INNOVATIONS AT WORKPLACE:
AN EVIDENCE-BASED MODEL FOR SAFETY MANAGEMENT

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Abstract. Safety culture is a sub-unit of organisational culture, which affects members' attitudes and behaviour in relation to organisation's ongoing health and safety performance. Many companies want to enhance their safety culture or some aspect of safety behaviour trying to find the effective way forward. Safety culture in small and medium-scale (SMEs) enterprises has received very little attention in Estonia. Estimates suggest that these enterprises have serious problems aggravated by limited access to human, economic, technological resources as well as lack of relevant occupational health and safety (OH&S) knowledge. The current paper commences with a discussion on the Reciprocal Model of Safety Culture and different perspectives on a framework espoused by Cooper (1999). The concept of safety culture and knowledge management is also discussed. Authors present supplemented Cooper's Reciprocal Model of Safety Culture with Knowledge Management System Dimensions. The exploratory study based on workplace visits and interviews with owner-managers of SMEs manufacturing enterprises gives an overview of the most characteristic OH&S representations and practices. An overview of the current Estonian OH&S system is also presented based on occupational health (OH) physicians' questionnaire surveys conducted in 2002 and 2009. The study suggests that there is need for discussion and improvement of collaboration between employers and OH professionals in order to strengthen knowledge management and infrastructure as well as safety culture at the Estonian enterprises. Competence and expertise in work and health topics is the foundation for the added value of OH professionals to the health of working population.

Keywords: knowledge management, safety management, safety culture, work environment.

INOVACIJOS DARBO VIETOJE:
KONSTRUKTYVUS DARBO SAUGOS VADYBOS MODELIS

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Santrauka. Darbo saugos kultūra yra organizacinės kultūros subvienetas, darantis įtaką organizacijos narių požiūriui ir elgesiui, atsižvelgiant į organizacijoje vykdomą profesinės sveikatos ir darbo saugos politikos lygį. Daugelis kompanijų nori pagerinti saugos kultūrą ar tam tikrą aspektą ir bando rasti efektyvių būdų tam pasiekti. Saugos kultūrai mažose ir vidutinėse įmonėse Estijoje skiriama labai mažai dėmesio. Šios įmonės susiduria su rimtomis problemomis, kurias pagilina ribotas galimybės prieiti

prie žmogiškųjų, ekonominių, technologinių išteklių, taip pat žinių trūkumas profesinės sveikatos ir darbo saugos klausimais. Straipsnyje aptariama saugos kultūros ir žinių valdymo koncepcija. Autoriai papildo Cooper (1999) saugos kultūros modelį, įtraukdami ir žinių valdymo sistemos elementus. Remiantis interviu su smulkių ir vidutinių gamybos įmonių vadovais, buvo atliktas tyrimas, kuris atskleidė situaciją, susidariusią profesinės sveikatos ir darbo saugos srityje. Pateikiama Estijos profesinės sveikatos ir darbo saugos sistemos apžvalga, pagrįsta profesinės sveikatos gydytojų anketine apklausa, atlikta 2002–2009 m. Tyrimas parodė, kad reikalingos diskusijos ir bendradarbiavimas tarp darbdavių ir profesinės sveikatos specialistų siekiant pagerinti žinių valdymą bei saugos kultūrą Estijos įmonėse.

Reikšminiai žodžiai: žinių vadyba, darbo saugos vadyba, darbo saugos kultūra, darbo aplinka.

1. Introduction

Knowledge management and training of workers for knowledge-based work methods (Andriušaitienė *et al.* 2008; Bivainis, Morkvėnas 2008) have attracted employers and governmental institutions (Tvaronavičienė, Korsakienė 2007) in the EU and outside (Gerasymchuk *et al.* 2007). The innovations in economy (Järvis, Tint 2007) and new training methods (Stankevičienė *et al.* 2008; Zabielavičienė 2008) are implemented in all Baltic States.

