmodified form with minimum possibilities (the most common change is to eliminate legislative disagreements) to adjust to company's particularities. Therefore, it often lacks the practical connection and reflection of the company's real needs. While being unable to participate in preparation process of the safety policy those companies address their resources more towards safety activities in practice. This explains the very strong negative correlation between Safety Policy (A1) and Safety Activities in Practice (A2).

TABLE VII

MEANS, DEVIATIONS AND CORRELATIONS BETWEEN ACTIVITY AREAS, NOHSASL ORGANISATIONS

	Mean	Deviation	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
A1	12.88	8.70												
A2	56.25	22.69	–.863											
A3	37.50	10.76	–.405	.521										
B1	47.22	16.67	–.793	.388	.258									
B2	47.92	10.49	–.715	.948***	.718	.221								
B3	58.33	21.52	–.405	.758	.800	–.086	.923***							
C1	67.59	13.31	–.751	.911***	.826	.356	.977*	.898***						
C2	44.44	18.14	–.569	.899***	.632	.000	.973*	.949***	.909***					
C3	36.11	22.91	–.464	.846	.564	–.135	.932***	.939***	.844	.990**				
D1	33.33	20.29	.127	.302	.707	–.487	.580	.849	.559	.671	.708			
D2	41.67	9.62	–.101	.424	.894***	–.192	.688	.894***	.723	.707	.700	.949***		
D3	8.33	16.67	–.058	–.061	.775	.333	.132	.258	.325	.000	–.081	.365	.577	

Abbreviations: ***A1:** Safety policy; **A2:** Safety activities in practice; **A3**: Personnel management; **B1**: Participation; **B2**: Communication; **B3:** Personnel safety training; **C1:** Physical work environment; **C2**: Psychological working conditions; **C3**: Hazard analysis procedures; **D1**: Occupational accidents and illnesses; **D2**: Workability of the employees; **D3**: Social work environment.

* Correlation is significant at the 0.05 level.

** Correlation is significant at the 0.01 level.

*** Correlation is significant at the 0.1 level.

NOHSASL companies represent a very strong positive linear relationship (above 0.85) at a significance level of 0.05 between variables C3–C2, B2–C1, B2–C2, B3–C2, D1–-D2 and A2–B2 (Table VII). Local companies with good Safety Activities in Practice (A2) tend to have good Communication (B2) skills and activities, too: the management has effective information channels to communicate with employees, personnel is aware of the hazard reporting system and they are encouraged to make suggestions. Local companies who do not emphasise the need of workplace risk assessment as the basic preventive tool in OHS are not eager to deal with psychosocial risk factors either. This gives correlation between Hazard Analysis Procedures (C3) and Psychological Working Conditions (C2). When local companies have established a good environment for communication, where employees are encouraged to make suggestions and those are considered, it contributes to a better and satisfying physical and psychosocial work environment. This explains the very strong correlations between Communication (B2) and Physical Work Environment (C1); Communication (B2) and Psychological Working Conditions (C2). Psychological Working Conditions (C2) are also very strongly correlated with Personnel Safety Training (B3). It is clear that the evaluation needs for training and insurance of adequate employees' safety knowledge reflect top management engagement. The management appreciation for employees favours better employees' psychological health. Local companies have very few resources to deal with accident statistics, accident investigation and absenteeism (D1). Those scores for all companies are considerably lower than that of OHSAS or NOHSASC companies. A significant number of investigated companies irrespective of their type do not handle the assessment of physical and psychological workability (D2). This leaves room for future improvements.

V. DISCUSSION AND CONCLUSION

The globalisation and constant competition in the world-wide market have encouraged companies to implement various standards to demonstrate engagement for quality, environment and OHS. OHSAS 18001 [10], [11] standard has gained the most acceptance managing OHS in the manufacturing industry. Several authors have studied the impact of OHSAS 18001 [16]–[23], [26]. In the Estonian manufacturing industry, OHSAS 18001 certification has not

gained too much attention yet. The investigated OHSAS companies have stated that their motivation to acquire OHSAS 18001 certification comes from some other managerial issues rather than the need to improve OHS. Those other aspects might be pressure to maintain competitiveness in the market, to improve company's image in the society and to integrate safety into the management strategy.

In our study, the investigated OHSAS companies perceive benefits from OHSAS 18001 certification as follows: (1) improved documentation management, (2) improved company's image and (3) better conformity of legal obligations. The same results have been obtained by Fernandez-Muniz et al. [18], [19] in Spanish owned SMEs: OHSAS 18001 helps companies comply with their legal obligations, improve their organisation and documentation system as well as enhance their corporate image. Another Spanish study [22] has indicated that the adoption of OHSAS 18001 standard decreases the rate of work accidents and that OHSAS 18001 can be used as a long-run strategic tool to achieve objectives that go beyond safety outcomes. They have concluded that businesses who adopted OHSAS 18001 show significant improvements in safety performance and labour productivity.

The current study supports different positive hypotheses about OHSAS 18001 benefits: it favours the registration of accidents, illnesses and near misses; it supports regular monitoring of social work environment; contributes to more effective safety training etc. However, two of the postulated hypotheses have not been confirmed: there is no difference in psychosocial climate between OHSAS and NOHSASL companies and also higher appreciation on physical workability has not been observed. Hohnen and Hasle [6] have noticed the same shortcomings in their study, especially lack of concern with psychosocial work environment in an OHSAS company.

In our study, looking at the results of audits, we can conclude that in OHSAS companies OHS management functions both in paper and in practice. However, in one or two cases there has been a doubt of window dressing and maintaining the system without practical value. Similar problem was encountered in a Danish study by Granerud and Rocha [26]. They demonstrated that five OHSAS 18001-certified manufacturing companies addressed health and safety issues in very different ways, including one manufacturer where the coupling took place and no legal requirements were complied. The study has raised the question of the impartiality of the certification agencies. In conclusion, Granerund and Rocha stated that OHSAS 18001 certification would not necessarily lead to higher levels of safety performance but it did not obstruct more advanced or innovative practices either. OHSAS 18001 can strengthen structured initiatives, feedback possibilities, help to create higher levels of transparency among companies and support the consultation of blue-collar representatives to perform reporting and evaluation.

Our study has also explored the differences between company types: OHSAS, NOHSASL and NOHSASC. The results have shown that companies, which belong to a larger corporation, are able to operate as efficiently as OHSAS companies since their OHS management system is strongly supported by the corporate policy, standards, guidelines etc.

The study conducted in Finland [20] to examine OHSMS in a global steel company revealed that local OHS practices and tools varied significantly between sites and there was not any common practice or tool in use. In addition, there was variation on how deeply the corporate OHS standards were adopted within subunits: some of them were exceeding the demands but some were below the standards. Corporate OHS management was based on OHS standards, vision and principle plan and targets. Management support of OHS effort was seen as the most important asset.

The results of our study have presented correlations between safety activity areas according to different company types. This promotes better conception to understand how various safety activities are connected with each other and gives an explanation how employers emphasising one specific safety element can smoothly influence positively other safety issues.

In conclusion, based on quantitative and qualitative data the study shows that OHSAS 18001 contributes, to a great extent, to establishment of company's written safety policy, development of physical work conditions, training needs of systematic training approach, better dissemination of information at all levels of organisation, occupational health service activities, more effective interaction of supervisors and employees, frequent registration and investigation of accidents and illnesses, regular monitoring of social work environment. The study results indicate that OHSAS 18001 does not provide support for assessing psychosocial climate and physical workability.

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