

Costs and Benefits of Occupational Safety and Health

*Proceedings of the European Conference on
Costs and benefits of Occupational Safety and
Health 1997*

The Hague, 28-30 May 1997

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Fietje Naas

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Preface

This book reports on the '*European conference on costs and benefits of occupational safety and health*', which was held 28-30th May 1997 in The Hague, The Netherlands.

It gives an overview of the various presentations of the conference, a summary of the discussions which took place in the plenary sessions and the sub-groups, and concludes with some outlines for future strategies on policy, practice and research in the field of occupational safety and health, with specific focus on the costs and benefits issue.

In addition to this, in the different sections a number of papers is included that could not be presented during the conference but still are relevant to the issue of costs and benefits. As such this book is a real international state of the art document. It contains over 50 papers from all over Europe, Australia, Japan, Canada and the United States.

The conference was hosted by the Ministry of Social Affairs and Employment of the Netherlands in co-operation with the European Foundation for the Improvement of Living and Working Conditions in Dublin. The European Commission cofinanced the event and the organisation was co-ordinated by the Dutch institute for working conditions NIA TNO.

About 450 people from 37 countries participated in the conference and proved with their presence and contributions that indeed the issue of costs and benefits is a central one in many countries today.

Introduction

Costs and benefits of occupational safety and health: Background and political context

F. Licher and J. Mossink

Social policy as a production factor, the political context

The Conference on Costs and benefits of Occupational Safety and Health 1997 was part of the activities during the Dutch presidency of the European Union. All activities focused in one way or the other on the importance of a European social policy, as a natural and necessary complement to the common economic and monetary policy. Priority areas were employment, equal opportunities for men and women, and the importance of social policy for economic performance. Important steps forward should be made in these areas and the discussions should help to create a common basis for the formulation of the social paragraph in the Treaty of Amsterdam.

One of these steps was the organisation of the high-level conference '*Social policy and economic performance*', which was held in January 1997 in Amsterdam. This conference should create a platform for different views and discussion on the way in which social and economic policy interact. The main questions were: Where do they reinforce or obstruct each other? Is there something like return on social investment? At the basis of the conference stood an international study on competitiveness of the Dutch welfare state '*The Dutch welfare state from an international and economic perspective*'. In this study the performance of the Netherlands in six fundamental fields of the welfare state, including occupational safety and health, is compared with that of seven other countries: Belgium, Denmark, Germany, Japan, Sweden, the United Kingdom and the United States.

The conferences which followed later on, the conference on direct employee participation, which was held 10-11th April in Amsterdam, and the conference on costs and benefits of occupational safety and health can both be considered as follow-ups to this first conference during the Dutch presidency of the EU. During these conferences more specific questions on the interaction between social and economic policy were discussed: Do social regulations and co-determination practices enhance economic stability? Can flexibility in working times, work organisation and labour market create win-win situations for individuals, companies and society? Do high safety, health and environmental standards improve productivity and innovation?

Demand for deregulation and business impact analyses

Background to the conference was in some way also the work of the business-led Molitor Committee, the 'Report on Administrative and Legislative Simplification' and 'The UNICE Regulatory Report' both presented to the European Commission in 1995. In these reports the authors argue that detailed regulation and the administrative burden related to national and European legislation have negative effects on e.g. cost levels, flexibility, capital expenditure and management time, and thus on the competitiveness of enterprises, in

particular the small and medium-sized enterprises. The four most mentioned defects are: regulations impose an excessive administrative burden, regulations are too prescriptive, regulations are not proportionate to hazard and risk, and regulations impose too complex risk assessment procedures. The Molitor Committee therefor strongly advocated for deregulation of the existing EU-directives in the field of occupational safety and health and for thorough cost-benefit assessments (business impact analyses) on proposals for new regulation.