Knowledge management in occupational health and safety (OH&S) has been investigated during many years for economical and ethical reasons, but the ways of approaching the problem have changed. Safety through technical design is still entirely relevant, but obviously it is not enough. We must try to understand better the psychological and social preconditions for worker's unsafe behaviour and accidents. Organisation culture is a concept used to describe shared corporate values, assumptions, beliefs and norms that join organisational members. At the same time, contrasting perspectives on organisational culture can be also used as a framework for appreciating how values, beliefs and attitudes about OH&S are expressed and how they might influence directions that organisations take in respect of safety culture. In 1986, the concept of safety culture first came into use in connection with the investigation of Chernobyl disaster. Safety culture is a sub-unit of organisational culture, which alludes to individual, job, and organisational features that affect and influence organisation's ongoing health and safety performance (Cooper 2000). UK Health and Safety Commission (1993) define safety culture as *"the product of individual and group values, attitudes, competence, and patterns of behaviour that determine the commitment to, and the style and efficiency of, an organizations health and safety programs. Organisations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy measures"*. Some other researchers (Carnino 1989) have proposed different definitions of similar nature. A lot of companies want to enhance their safety culture or some aspect of safety behaviour. Many managers have started showing an interest in safety performance and their conclusion is that intervention should be directed towards workers and worker behaviour (Järvis, Tint 2009). However, the newest investigations show that the changing of safety climate and culture is really a matter of changing managers' behaviour. The behaviour-based safety approach may be effective for reactive safety management by modifying behaviour and improving compliance behaviour. Behaviour is also one of the main issues (together with situations and person factors) identified in the model of safety culture as the key factor which is applicable to the accident causation chain at all levels of an organisation (Cooper 2000; Heinrich *et al.* 1980).

1.1. Models of safety culture

A literature review shows that very few models of organisation (safety) culture exist. Whilst there are differing perspectives within the broad definition of safety culture there appears to be general agreements and common statements, however, when it comes to decomposing culture to its sub-units there appears to be moderate divergence of opinion. An effective development of the culture models started in the 1980s. Accident causation models recognise the presence of an interactive or reciprocal relationship between psychological, situational and behavioural factors (Heinrich 1980). The common thread that can be found in many models is the implicit or explicit recognition of the interactive relationship between psychological, behavioural and organisational factors. Cooper (1999) described organisation culture: "...*the prevailing organisational culture is reflected in the dynamic reciprocal relationship between member's perception about, and attitudes towards, the operation of organisational goals; members' day to day goal-directed behaviour; and the presence and quality of the organisations systems and sub-systems to support the goal-directed behaviour*". In essence, this definition reflects Bandura's (1986) model (Cooper 2000) of reciprocal determinism derived from Social Cognitive Theory and includes Social Learning Theory. Bandura's reciprocal model suggests a good framework for analysing organisational and safety culture which assesses internal psychological factors (person) and external observable factors (situation and behaviour) in dynamic environment as well as provides a "triangulation" methodology with which to encourage multi-level analyses. Bandura's model (1977, 1986) of reciprocal determinism has been modified and

adapted by Cooper. Based on previous research in the field of safety culture, Cooper proposed a model to reflect the concept of safety culture, that contains three elements: internal psychological factors (safety climate), external observable factors – organisation (safety management system) and job (safety behaviour) (Fig. 1). All elements of this model can also be broken into exactly the same reciprocal relationships, thereby allowing the multi-faceted nature of the safety culture construct to be systematically evaluated by Cooper. His model includes Zohar's (1980) Safety Climate dimension, Safety Management System and Behavioural Dimensions.

