Costs of occupational accidents - Effects of occupational safety on company business

A research and development project

Markku Aaltonen[1]; Kimmo Oinonen[2]; Jari-Pekka Kitinoja[3]; Jorma Saari[4]; Mika Tynkkynen[5]; Henriikka Virta[6]

[1] Team Leader, Finnish Institute of Occupational Health, markku.aaltonen@ttl.fi
[2] Assistant researcher, Finnish Institute of Occupational Health, kimmo.oinonen@ttl.fi
[3] Research engineer, Finnish Institute of Occupational Health, jari-pekka.kitinoja@ttl.fi
[4] Professor, Finnish Institute of Occupational Health, jorma.saari@ttl.fi
[5] Research scientist, The Federation of Accident Insurance Institutions, mika.tynkkynen@vakes.fi
[6] Research engineer, Finnish Institute of Occupational Health, henriikka.virta@ttl.fi

***Keywords*—occupational safety, productivity, costs of accidents, Internet concepts, accident research**

1 INTRODUCTION

The costs of occupational accidents could be cut by effective preventive measures, and at the same time productivity could be improved. Usually safety measures are considered only from the medical or technical points of view. The economic viewpoint widens the basis for decision making so that it is possible to arrive at the most productive safety solution with respect to the available economic resources. [1]

The European Commission is concerned about the costs of 'non-social policy' for Europe. The Community Strategy on Safety and Health at Work for 2002–06 [2] has set the development of knowledge about economic and social costs arising from occupational accidents and illnesses as one of the top priorities. Work-related accidents are still a major safety and health problem in Europe. Every year, approximately 5 500 people are killed in accidents in their workplace. Probably around 150 million working days are lost each year due to work-related accidents. Eurostat has estimated that accidents at work incurred costs of 55 billion euros in 15 EU Member States in 2000. This estimate corresponds to 0.64% of the GDP of about 8500 billion euros for these countries. [3] This is a huge cost for businesses and a huge cost in terms of human suffering for the victims and their families.

According to research findings there exists a clear link between a good working environment and the performance of a company. [4] A number of different success factors have been identified in the literature, namely:

- combining business targets and human resources activities, in order to achieve better results;
- taking a wider approach to health promotion to include not only health conditions but also employee attitudes and corporate culture;
- using occupational safety and health (OSH) improvement programmes, as they seem to provide better results than implementing only specific prevention measures;
- including technical innovations and organizational improvements;
- carrying out measurement and evaluation. Demonstrating return on investment, both prospectively and retrospectively, is needed.

Figure 1 presents one model to describe how successful safety activities can promote economic performance of a company. At the same time when accidents costs will decrease, it is possible to increase productivity and to improve quality when the production is running smoothly without interruptions. According to the model, accident prevention can have benefits in the form of reducing anticipated losses, savings in expenditures or additional gains. Often additional (or unintended positive side-effects of prevention) benefits are even more important than the benefits that are directly related to reduction of sick leave and disability. [5]

Thus, occupational safety and health can affect company performance in many ways. Healthy workers are more productive and can produce at a higher quality. Fewer work-related accidents and diseases lead to less sick leaves. In turn this results in lower costs and less disruption of the production processes. Equipment and a working environment that is optimized to the needs of the working process and that are well maintained lead to higher productivity, better quality and less health and safety risks. Reduction of injuries and illnesses means less damages and lower risks for liabilities. [6]