Costs and benefits as the central issue in OSH

The conference thus found itself in the middle of the European debate on the interrelationship between social and economic policy, and the role of European institutions in creating a common European social policy. Employer representatives and right wing politicians on the one hand and employee representatives and left wing forces generally on the other hand both arguing for a different future for Europe. It explains in some way why the issue of costs and benefits is the central issue in the field of occupational safety and health today and why such strong adversative feelings are related to cost benefits assessments. It explains also why the discussion on methodology is so important. What is and can be calculated and what not, might highly influence the outcomes of cost-benefit assessments and thus the political consequences of such assessments. The Commission has therefor started a series of activities to accomplish a more common framework to the issue of costs and benefits.

European Commission initiatives

An ad-hoc group 'Social and economic appraisal of health and safety legislation' of the Advisory Committee for Occupational Safety and Health to the European Commission is installed to prepare a methodology for the social and economic evaluation of EU-directives and an administrative procedure which should be followed when preparing such evaluations. A three year during project has been developed to gather more information on the issue and to implement cost-benefit assessments into practice. The Dutch research institute NIA TNO is co-ordinating this project in which institutes of most EU member states participate. This research group will organise a number of work conferences on the different aspects of costs and benefit assessments the coming years.

The financial support of the Commission to the conference in The Hague can be placed in the same strategy. The aims of the conference fitted perfectly in the Commission strategy to create a more common framework to the cost-benefit issue.

Discussion on the effectiveness of OSH-policy

The main aim of the conference was to bring together all the experts and parties involved in the cost-benefit debate: researchers, economists, occupational safety and health professionals, personnel managers, social partners and politicians, and 'to discuss the issue of costs and benefits in the context of the development and implementation of more effective safety and health strategies, both at the national and the company level'.

The latter is very important as the organisers did not want to reinforce the ideological positions in the cost-benefit debate, related to the issue of deregulation. The aim was to create a more open discussion on the future of occupational safety and health policies based on facts and sound analyses. This discussion should thus have a broader focus than the

advantages and disadvantages of (de)regulation for business. It should also consider the effectiveness of other policy instruments, such as financial incentives, and the impact of occupational safety and health investments on labour productivity and health care costs.

These general introductions on the theme of costs and benefits were further elaborated by other authors and discussed in the following parallel sessions:

International comparison of occupational safety and health systems,

- 1) Economic incentives, a new forward looking approach,
- 2) The benefits of work place health promotion, marketing to business,
- 3) Prevention of absenteeism, assessments of company measures,
- 4) Costs and benefits of stress prevention, practice and future directions,
- 5) Cost-benefit models, the theory and practice,
- 6) Impact of safety and health regulations on business, lessons from practice,
- 7) Occupational safety and health as a factor in competitiveness, 9
- 8) In company decision making on occupational safety and health practice,
- 9) Cost-effectiveness of occupational safety and health service, especially in SMEs.

It was this broad scope and the emphasis on facts and sound analyses in the conference programme which has been also been the basis for the co-operation with the European Foundation in the organising of the conference. The conference was an excellent platform for the Foundation to present their research and promotion work of the last few years in this area. They studied among others the effectiveness of occupational safety and health policies on both the company and the national level, gathering information on prevention projects (stress, health promotion and absenteeism) and evaluating different incentive schemes.

Political perspectives

Political statements made by Eric Carlslund deputy Secretary General of the trade union confederation ETUC and Zygmunt Tyszkiewicz Secretary General of the private sector employers confederation UNICE, a representative on behalf of commissioner Flynn of Social Affairs of the European Commission, and Frank de Grave the Dutch State Secretary for Social Affairs and Employment.