Schein (1992) (Cooper 1999) developed a three-layered cultural model that assesses: espoused beliefs and values; core underlying assumptions; behaviours and artefacts. Furnham & Gunter (1993) explored Schein's cultural model and confirmed that the underlying assumptions need to be manifest in some way. Johnson (1992) presents a "culture web", based on Schein's (1992) culture modes, which mainly examines beliefs and values in the organisation. Guldenmund (1998) (Cooper 1999) also demonstrated safety culture as a three-level model, which emphasises behaviours and artefacts, suggests that behaviours might encompass inspections, accidents, near-misses, while safety posters, personal protective equipment could be constructed as artefact. The level one of the Guldenmunds' model analysed organisation policies, management styles, etc. and the second level evaluates the safety climate in order to measure individuals' attitudes and perception about safety. Reason (1997) suggests that safety culture is a sub-culture of corporate culture as well as comprises different sub-cultures among sub-group of people (i.e. department, working group). Reason espouses safety culture dimension of: an informed culture; a reporting culture; a flexible culture and a learning culture. An informed culture (equivalent to a safety culture) is comprised of many types of situational specific cultures (not all of which are safety related), which interact with each other to create the "informed culture". Reason's approach can also be subsumed within the psychological, behavioural and situation components of the reciprocal model (Cooper 2000). The dynamic and interactive relationships between person, environment and behaviour were proposed in a "Total Safety Culture" model by Geller (1997), which estimates 10 core values for the total safety culture. Safety Culture Maturity Model (Fleming 2000) assesses core components as follows: management commitment, communication, productivity versus safety, safety resources, learning organisation, participation, shared perceptions about safety, trust, industrial relations and job satisfaction as well as training.

1.2. Impact of safety culture and knowledge management on occupational health and safety

The growing complexity and dynamic of the global economy widen the potential impact of knowledge on today's business enterprises (Hejduk 2005). Knowledge has been recognized as a new resource in gaining organisational competitiveness and it is also the central resources in the achievement of the goal of OH&S management. Active interest in OH&S requires that the workers and employers have the right information at the right time to make a decision affecting health and safety. Knowledge and information is a precondition for action. Proving useful information to decision-makers (including employers, government officials, OH&S professionals, unions and workers) is essential in addressing OH&S issues (Järvis, Tint 2007). Despite the growing interest in knowledge management (KM) studies, only a few (Sherehiy, Karwowski 2006; Schulte *et al.* 2003, 2004) researches were carried out in the field of OH&S. In the context of the management of OH&S, special attention should be given to tacit knowledge, because the research topics are often identified through direct human experience in the workplace, and the results of the research are often immediately applicable to the solution of a problem. When people solve complex problems in the field of OH&S, they bring knowledge and experience to the situation and as they engage in problem solving they create, use and share tacit knowledge (Järvis, Tint 2007). Sherehiy & Karwowski (2006) suggested that the principles and tools of KM should be used to facilitate the management of the existing individual (personal) knowledge, structural knowledge (i.e. knowledge codified into manuals, reports, databases, data warehouses) and organisational knowledge (activity of learning within the organisation) in the fast domain of practical application. In order for OH&S knowledge to create value, it must be shared. Although knowledge sharing and knowledge transfer are often used interchangeably. *Knowledge sharing* refers to the exchange of knowledge between two individuals and focuses on human capital. *Knowledge transfer* focuses on structural capital and the transformation of individual knowledge to group or organisational knowledge, which becomes built into process, products and services (Jakobson 2006). Many Estonian OH&S legislations and regulations contain stipulations about disseminating and applying information concerning OH&S. From a legislative perspective, improved dissemination of information and knowledge should encourage awareness, urge precaution, and lead to a reduction in occupational morbidity and mortality. The process of KM and knowledge transfer at the state level in Estonia was analysed in recent years (Järvis, Tint 2007). According to the study results the main ways of knowledge transfer in the field of OH&S in Estonia are via communities of practice, the Internet and training.

However, there is little known how employers, workers and OH&S professionals receive, analyse, share and use this information.

It is well known that organizational culture plays an important role in the successful implementation and operation of KM and information systems (Balthazard, Cooke 2004). The authors believe that certain aspects of safety culture may play a more pronounced role in the successful adaption of KM practice and systems. The complimentary factor for ensuring optimal OH&S information and knowledge transfer and flow (in KM process) is a supportive and harmonized safety culture shared by all organisational constituents. The safety culture of an organisation is shaped by many factors, some of which can be changed. In this paper authors present useful perspective on safety culture and knowledge management.