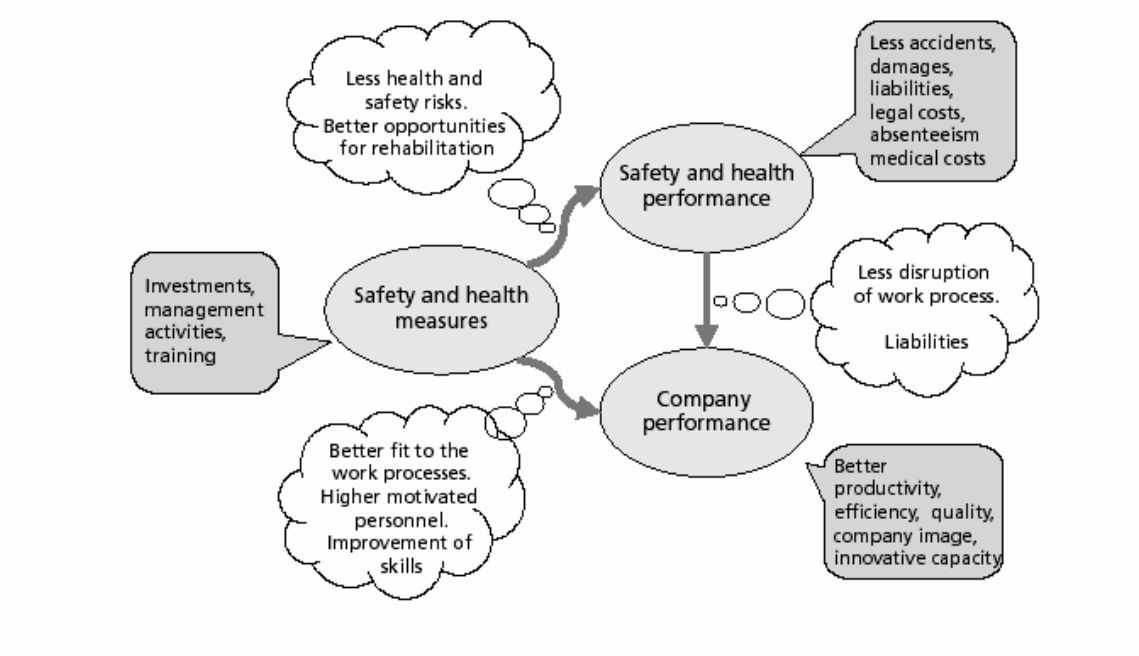


Figure 1. Economic effects of safety and health at company level [5]

In a Finnish research project, there was a statistically significant correlation between the TR Index and the contribution margin of the construction sites. The study consisted of 142 different construction sites. The TR safety observation method is a reliable tool of evaluating the safety level of a construction site [7]. On the basis of the study it was concluded that construction sites with a poor working environment (i.e. low TR Index) could seldom achieve good margins. The study showed also that a good safety level (i.e. high TR index) could even be used for the prediction of future profitability of that site. [8]

This paper introduces the ongoing research and development project *"Costs of occupational accidents - Effects of occupational safety on company business"* and its preliminary results. The project is carried out by the Occupational Safety Team at the Finnish Institute of Occupational Health (FIOH). It was ordered by the Finnish Federation of Accident Insurance Institutions, but also the Finnish Ministry of Social Affairs and Health and the Finnish Work Environment Fund are funding the project. Four main Finnish insurance companies are involved in the project as well.

The project is an integral part of the nation-wide programme entitled "Prioritizing occupational safety - occupational accident prevention programme". The core idea of the programme is to promote adoption of a high-standard safety culture and the "vision zero" concept in all sectors of Finnish working life. [9]

The project started in 2005 and it will finish 2007.

2 AIMS

The project has the following goals:

- to provide new practical methods and information about costs of accidents and economic importance of occupational safety and health;
- to investigate cost information needs of different personnel groups related to OSH;
- to calculate costs of accidents in companies according to the Eurostat method [3];
- to explore effects and costs of accidents in supply chains of subcontractors;
- to develop an accident scenario model for accident investigation;
- to establish a framework for continuous follow-up of information in the economic aspects of occupational safety and health;
- to enhance safety management by utilizing accident cost information;
- to enhance productivity, quality and competitiveness of the workplace by improving working conditions.

3 PROJECT LAYOUT AND METHODS

The project consists of six research modules, which are being carried out in different time periods.

The research module 1 has consisted of a study on information needs on accident cost information among different interest groups (company management, safety personnel, occupational health personnel, purchasers, etc.). In total, personnel in 23 companies have participated in the inquiry and in-depth interviews. Table 1 presents the sectors of the participating companies.

TABLE 1

NUMBER OF COMPANIES PARTICIPATING IN THE PROJECT

Sector	N	%
Manufacture of goods	11	48
Electricity, gas, steam and hot water supply	4	17
Construction	4	17
Municipalities	2	9
Wholesale and retail sale	1	4
Health and social work	1	4
Total	23	100

Table 2 shows the number of persons who have responded to the questionnaire. The inquiry was organized by using the web-based information system Digium. Preliminary results of this questionnaire are presented in the following chapter 4.