They all agreed in a more or less explicit way that risk-assessment and preventive action is necessary, that more attention should be paid to new risks (such as psycho-social risks, RSI and new toxic substances) and risk groups (for instance flexible workforce), and that the individual, company and national losses due to ill-health and occupational accidents are too high (in average 1 to 4% of GNP) and thus should be reduced. They differed however greatly in their view on the focus and possible outcomes of cost-benefit analysis, its role in the decision making process, and the need for changes in occupational safety and health policy and regulations. At one point concerning cost-benefit analysis they seemed to agree however. Both employers and employees seemed not to be in favour of including the costs of death, life expectancy, loss of capabilities and human suffering into cost-benefit calculations. Financial costs and benefits related to risk assessments, investments, absenteeism, productivity and health care should in their view clearly be distinguished from human and social suffering and well-being.

Employer and employee perspectives

The employers advocated, as could be expected, for deregulation and emphasised the necessity of business impact analyses for every piece of new legislation. They proposed deregulation on the European level along with the evaluation of the EU-directives already implemented. They see cost-benefit analysis as a possible tool for deregulation.

The employees warned for the possible misuse of the instrument of cost-benefit analysis. Costs-benefit analysis should in their view not merely focus on the short-term costs for enterprises, but also include the benefits to companies as well as to society in the long run. They emphasised that legislation has often produced innovative effects in production, with related positive effects on efficiency and competitiveness of business as a whole, and that preventive action has positive effect on health care costs and thus on social premiums and tax-expenditures.

They are, as could be expected, contrary to deregulation of existing legislation and argued for modernisation of EU-regulation, arguing that also psycho-social factors should be included and new risk groups should be addressed.

The Commission strategy

The European Commission stressed that although health and safety is a productive factor, it is also a basic right to workers. The Commission underlined the necessity for further progress in the prevention of ill-health and occupational accidents and costs which are related to badly managed health and safety. They will continue to communicate the message that investments in safety and health are generally profitable and that therefor there is no reason to argue the EU-directives. The Commission regards the implementation and enforcement of the existing EU-directives as a top-priority.

The Dutch model

The Dutch State Secretary for Social Affairs and Employment tried in some way to find a way out of the regulation-deregulation dilemma, which can hold up further progress in the field of occupational safety and health, by advocating, as has been done for environmental emissions, for concrete *reduction* targets in Europe for major risk factors, ill-health effects and occupational accidents. He emphasised that other policy instruments, like mandatory contracts for employers with occupational safety and health services, differentiation in insurance premiums related to sick leave and work disability and fiscal advantages related to investments in optimal work equipment might be much more effective than additional regulation. Especially detailed regulation is not likely to stimulate and motivate employers own responsibility.

Exploration of future strategies

The more specific aims of the conference were to exchange information and review national and international experiences in the implementation of health and safety policies and cost-benefit analyses; to identify and discuss the key factors influencing costs and benefits of occupational safety and health policy at the individual, the company and the national and at the European level; to explore strategies for the future in policy, science and practice to improve the efficiency and effectiveness of occupational safety and health.

1 Key issues, review and perspectives

Introduction

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This chapter gives overview of the current issues in the field of costs and benefits of occupational safety and health.

The outlines of the topic of the conference were sketched in a background paper, a review of recent research and a discussion on cost-internalisation, which seem to be at the heart of the current discussions. The background paper of Mossink gives an overview of issues in both the political debate and in research. In this paper, the contents of each chapter are placed into the wide picture of costs and benefits of occupational safety and health.

Eleftheria Lehmann of the 'Landesanstalt für Arbeitsschutz Nord-Rhein Westfalen', made a keynote on the state of the art in cost-benefit research. She did this by listing the problems involved in cost-benefit analysis. The first problem is that to prove the benefits of occupational safety and health prevention one should calculate the possible savings due to accidents or illnesses that did not occur. Although these can easily be estimated at the macro-level (1-4% of the GNP, as has been calculated in various countries), they still do not prove anything about the real benefits of investments in safety and health. Many questions arise when studying more closely the effects of safety and health investments e.g. are all accidents and illnesses really avoidable, until which prevention level benefits exceed costs, and should one calculate absenteeism as a cost even as there often is no evidence of real production loss? One way to solve this problem is just to look at the human costs of badly managed safety and health, for example by calculating the number of absence days every dollar production. However that leaves the difficulty of establishing a desirable societal figure for this indicator, as the value of lowering of this figure for employers and employees is unknown.