2. Objectives of the paper

In the light of the above literature survey, authors decided to carry out an exploratory research in order to produce a first picture of safety culture (its components) in Estonian small and medium-scale (SMEs) enterprises. More specifically, the research goal was divided into four parts, as follows:

1. Assess the safety culture elements in Estonian SMEs. Describe the manager's attitudes, knowledge level and concerns in this regard.
2. Suggest and show the innovative possibilities for improvement of safety culture at the Estonian SMEs through complex approach to safety and health, which includes knowledge management system.
3. Target at the occupational health and safety problems specific to SMEs and identify the main priorities and major problems in the relevant system in Estonia.
4. Evaluate the attitudes, professional skills, knowledge of occupational health physicians; investigate their role in creation of safety culture at the enterprise.

3. Methodology

3.1. Case studies

Case studies were seen to promote better understanding of the rationale of current safety culture, the development need and obstacles. Based on the information gained through case studies as well as review and analysis of the literature drawing from several databases, authors stated the development of model system for safety culture.

The exploratory study based on workplace visits and semi-structured interviews with owner-managers of 7 small and medium-scale (SMEs) manufacturing enterprises were carried out using validated questionnaires. Of these, 2 were in wood processing sector, 1 was in the cloth-

ing manufacturing sector, and 1 in printing industry, 2 and 1 were accordingly in mechanical industry and plastic industry. Each interview lasted an average of 20 min. in order to evaluate the management's commitment to safety; worker's involvement in safety. In addition, the data from 18 enterprises were used for assessment of safety culture as well as to examine specific to SMEs problems in the OH&S system. The enterprises were located in different parts of Estonia, however major of them in or around the capital and western part of the country. Methods which have been used are as follows: observation, risk assessment, documentation overview, safety rules and procedures.

3.2. Survey of the practice of occupational health professional

The substantive parts of the article present comparative survey evidence from questionnaire surveys which were conducted in 2002 and 2009. The method used was administration of a self-completed questionnaire with 10 groups of questions to all occupational health professionals who were according to the Estonian Act of Occupational Health and Safety practising as occupational health (OH) physicians. The questionnaire consisted of main parts: identification data, questions on awareness and use of information sources, attitudes to ethical issues, their everyday tasks and duties, their perception and assessment of safety culture at the Estonian enterprise, cooperation with employers, strengths and weaknesses of the current OH&S system in Estonia, etc. Only qualitative data is presented in the current article.

4. Qualitative findings

4.1. The results of safety management and culture investigated in companies

The study was conducted in small and medium-scale enterprises, because the number of such type of companies are around 50 000 in Estonia. The summary of the companies is presented in Table 1. In each company, the management attitude towards health and safety (i.e. the supportive actions to provide adequate information, investments in OH&S, etc.) was assessed on the basis of the interest in the results of outcomes of the research. The awareness and supportive actions of company management for the problems of OH&S were assessed as stimulating/supportive, neutral or impeding/ negative. It has to be highlighted that as regards daily routine, formal or informal assignment of OH&S responsibility and participative management practices are not very common in the investigated SMEs. Although most of the managers said they entrusted some OH&S responsibilities to their employees, it was not examined what are the means available to help those employees to assume their responsibilities. There is

Table 1. Summary of the investigated companies

Industry	Companies	No. of workers	Awareness of company management
Wood processing	5	25…200	+ (2 cases) ± (2 cases) – (1 case)
Clothing industry	5	120…225	+ (4 cases) ± (1 case)
Printing industry	3	24…140	+ (2 cases) – (1 case)
Mechanical industry	2	90…175	± (2 cases)
Plastic industry	3	25…180	+ (1 case) ± (2 cases)
Office rooms	18	15…100	+ (9 cases) ± (7 cases) – (2 cases)