TABLE 2
NUMBER OF RESPONDENTS IN THE INQUIRY

Personnel group	N	%
Top management	9	6
Line management	71	46
Specialist in book keeping	4	3
Specialist in production/purchasing	11	7
Other specialist	8	5
Safety officer	19	12
Safety representative	21	13
Other safety specialist	4	3
Employee	3	2
Other	6	4
Total	156	100

The research module 2 includes a literature survey on latest research findings and practical information in the economics of OSH. It includes also the development of an Internet site for this topic. The concept of this site is presented in the following chapter 4 as well.

The research module 3 consists of a data collection of accident cost information at company level and calculation of these costs. It is carried out by using the Eurostat method [8]. Data collection is currently being carried out in the participating companies by using the Digium system.

In the fourth research module, a method is under development, where accident scenario models are applied for accident investigations. The model is tested by using information from serious forklift accidents. These accidents have been investigated by the Finnish Federation of Accident Insurance Institutions.

The research module 5 explores the effects and costs of accidents in the supply chain of companies. Accidents increase costs of production, which are added to prices to next customer in a supply chain. Finally, the total price of the product includes the costs of accidents in the whole supply chain. Accidents may cause also disturbances in supply chain, when delivery times are very tight. The Cost Management Centre of the Tampere University of Technology is collaborating with the FIOH in this module.

The research module 6 covers dissemination and utilization of the project results and products. These include training courses and training packages, information packages for media, and scientific and popular articles related to economics of OSH.

4 PRELIMINARY RESULTS

As the project is still ongoing, some preliminary results are presented in this chapter from research modules 1 and 2.

4.1 Survey on safety information needs

Table 3 presents the use of different performance indicators in the participating companies (n=23). Each of them is following the amount and frequency of accidents and results of well-being surveys. However, only half of them are investigating the accidents. Instead, 61% of respondents are following the costs of accidents and 57% the costs of sick leaves.

TABLE 3
USE OF PERFORMANCE INDICATORS IN THE PARTICIPATING COMPANIES (N=23)

Indicator	N	%
Amount of accidents	23	100
Accident investigations	11	48
Number of reported near-accidents	20	87
Accident frequency	23	100
Severity of accidents	15	65
Use of different indexes, e.g. housekeeping index	8	35
Number of risk assessments	10	43
Number of safety audits	12	52
Number of safety initiatives	8	35
Number of accomplished safety measures	4	17
Results of well-being surveys	23	100
Costs of safety activities	5	22
Costs of accidents	14	61
Costs of sick leaves	13	57
Others	1	4

Every fourth out of five respondents were considering that the safety information flow in their workplaces is running well. However, every third person was responding that they do not utilize safety cost information enough. Almost all respondents (92%) agreed that there is a clear connection between the quality of working environment and productivity. But only 54% of respondents said they have enough cost information when making decisions about safety activities. Also, 40% of respondents agreed on the statement that OSH activities and investments are not considered generally productive in their company.

Electronic mail messages were the most common way to receive safety information of the company (82% of all

respondents). The intranet system of the company was also commonly used (69%). Safety meetings (70%), safety bulletins on paper (71%) and bulletin boards (50%) were also used in safety communication.

Respondents provided also a large number of individual comments and initiatives about safety information flow. Safety campaigns were considered as an important way to activate safety work. Line management should be informed better about safety-related matters. Intranet systems, electronic bulletin boards, in-house TV systems and push technology applications, including text messages of mobile phones could be utilized more in safety work. However, personal face-to-face communication, informative meetings and safety training were also mentioned as an effective way to influence on safety behavior.

4.2 Development of the web feature

Under the second research module, a special web feature on *"Economic aspects of occupational safety and health"* has been developed. Currently the information is fragmented in various web sites and it is difficult to get an overview of existing information. This feature aims to provide complete set of information related to the topic. The language of the feature is Finnish.