The other way is to try to calculate the benefits of preventive action at the company (micro) level in terms of avoidable production losses. This has proven to be as tricky as the calculation of benefits at the societal (macro) level. Often no direct link between preventive action and reduction of production losses can be proven. Other interfering factors are the non-occurrence of production losses due to planned flexibility and the existence of over-capacity.

A better indicator might be the calculation of the number of non-disturbed production hours. Dividing the costs of occupational safety and health investments by this number will give a quite interesting efficiency indicator for the company prevention policy. This indicator can be especially helpful when one is primarily interested in the cost-effectiveness of safety

and health measures, also in relation to other preventive measures e.g. in the area of quality control or environmental policy.

In addition to these kind of cost-effectiveness analysis also more qualitative analysis can be made to estimate the added value of investments in occupational safety and health to flexibility and the quality of production. In various companies considerable positive effects are found on these production parameters by investing in the quality and the organisation of the work and the psycho-social well-being of the workers.

The keynote address on the question 'What is the debate on costs and benefits about?' was made by Peter Dorman, of the Michigan State University. He stated that the issue of costs and benefits is in the end a story about cost-internalisation. He argued that due to globalization and the increase of flexible work patterns the traditional occupational safety and health legislation is in crises, and advocates strongly that new forms of enhancement of public health values have to be introduced. Cost-internalisation e.g. by introducing differentiation in insurance premiums and an injury tax is such a form. Although cost-internalisation can have, and has demonstrated in practice, several positive effects on the company behaviour, Dorman argues that full cost-internalisation, however, is not feasible neither desirable. Not all costs can be adequately calculated and attributed, not all societal costs can be appropriately addressed, and full cost-internalisation can come in conflict with the limited liability basis of the company.

In addition to the mechanism of cost-internalisation he therefore argues for institutional reform. In his perspective, this includes in his perspective full information about health and safety risks for workers, presence of health expertise in the company, workers right to refuse dangerous work and close collaboration between employer, experts and workers in the formulation and implementation of a company safety and health policy. It is thus in the combination of regulation, cost-internalisation and institutional reform that workers health can be guaranteed also in the modern corporation.

Costs and Benefits of Occupational Safety and Health

Background paper for the European Conference on Costs and Benefits of Occupational Safety and Health 1997

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Introduction

The costs and benefits of improving working conditions and occupational safety and health are crucial in a number of ways. They are a key element in development and implementation of new policies and improvements for occupational safety and health. At all levels (national, companies and individuals) improvement of occupational safety and health can produce attractive benefits, but there are also costs at all levels.

Interest in the costs and benefits of occupational safety and health is growing from several perspectives. It is argued that quality of work and good working conditions are positively related to both better health and well-being of employees and competitiveness of companies. In most countries of the European Union legislation has come into effect or is in preparation. A number of questions about the costs and the benefits arise, and it is clear that occupational safety and health legislation may have both economic costs as well as benefits.

In Europe, but also in Australia, Canada and the US a growing number of studies have been published about the costs and benefits of all aspects of occupational safety and health. Topics that are addressed frequently are the cost of occupational illnesses to society and cost-benefit analysis of projects or at the company level. Several instruments for cost-benefit estimations have been developed. In addition, a number of more specialist topics are to be found in literature, like costs and benefits of health promotion, stress prevention, safety and accidents, (reduction of) physical workload and vocational rehabilitation.

This paper presents an overview of current issues, perspectives and state of cost-benefit research. It serves as a background to the conference programme. In the following sections a number of major issues are briefly outlined and related to the programme of the conference.

Occupational safety and health is an economic factor

It is hard to show that policies on occupational safety and health can be put in practice without paying attention to the economic side. Any policy or measure that affects work the way work is performed is likely to have an economic impact.