Abbreviations: "+" – stimulating, supportive; "–" – impeding, negative; "±" – neutral

a lack of resources at the SMEs enterprise in order to hire the working environment specialist/ safety manager who would deal with the OH&S problems. Generally, these responsibilities are divided between different specialists in various departments. SMEs have special problems with the work environment: the risk is higher and the ability to control risk is lower. There are also studies indicating that exposure to physical and chemical hazards is higher in SMEs than in large companies (Soresen *et al.* 2007) and there is no reason to believe the opposite concerning Estonian enterprises due to absence of the appropriate research. The level of safety performance, managers' and workers' knowledge in OH&S was various in different investigated enterprises. The enterprise's safety performance depends on the following components: surveillance of working conditions, workers' knowledge management, safety management system and cooperation with OH professionals (Reinhold *et al.* 2009). Two thirds of respondents consider the risk to their employees' health sufficiently low. However, majority of the interviewed managers had a certain plan of activities to improve working conditions. An interesting finding was also that none of the interviewed managers had tried to evaluate the economic losses that had been caused by employees' sicknesses and/or occupational accidents. According to the results from interviews, there is a lack of workers' involvement in the safety practice and cost-benefit analysis of interventions made in working environment. The main results of the study were as follows: the lack of managers' awareness in the field of OH&S, especially among non-Estonian employers; the absence of the safety policy; the accident investigation and

reporting procedures were weak (Kempinen, Tint 2006); low quality of risk assessment; insufficient safety training provided to workers; lack of effective cooperation with OH physicians.

4.2. Questionnaire study of occupational health physicians

The role of OH physician in private sector is changing. Occupational medical services for employees previously covered by in-house are now provided by outsourcing since 2003 in Estonia. According to the Estonian Act on Occupational Health and Safety, only entrepreneurs or private medical health professionals may now provide the services. The private practice of occupational medicine has become the growth area of the speciality in Estonia. For several years the number of active OH physicians is slightly increased. These trends have been driven primarily by new OH&S legislation, economic imperatives and new management philosophy. However, it is not clear that organisations in general are deriving the greatest value they can from their OH physicians and that the managers are effectively cooperating with their OH professionals. In order to investigate OH physicians' attitudes and perceptions towards their cooperation with managers and working environment specialist, questionnaire surveys were conducted in 2002 and 2009. During the first survey, questionnaires were distributed to 103 Occupational health professionals (OH physicians, nurses, hygienists and ergonomist) in 2002 and response rate was 40 % (Kempinen, Sarap). In the present article only OH physicians' responses are used. All active OH physicians received similar questionnaires in 2009 and 48% of them completed the questionnaire. As was mentioned before, the number of OH physicians has increased since 2002, therefore the work experience in the field of OH&S of OH physicians was longer (21.4 years) in the first study (in 2002) than in the second in 2009 (11.3 years). The results from both surveys indicated that the majority of OH physicians (46 %) were working in OH units (department) in hospital and 30% - in occupational health services (OHS). Almost all of the OH physicians (98%) reported that they had attended the specialisation courses for OH physicians and all respondents had received training in the field of OH&S. During the first study in 2002, the main educational centre for OH physicians was the Estonian Occupational Health Centre. In 2004, changes in the political climate concerning OH&S issues led to reorganisation of the Labour Department at the Ministry of Social Affairs in Estonia. At the same time, the Occupational Health Centre as the only one competent OH&S authority in Estonia was closed down; its responsibilities were distributed between different State organisations (Labour Inspectorate, Health Care Board). However, at the moment, there is no one competent au-

thority who would deal wholly with complex OH&S issues (i.e. research, expertise, training, consultancy, guidelines, etc.) and would be responsible for coordination, creation and dissemination of OH&S information and knowledge. There is a policy dimension to this debate that must also be acknowledged.