The development has been carried out in close cooperation with the Occupational Safety and Health Department of the Finnish Ministry of Social Affairs and Health. The Department is managing the Finnish Focal Point of the European Agency for Safety and Health at Work. Finland has its own Internet site as a part of a European network established by the European Agency. The aim of the network is to collect and disseminate information throughout the European Union in order to encourage improvements in the working environment. The Finnish site (figure 1) provides information of occupational safety and health in Finland. The new web feature will be an integral part of the Finnish Internet site and it will be located at the "Good practice" section.

The concept of the new web feature consists of seven main chapters (table 4). Each chapter consists of a number of sections consisting of a full-text description, list of references and list of links related to the topic of the section. At the moment, the web feature includes more than 60 pages.

TABLE 4
CONCEPT OF THE NEW WEB FEATURE FOR "ECONOMIC ASPECTS OF OCCUPATIONAL SAFETY AND HEALTH"

Main chapter	Sections	Subsection
General introduction to the web feature	--	--
Responsible company business	Corporate social responsibility	--
	Legislative requirements to working environment and well-being at work	--
Measures for improving the working environment	Introduction	--
	Improvement of work organization	--
	Good management practice	--
	Ergonomics	--
	Work planning and design	--
	Working hours	--
	Maintenance of work ability	--
	Training and orientation	--
	Tidiness and housekeeping	--
	Quality	--
	Economic incentives and payment by results	--
	Innovations	--
	In-door environment	--
	Purchasing	--
	Measures of well-being at work	--
	Management of human resources	--
Costs of occupational safety and health	Introduction	--
	Costs at company level	Introduction
		Costs of accidents and occupational diseases
		Costs of sick leaves
		Costs of disability pensions
		Costs of personnel turnover
		Costs of presenteeism
		Costs of safety activities and investments
	Costs at society level	Introduction
		Costs of accidents and occupational diseases
		Costs of disability pensions
	Costs at individual level	Introduction
		Consequences to persons
Productivity	Introduction	--
	Importance of productivity to company business	--
Insurance systems	--	--
Materials and methods	Calculation models	Accident costs
		Costs of sick leaves
		Costs of personnel turnover
		Costs of disability pensions
		Costs of proactive safety actions
		Methods for cost-benefit analysis
		Methods for Human Resources Accounting
	Training materials	--
	Case studies	--
	Literature	--
	Links	--

Existing information already available in the Finnish Internet site are being utilized by interlinking them to the new feature. Within the web feature the user may find the relevant information by accessing it from different access points. E.g., when looking methods for accident cost calculation one may enter to this topic accessing from "Costs of occupational safety and health" -chapter or from "Materials and methods" -chapter. It is intended to test the usability of the web feature during the project period as well.

The main user groups of the web features will be line managers and OSH practitioners at the workplaces, OSH specialists working in administration, insurance companies and safety business, trainers and researchers in OSH and general public. The updating and maintenance of the web feature will be organized after the project has ended

The web feature will be open to public in autumn 2006.

5 Discussion

The connection between good working environment and productivity was understood very well at least among the respondents in the participating companies. However, 40% of respondents agreed on the statement that OSH activities and investments are not considered generally productive in their company. More information about positive effects of good safety level is still needed in companies.

Cost information was available to some extent but it could be utilized better in decision making. Emails and safety intranets are already commonly used, but new developments are still needed, e.g. push technology applications.

The development of the new web feature economic aspects of OSH is about to be completed. The user feedback of the usability of the system is important and is needed for further enhancements.

More results originating from the project will be published after finalizing the research modules.

Acknowledgements

The project is funded by the Finnish Work Environment Fund, the Finnish Ministry of Social Affairs and Health, the Finnish Federation of Accident Insurance Institutions and the Finnish Institute of Occupational Health.

References

[1] Ahonen, G., *Labour protection and economics; A paradigm theoretical study in the use of economic analysis in labour protection contexts*. Svenska handelshögskola, Nr. 33, Helsingfors. 1983, 215 pp. (Doctoral dissertation).

[2] Commission of the European Communities, *Adapting to change in work and society: a new Community strategy on health and safety at work 2002–2006.* COM(2002) 118 final, Brussels, 2002, 18 pp.

[3] Eurostat, *Statistical analysis of socio-economic costs of accidents at work in the European Union*. Final report. Luxembourg July 2004. 115 pp.