At the macro level there is an effect on total macro-economic efficiency, losses (or availability) of resources, and financial costs. There is an influence on the distribution of (financial) revenues and costs between individuals, companies and collective funds or insurances. Furthermore, occupational safety and health has effects on the labour market.

Vocational preferences and financial compensation for unhealthy or dangerous working conditions are examples.

At the sector and company level, compliance with regulations and standards may pose a cost factor and for certain sectors this may affect international competitiveness. Companies or sectors that are known for bad working conditions may have problems in recruiting good personnel and may have to compensate this by higher wages.

Within companies) preventive policies have both costs and benefits. The costs consists of preventive action (policies, investments) and corrective costs (damages to health, costs of absenteeism or legal damages). The benefits can be monetary (reduction of costs) but can also consist of benefits that are harder to express in money (such as morale, productivity or quality gain). Better occupational safety and health can improve organizational performance. Some recent studies show that work and innovation are related and that organizational structures that offer good working conditions stimulate innovation.

From the perspective of employees, working conditions may influence vocational preferences. Most importantly, workers (and their) families are confronted with the (economic) consequences of ill health.

Why cost-benefit analysis?

In itself, improving health and safety is a goal worth pursuing. However in general there is competition between goals as (financial) resources are scarce. Cost-benefit evaluations can help in this situation in several ways:

- Focus attention on occupational safety and health as an (economically) interesting goal to pursue and emphasize the importance of the issue.
- A supporting role in decision making processes.

For practical situations a number of motives and uses for cost benefit-analysis can be indicated, very much dependent on the situation and the actors. Some examples are:

- The spectrum of preventive measures is large, so the problem is to choose the most efficient use of scarce resources, in order to achieve maximum effect at minimum cost.
- Assessment of the value of good working conditions in relation to other goals.
- Demonstration that a high level of occupational safety and health standards is affordable.

Cost-benefit analysis (at least in the Netherlands) is less common in the area of occupational safety and health than for medical treatments, infra structural and environmental projects or of course in projects that have an economic or commercial goal. In some European countries cost-benefit analysis and/or impact analysis of new legislation (also in the field of occupational safety and health) is common practice.

The effects of improved occupational safety and health on business are important at several levels (company, branch as well as national level). In many assessments of the costs and benefits of occupational safety and health, the benefits of improved productivity are not quantified. At the macro level in particular, improvement of company productivity is often neglected. However, the link between working conditions and employee health on one hand and company competitiveness on the other hand is one of the emerging areas of interest.

OSH as economic factor, some major issues

- Damages and costs sum up to 1.5% to 4% of GNP of European countries, how can prevention reduce the costs?
- Does free market regulation lead to better occupational safety and health?
- If so, under what conditions and which sectors or professions profit most?
- What can be done to internalize costs to companies?
- To what extent can social security systems, incentive systems and legislation contribute?
- What is the state of knowledge and experience?

International perspective

A number of factors influence the outcome of economic assessments on the macro level. In particular the costs and benefits for each of the parties involved (authorities, companies, workers, insurances) vary with the context of the social security system.

International differences in social economic structures, as well as in culture and ethics will influence values and attitude regarding work and occupational safety and health. Examples of international differences are:

- Social security system, differences in legislation;
- Occupational diseases compensation system and statistics;
- Differences in labour participation, economic structure of sectors;
- Differences in market structure (availability and prices of services and products).

International comparisons may give insights in the effectiveness of the systems and give clues for future directions. However, a wide range of factors will have an impact on the available data and statistics used in calculations of national costs, so that international comparisons will be difficult and can only be performed with great care.

International comparison of occupational safety and health systems

- What are current national policies, regulations and social security systems?
- What are particular strengths and weaknesses of national policies and social security systems?
- What can countries learn from each other?

Actors

One of the most complicated issues in the analysis of costs and benefits of occupational safety and health is that at least three groups of actors are involved:

1. Individuals, workers and their families;
2. Companies, sectors and private insurances;
3. Government, collective funds.