During the second survey, more than half (55.6%) of the participants in the survey stated that they received their specialisation and relevant training at the Tartu University. Important finding was that during the both studies, among the 15 main topics related to OH&S, OH physicians in 2002 and six years later considered issues of occupational diseases and work related diseases (diagnostic and prevention), OH&S legislation and rehabilitation and/or promotion of work ability to be the most important issues for the future training. Currently, many respondents revealed that they tend to work on a part-time basis as OH physicians, serving more than one employer and often have a short-term contract with employer. This can be explained based on the relevant Estonian OH&S law. According to the law, the employer is obligated to organize OHS for the employees and to bear the costs incurred. The services provided by an OH physician, OH nurse, a hygienist, a psychologist or an ergonomist are considered to be OHS. According to the law, the statutory requirements are met if the employer acquires the services from any of the individual specialists and multidisciplinary provision of OHS is not required. The other important factor is that family physicians still often are recruited into workers' health surveillance, which is at variance with Estonian legislation and good occupational health practice (GOHP).

The most commonly reported activities among OH physicians were performing the health examination, rehabilitation/planning of rehabilitation and workplace visits. Besides above listed activities, minority of OH physicians were involved in advising and consulting the working environment specialists and employers; dealing with activities related to maintaining work ability and making the expertise of occupational diseases. According to OH physicians' responses (59.5%) Estonian employers are generally well informed about their OH&S responsibilities and 62% of respondents stated that employers are ready for cooperation with OH physicians. More than a half of OH physicians revealed that employers always (11.8%) and often (54%) follow the advice and recommendations given by OH physicians after workers' health surveillance. At the same time, 27% of the respondents stated that employers have little motivation from the legislation to deal with OH&S issues. These findings confirmed the Martimo (2004) and Kempinen, Kurppa (2004) findings. Interestingly, that according to OH physicians' responses from the second survey (2009), the main priorities and major problems in the current OH&S practice in Estonia were exactly the same

as were reported by OH professionals in 2002 (Kempinen, Sarap 2002): lack of political commitment of the government and social partners to be able to draw up policies for further development of OH&S; non-sufficient legislation (the absence of the Compulsory Insurance Act of Occupational Diseases and Accidents); the absence or low quality of risk assessment; there is no agreement between the OH physicians and the Estonian Sick Fund in order to compensate costs for the analysis and rehabilitation of workers. There is also low coverage of the OHS offered to employees and lack of the OH&S professionals as well as lack of the research activities in the field of OH&S. Results of the first survey (2002) and an overview of the present OH&S situation in Estonia were analysed in detail (Järvis, Tint 2009; Kempinen, Sarap 2002; Martimo 2004) and the description of the factors influencing safety culture in Estonian enterprises were presented. Based on the information about the present OH&S situations, authors would like to propose that OH physicians be looked at in a new way as a fresh resource of knowledge and competence with defined capabilities, and that their position description be developmental that emphasize these capabilities at the state as well as organisational levels. Process of OH&S knowledge creation and transformation, prevention, risk anticipation, risk assessment and management are perhaps the areas where OH physicians can make the greatest contribution. Since risk anticipation requires a broader perspective, team work, balancing resources and priorities, in addition to working environment specialist who coordinates OH&S at the organisational level, qualified and well-prepared OH physicians should be effectively involved and certainly can contribute to definition and solution of the OH&S problem as well as improve the safety culture at the enterprise.

4.3. Modified model of safety culture

As it was described in part 1.1 "Models of Safety culture", there is already an understanding of the factors that affect safety culture. Fig. 1, for example, shows a useful framework developed by Cooper (2000) which contains three
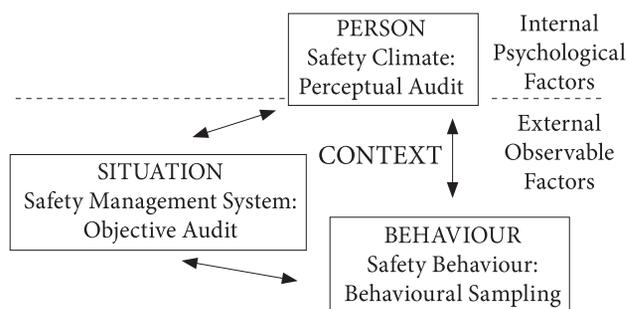