[4] de Greef, M., Van den Broek, K., *Quality of the Working Environment and Productivity*. Research working paper. European Agency for Safety and Health at Work 2004. 82 p.

[5] Mossink, J., de Greef, M., *Inventory of Socioeconomic Costs of Work Accidents.* Research working paper. European Agency for Safety and Health at Work 2002. 46 p.

[6] European Agency for Safety and Health at Work, *Business aspects of OSH.* A Web feature at http://osha.europa.eu/priority_groups/business/

[7] Laitinen H, Marjamäki M, Päivärinta K., The validity of the TR safety observation method on building construction. *Accident Analysis and Prevention* 31 (1999) 463-472

[8] Kemppilä Sari, Laitinen Heikki, Leinonen Mikko, *Working environment and productivity — A research and development project.* Tampere University of Technology, Research report, Tampere 2002. 76 p. (in Finnish, summary in English is available in [4], p. 45)

[9] Ministry of Social Affairs and Health. *Prioritising occupational safety - occupational accident prevention programme 2001-2005,* Helsinki, 22 p. http://www.tyotapaturmaohjelma.fi/english/accprevprog.doc

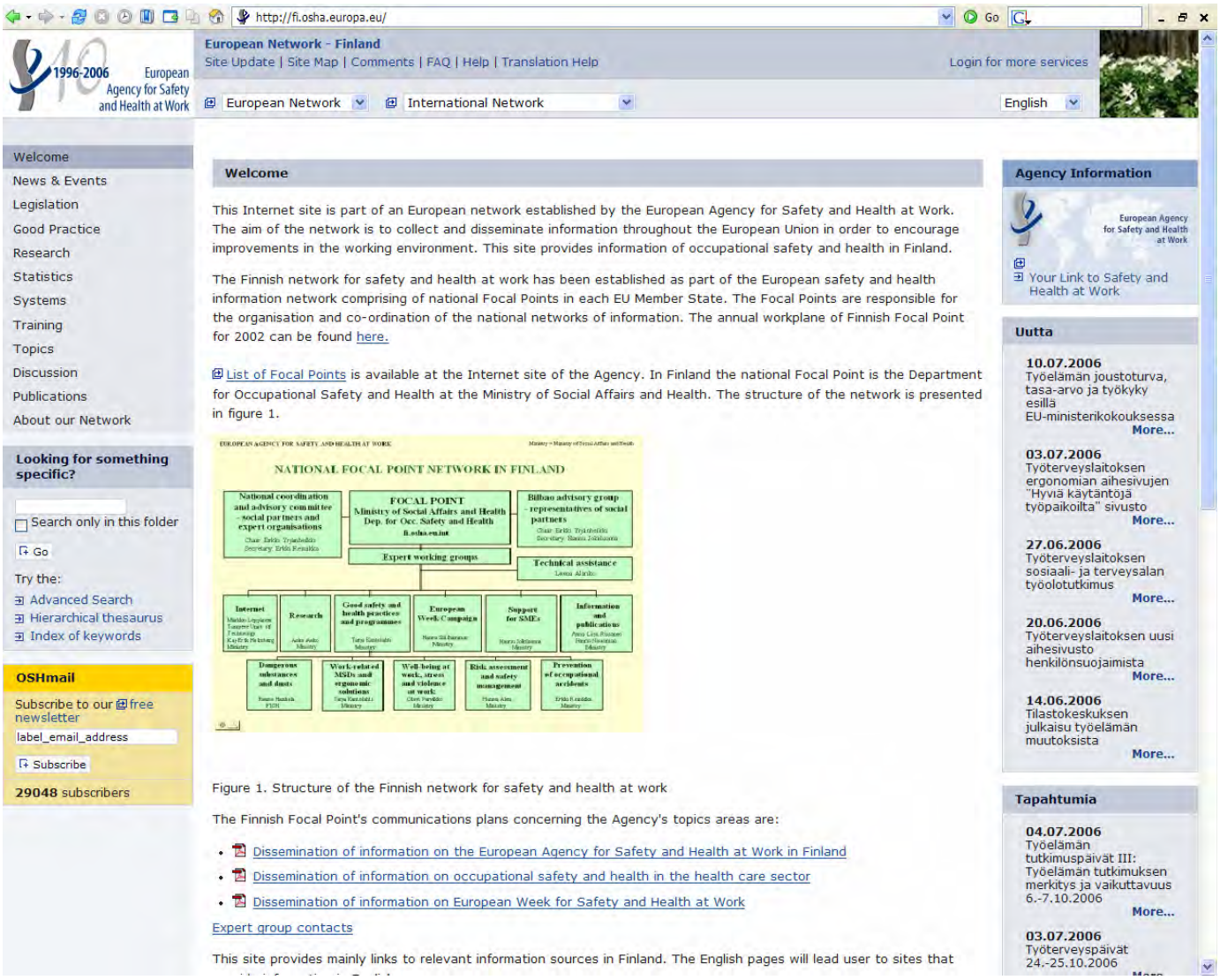


Figure 1. The main page of the Finnish Internet site for occupational safety and health at http://fi.osha.europa.eu

Finnish Institute of Occupational Health

Työturvallisuus kohti maailman kärkeä

Costs of occupational accidents - Effects of occupational safety on company business

A research and development project