Actions and behaviour of these three groups of actors are strongly interrelated and costs and benefits of occupational and health are transferred between these groups. The interests of each of the groups differ, as do their capacities to influence conditions at work.

The economics of occupational safety and health examines the decision making within, and the behaviour of, each of these groups as well as the debate between them. At the same time the effects of different policy choices are quantified as much as possible. In the national discussions the division of costs and benefits between the parties is one of the major issues.

One of the specific issues in both the debate and research on the costs and benefits of occupational safety and health is that those who pay the costs do not necessarily get the benefits. Much of the discussion is about which party should invest and to what extent. Issues in this respect are for instance:

- Transfer between groups of actors, role of regulations and government policies. Note that in studies on the macro costs, the allocation of costs between the parties does not play a role as transfer payments do not add to the gross national product (GNP).
- Administrative structure, what is an optimal allocation of responsibilities and tasks between the various actors.

In the discussion on new legislation and social security, employers often argue that safety and health measures increase costs. In several countries, such as the UK and USA, the impact of new regulations is assessed before regulations come into effect; and the impact on business is often a key focus.

Impact of occupational safety and health on business

- What are the positive and negative outcomes of regulation concerning OSH on business;
- Experiences with recent cost-benefit analyses and evaluation of effects of legislation on costs and business;
- What are the strong points and weaknesses of recent examples, how can assessments be improved;

Stimulating preventive action

Occupational safety and health costs are generally generated at the company level. Also, any practical improvement or policy implementation takes place within the company context. Therefore, the micro level is of great importance. As a consequence, companies (most of which are classified as small or medium sized) are key actors. The costs and benefits are a consideration in influencing companies' behaviour with respect to occupational safety and health.

Often the costs of occupational illnesses and accidents are externalized (transferred to other actors such as individual workers, collective funds or other companies). Internalization of

costs and benefits is essential in order to use economic incentives as a mechanism to stimulate companies to start preventive action. Several possibilities seem available to internalize costs:

1. Incentives in insurances and the social security system;
2. Making the employer liable for occupational diseases and accidents;
3. Demonstrating that good working conditions enhances productivity and quality and contribute to the company's competitiveness (see section 6).

Internalization of costs should lead to full cost pricing of products and services. Damage to health and well being may be caused by the production processes and therefore should be treated as part of the production costs.

Internalizing costs: incentive systems

Incentives can be used to stimulate enterprises to improve occupational safety and health effecting an economic motivation. The incentives are intended to mobilize social partners (inside and outside the enterprise). Improvement strategies have to be initiated and carried out within companies. In particular preventive action should be stimulated. Incentive systems can help to internalize the costs.

One of the possibilities is to create a system of insurances with premiums that are composed of three elements (base, sector specific part and a part that depends on the work environment). Incentive systems to stimulate the appropriate choice of measures (technical, organisational, educational) may include tax reductions, subsidies, influencing availability of capital, reduction of insurance premiums, marketing assistance and the like.

Economic incentives: a new forward looking approach

- Which incentive systems are in practice?
- How can incentive systems be improved?
- What are implications for employers, trade unions, policy makers and insurance organisations?

Internalising costs: liability issues

In several countries the number of claims by workers are increasing. Claims are often a consequence of damages due to accidents and more traditional occupational illnesses (like consequences of exposure to asbestos). Also the first claims with respect to stress and repetitive strain injuries (RSI) have been granted. The legal component and liability issues are likely to play a role in internalizing the costs of occupational accidents and illnesses. It can be seen as an addition to incentive systems. The mechanism for liability to be introduced as a method to internalize costs gives rise to discussion. For instance, one could imagine that especially weaker parties (workers, but also small enterprises) will have difficulties bearing the burden of legal procedures.

An important issue in the subject of liability is the extent to which illnesses can be related to work.