Fig. 1. Basic safety culture model (Cooper)

main aspects: psychological aspects (often called "safety climate") – how people feel; behavioural aspects – what people do, and situational aspects – what the organisation has or has put in place. This combination of factors is making the complexity of factors clear – they are related to people, their behaviour and their interactions with the safety management systems of the organisation. It is also known, that dissemination of OH&S information and KM are important aspects for effective and successful managing of health and safety in the enterprises. Authors have presented an adopted and modified Cooper's Model of Safety Culture with Knowledge Management System Dimensions, which can allow in-depth studying of the impact of KM on development of safety culture processes. The model proposed takes into account the dynamic interrelationships between safety climate, safety management systems, safety behaviour and motivational strategies, helps to create, transfer and utilize safety knowledge (KM system). Authors suggest that organisations should pay more attention to how their OH&S knowledge is managed (how knowledge is created, transferred and used by workers) in order to develop positive safety culture. The suggested knowledge elements of the model can also be broken down into exactly the same reciprocal relationship

(Fig. 2). Presented reciprocal model provides a comprehensive way of thinking about the many processes and aspects that might impact on safety culture. The concept of the presented model is also partly related to Reason's (1997) "informed (or safety) culture" model, which includes dimensions of an informed, a reporting, a flexible and a learning culture.

5. Discussion and conclusions

A set of publications (Sherehiy, Karwowski 2006; Schulte *et al.* 2004) indicates that in order to improve the management of OH&S system there is need to develop the principles and tools of KM in the area of application at the state as well as organisational level. Even though rapid improvement has been made in the field of OH&S in Estonia in recent years, there are still challenges ahead. At the state level, decisions concerning OH&S are planned without paying careful consideration to the whole OH&S system. This is mainly because only scarce data are available for decision making. The process of KM in the field of OH&S at the state level and major problems were identified and several possibilities for improvements in Estonia were discussed by some researchers (Järvis, Tint 2007; Kempinen, Kurppa 2004; Martimo 2004; Reinhold *et al.* 2009).
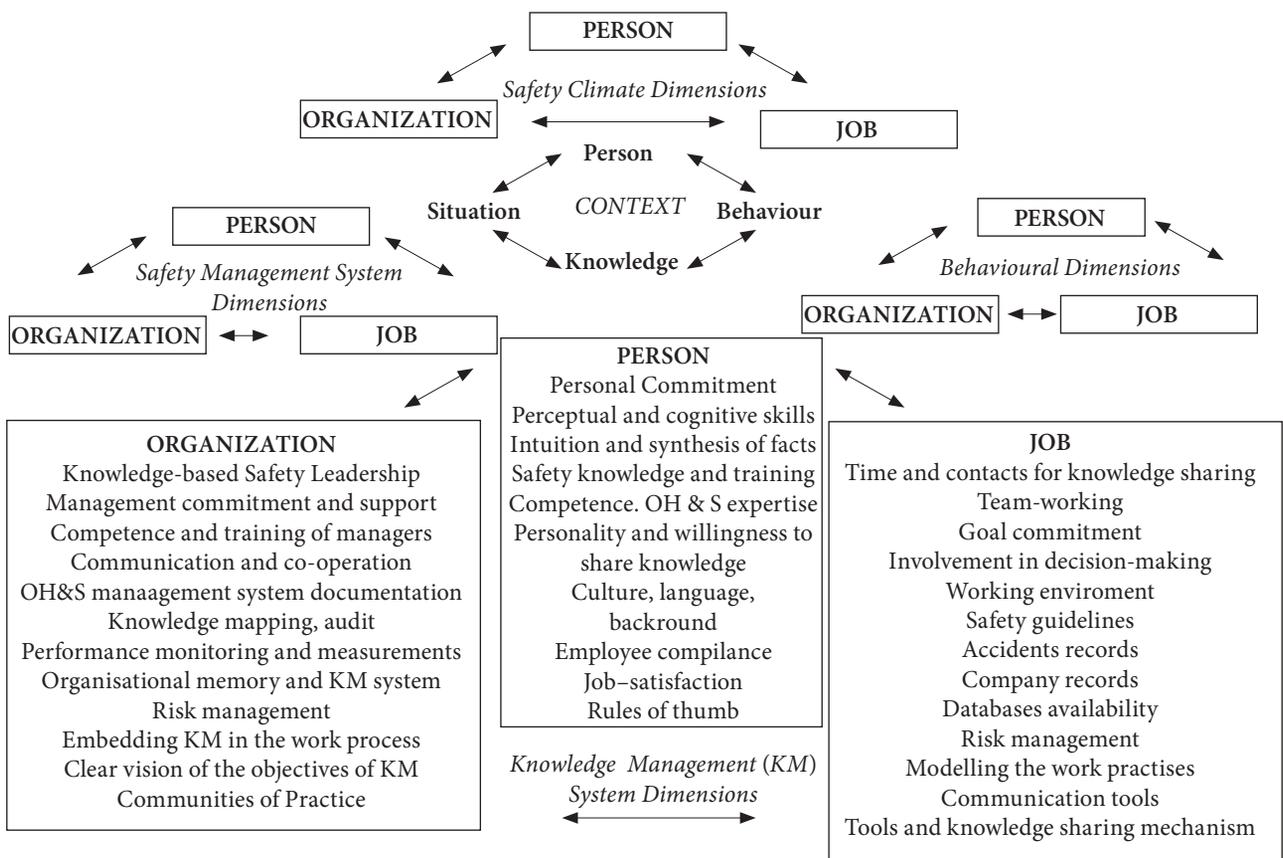
Fig. 2. Reciprocal Model of Safety Culture