Markku Aaltonen; Kimmo Oinonen; Jari-Pekka Kitinoja; Jorma Saari; Mika Tynkkynen*); Henriikka Virta

Finnish Institute of Occupational Health
Occupational Safety Team
Helsinki, Finland

***) The Federation of Accident Insurance Institutions,**
Helsinki, Finland

European Productivity Conference 2006
August 30 – September 1, 2006, Dipoli, Espoo, Finland

Costs of non-social policy in the European Union

- **Top OSH priority** of the European Commission
- Yearly **5500** fatalities in work accidents

150 million working days are lost

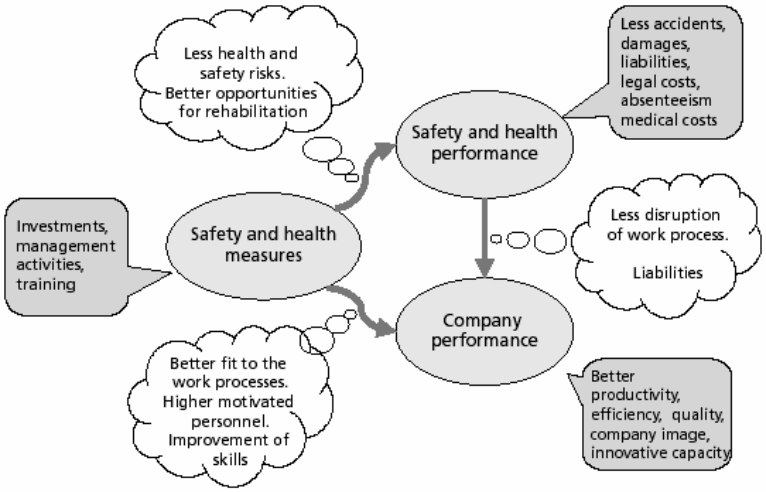
- Accident costs were **55 billion euros** in EU-15 Member States in 2000
- This equals to **0.64%** of GDP of these countries
- Huge cost for businesses and human suffering for victims and their families

Link between a good working environment and the performance of a company – Success factors (de Greef et al 2004)

- Combining business targets and human resources activities, in order to achieve better results;
- Taking a wider approach to health promotion to include not only health conditions but also employee attitudes and corporate culture;
- Using occupational safety and health (OSH) improvement programmes, as they seem to provide better results than implementing only specific prevention measures;
- Including technical innovations and organizational improvements;
- Carrying out measurement and evaluation. Demonstrating return on investment, both prospectively and retrospectively, is needed.