Benefits to companies

Beside the avoidance of costs, attention to the economic benefits of improved safety and health at work can also offer a stimulus for preventive action. Of course, cost reduction, effective production and cost levels are important to companies. However, companies' competitiveness also depends on the ability to anticipate any changes in the market and to innovate in both its products (or services) and its production processes, in order to develop new markets and growth.

Occupational safety and health has an impact on the cost level as well as the innovative potential of a company. Recently attention has focussed on the contribution of workers' health and well-being to the performance of companies. Though indications have been presented in a number of studies, firm and generally applicable evidence is lacking.

Occupational safety and health as a factor in competitiveness

- How does improved occupational safety and health improve competitiveness?
- How effects of OSH on competitiveness be qualified?
- What evidence is available, examples of the positive impact of OSH on competitiveness.

Potential benefits of improved safety and health for companies

Health promotion and stress prevention are two important strategies at the company level. Both have effects on workers' health and companies' performance. Though in most countries not recognized as an 'official' professional illness, stress related health problems are likely to account for a major fraction of the total costs of occupational diseases and accidents. Furthermore some authors point out that organizational structures that reduce stress risks also contribute to improvement of the competitive advantage of companies.

Costs and benefits of stress prevention

- What is the prevalence of stress among European workers?
- What are the relevance, ways and problems of assessing the costs and benefits at the company level?
- How can the assessment of costs and benefits of stress prevention at the company level be improved?

In company decision making, clarifying the costs and benefits to companies

At the micro level, this relation is for instance especially clear in ergonomic improvements that enhance productivity. It can also be demonstrated in organisational structures that at the same time reduce stress risks and enhance flexibility.

A number of models and methods have been developed to evaluate occupational safety and health activities at the company level. Some are limited to consideration of the monetary aspects, while others have a wider scope and deal with non-monetary benefits as well. Most of the techniques follow common practices for economic evaluation of investment and offer an extension to these practices. However, the use of economic evaluations for occupational safety and health improvements in the company is not widespread. Little is known about practical experiences and especially the predictive and practical value are not clear.

The benefits of health promotion: marketing to business

- What are the principle benefits of workplace health promotion?
- To what extent can arguments of costs and benefits contribute to a more successful marketing of workplace health promotion in companies?
- Which approaches offer the best perspective for successful marketing of workplace health promotion in companies?

In company decision making on occupational safety and health: impact of economics

- Which instruments are in practice, what are experiences with economic evaluation instruments?
- What can be learned from practical experiences?
- Do existing instruments meet the needs of practice, do the instruments provide the right answers?

In literature mainly ex-post evaluations are reported. Evaluation of general health promotion programmes, ergonomic interventions and for example, prevention of hearing loss programmes can be found. These certainly can be used as illustrations, but in most decision-making processes ex-ante evaluations are more useful. There are many problems with making good ex-ante evaluations, the lack of data concerning the relationship between measure and effect being rather fundamental.

Markets

One of the intriguing questions for (inter)national occupational safety and health policies is whether market mechanisms will eventually lead to better occupational safety and health. And if so, for which sectors or professions, or, if not, what regulations and incentives will be effective. In order to answer this question, an economic analysis would be helpful.

Economic theory

In the field of economics and econometrics little work appears to have been done on the issue of working conditions as an economic or production factor. Application of neo-classical

theory to working conditions can explain certain observations (e.g. higher paid jobs tend to have better working conditions) with respect to employers' behaviour. While the use of the neo-classical theory is subject to a number of preconditions, it is precisely these preconditions that seem not to hold in the case of working conditions and occupational safety and health:

- complete information and certainty, knowledge within companies about the costs and the benefits of measures, investments or policies;
- dynamics: the effects of adverse working conditions may have long latency times, improvements can take considerable time before an effect becomes apparent. The planning horizon of companies and the requirements for pay-back periods may be much shorter.
- transaction costs are known,
- rationality: economic models, based on neo-classical economic theory assume rational behaviour, in fact employers do not optimize constantly in a rational way. On the other hand, no employer can persist in not-optimizing systematically (for economic reasons).
- decision making in companies is spread over the organisation and many people are involved; as a result the process becomes more diffuse and more arguments are involved.