The contribution of the present paper consists of the presented modified Cooper's Model of Safety Culture with the concept of KM. An overview of the safety culture in SMEs was evaluated through workplace visits and semi-structured interviews with owner-managers. In addition, the main problems of the current Estonian OH&S system are presented based on the results of OH physicians' questionnaire surveys conducted in 2002 and 2009. Based on the previous research and the results of the study it is possible to conclude that there is urgent need for the knowledge-based change in the field of OH&S in Estonia, which could be also one of the effective and most powerful strategies for organisational development. KM process can be seen as a tool for improvement safety culture and safety performance at the Estonian enterprises. There is also need for an effective KM training –support system in order to provide an organisation with strategic advantages and help to develop learning environment, which can help create and maintain skills in OH&S and therefore create the positive safety culture. There is potential for organisations to learn, adopt and apply bets practice, knowledge and information in the field of OH&S from other companies and professionals. Based on surveys, authors emphasise that two main factors in the KM process are essential for strengthening and enhancement of OH&S system: community of practice and supportive and harmonized safety culture. The study suggests that there is need for discussion and improvement of collaboration between employers and OH professionals (development and expansion of communities of practice) in order to strengthen KM and infrastructure as well as safety culture at the enterprises. Authors commend that the greatest value in OH physicians services may be in the anticipation of risk related to health issues and the flexibility this gives the organisation to manage the OH&S problems and to improve safety culture in Estonian SMEs. The added value in OH physicians is based upon the expertise in OH&S issues they can offer to organisations and workers. Authors believe that presented Reciprocal Model of Safety Culture with KM System Dimensions can assist in the ongoing analyses and implementation of a positive safety culture.

6. Further research

The next phase of the research, involving more careful and in-depth analysis of the results from two OH physicians' questionnaire surveys, is further research to test the proposed by authors model of safety culture.

Authors also planned the first longitudinal study of OH&S approaches to the workplace level in Estonia, which will allow gaining insight about various organizational factors that might have influenced the workplace level of OH&S, practices and attitudes to SMEs over the past dec-

ade, as well as to assess the improvement made after accession of Estonia into the EU. This study will include similar workers' questionnaire study in 2009 that was already carried out in 2001-2002; one-to-one interviews with senior managers from older and newer companies, which may help elucidate changes in OH&s practices over the course of a firm's history, how they affect the priority of OH&S according to management. In addition, stronger data are needed on factors involved in safety knowledge creation, transfer and translation into practice, especially focusing on KM for young workers and non-Estonian speakers.

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