European model for economic effects of safety and health at company level

(Source: Mossink, J., De Greef, M., 2002)



The Finnish case study on
"**Working Environment and Productivity**"

Project organisation

- Co-operation between the:
  - 'Workplace 2000' Research Programme of the Finnish Institute of Occupational Health
  - Institute of Industrial Management at the Tampere University of Technology
- Financed by the Finnish Work Environment Fund

Project layout and period

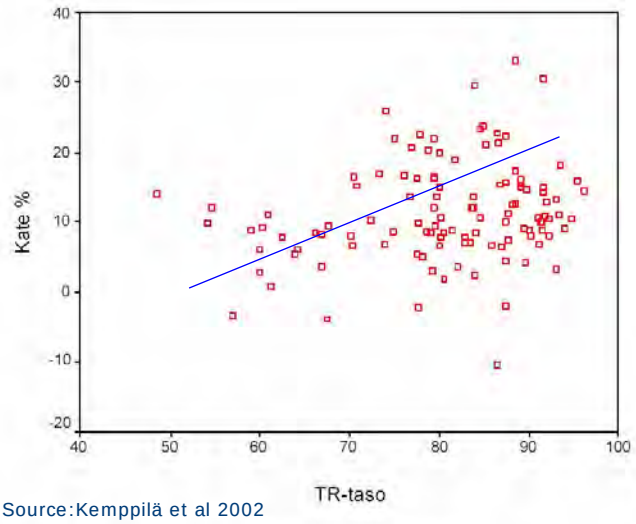
- Four sub-projects
- One construction company (incl. 142 construction sites)
- Three metal companies:
  - company I: 130 employees
  - company II: 300 employees
  - company III: 30 employees
- Project period: 1998-2002

The Finnish case study on "Working Environment and Productivity"

Interventions

- Improving order and tidiness
- 'Continuous Improvement Programme'
- Better use of computer systems
- Investment in technology
- Improving ventilation
- Improving the ergonomics of tools and equipment
- 'Fitness Improvement Programme'
- Improving the work methods
- Reorganisation of work
- Changes in salary systems
- Use of team work

Results: Correlation between the TR-level (safety level) and the margin (%) of the construction sites, n=116



Source:Kemppilä et al 2002

KUVIO 3. Työmaiden TR-taso ja kateprosentti (n=116)

The Finnish case study on "Working Environment and Productivity"

Discussion

- On the basis of the study it was concluded that construction sites with a poor working environment (i.e. low TR index) could seldom achieve good margins.
- The study showed also that a good safety level (i.e. high TR index) could even be used for the prediction of future profitability of that site.

Finnish Institute of Occupational Health

Työsuojelurahasto

Työturvallisuus kohti maailman kärkeä

Costs of occupational accidents - Effects of occupational safety on company business

A research and development project

- Occupational Safety Team at the Finnish Institute of Occupational Health
- Finnish Federation of Accident Insurance Institutions
- Finnish Ministry of Social Affairs and Health
- Finnish Work Environment Fund
- Four main Finnish insurance companies are involved in the project as well
- Project period: 2005-2007

Aims of the project

- To provide new practical methods and information about costs of accidents and economic importance of occupational safety and health
- To investigate cost information needs of different personnel groups related to OSH
- To calculate costs of accidents in companies according to the Eurostat method
- To explore effects and costs of accidents in supply chains of subcontractors
- To develop an accident scenario model for accident investigation
- To establish a framework for continuous follow-up of information in the economic aspects of occupational safety and health
- To enhance safety management by utilizing accident cost information
- To enhance productivity, quality and competitiveness of the workplace by improving working conditions

Project layout and methods

The project consists of six research modules:

1. A study on information needs on accident cost information
2. Development of an Internet site for the topic
3. Data collection and calculation of accident costs according to Eurostat method
4. Development of an accident scenario model for accident investigation
5. A study on effects and costs of accidents in the supply chain of companies
6. Dissemination and utilization of the project results and products

Preliminary results - Survey on safety information needs

Use of performance indicators in the participating companies (n=23)

Indicator	N	%
Amount of accidents	23	100
Accident investigations	11	48
Number of reported near-accidents	20	87
Accident frequency	23	100
Severity of accidents	15	65
Use of different indexes, e.g. housekeeping index	8	35
Number of risk assessments	10	43
Number of safety audits	12	52
Number of safety initiatives	8	35
Number of accomplished safety measures	4	17
Results of well-being surveys	23	100
Costs of safety activities	5	22
Costs of accidents	14	61
Costs of sick leaves	13	57
Others	1	4

Preliminary results - Survey on safety information needs

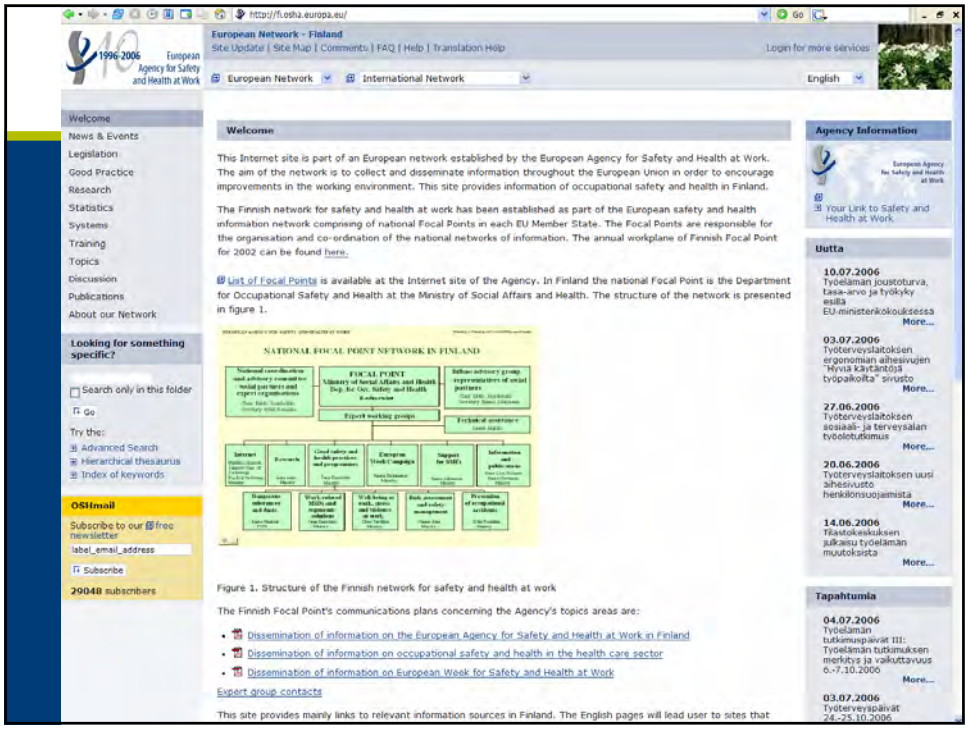
Communication of safety information in the companies (N=156)

- Electronic mails (82% of all respondents)
- The intranet system of the company (69%)
- Safety meetings (70%)
- Safety bulletins on paper (71%)
- Bulletin boards (50%)

Preliminary results

Concept of the new web feature for "Economic aspects of occupational safety and health"

- Currently the information is fragmented in various web sites
- It is difficult to get an overview of existing information
- The new web feature aims to provide complete set of information related to the topic
- The development has been carried out in close cooperation with the Occupational Safety and Health Department of the Finnish Ministry of Social Affairs and Health
- The concept of the new web feature consists of seven main chapters
- Each chapter consists of a number of sections consisting of a full-text description, list of references and list of links related to the topic of the section
- The language of the web feature is Finnish



Preliminary results

Main content of the new web feature 1(2)

Main chapter	Sections
1. General introduction	
2. Responsible company business	- Corporate social responsibility - Legislative requirements to working environment and well-being at work
3. Measures for improving the working environment	- Introduction - Improvement of work organization - Good management practice - Ergonomics - Work planning and design - Working hours - Maintenance of work ability - Training and orientation - Tidiness and housekeeping - Quality - Economic incentives and payment by results - Innovations - In-door environment - Purchasing - Measures of well-being at work - Management of human resources

Preliminary results

Main content of the new web feature 2(2)

Main chapter	Sections
4. Costs of occupational safety and health	- Introduction - Costs at company level - Costs at society level - Costs at individual level
5. Productivity	- Introduction - Importance of productivity to company business
6. Insurance systems	
7. Materials and methods	- Calculation models - Training materials - Case studies - Literature - Links

Discussion

- The connection between good working environment and productivity was understood very well at least among the respondents in the participating companies
- Cost information was available to some extent but it could be utilized better in decision making
- The development of the new web feature on economic aspects of OSH will be opened to public in autumn 2006
- More results originating from the project will be published after finalizing the research modules