Economists point out that the measurement of working conditions is problematic as there is no single measure to rate working conditions.

Markets for technology, information and services

As the demand for "worker friendly" equipment grows, prices will lower. Low risk materials and equipment and processes that are (relatively highly priced) specialities today will be tomorrow's commodities and available at lower prices. Features improving occupational safety and health will increasingly be integrated in design up front. At the moment however, improvements in safety and health are often add-on investments which have (of course) higher cost. In order to bring about desired effects in the technology market, economic incentives and legislation may play an important role.

Occupational safety and health services and consultants can (among other) play a role in improving information transfer to companies (consulting). One of the challenges occupational safety and health services face is to show their (economic) effectiveness and value to companies. It should be recognized that the supply side in the OSH market (for technology and services and information) seem to be immature.

Cost effectiveness of occupational safety and health service, especially in SMEs

- Do OSH services and current technology markets meet the needs of companies (in terms of cost-effectiveness)?
- What are current trends in OSH services?
- What is the position of small and medium sized enterprises?

Methodological issues

The process of making good economic assessments and the use of these assessments as a background for policy making poses a number of methodological problems.

1. The relationship between conditions at work and health is not clear cut. For some occupational diseases a single cause can be found (like hearing impairments or some respiratory or skin diseases). For other such as stress related health problems or musculo-skeletal impairments multiple causes (both inside as outside work) exist. It may be difficult to establish the extent to which some health problems can be related to work. Furthermore there is mostly a time delay between exposures and (health) effects, of 10 to 20 years for some diseases.
2. No good or at least accepted method is available to give a monetary value to health, suffering or human life.
3. The result of any method is only as good as the data available. Many of the costs are unknown or can only be estimated by using statistics about workers compensation. The quality of statistical data is uncertain in many cases. In some countries compensation costs are well known and can be used as a starting point, but in most, information on sick leave is probably not completely accurate. More or less the same goes for the diagnosis. Some economists point out that no data or measurement method for working conditions or occupational safety and health status exist.
4. Workers' health may be a productive factor. So far, enhanced productivity or quality is mostly not (in a quantitative way) included in cost-benefit assessments at the macro (national) level.
5. Future behaviour of key actors and also secondary effects of improvement of working conditions are generally not included in methodology. For instance side effects of lower sick leave rates on unemployment or the labour market are seldom addressed. Also changes in regulations may provide a stimulus for technological or organizational innovations that are not dealt with in current methodology.

For future development of methodology one of the challenges is to balance the needs of policy makers and social partners with methodological limitations, acknowledging that many costs or benefits that can not (yet) be expressed with a monetary value.

Scope of the cost-benefit issue

It must be emphasized that the scope of cost-benefit analysis is much wider than just evaluating the economic impact or calculating monetary value. The quality of (working) life, health, social benefits and welfare should be part of any evaluation. However, probably because sound methodology in this respect is lacking, these aspects seldom turn up in evaluations. As a consequence current discussions often focus on just the monetary values that can be assessed.

Cost/benefit models

- Which are the key issues in cost-benefit analysis and models with respect to occupational safety and health?
- What are the current weaknesses in methodology and which options do exist to overcome these weaknesses?
- What are the borders and limitations of methodology?
- Does current methodology meet the needs for policy development and does it support the public debate on occupational safety and health?

Conclusions

Until some years ago, OSH was a field in which autonomous action was taken and specific goals were pursued, without considering the economic impact. In recent years interest in the economic impact has been growing. In discussions between social partners on new legislation and policies the economics of occupational safety and health has become an important part. Meanwhile, non-monetary benefits seem to be only in the background. Research and experience has shown many imperfections in methodology. So far promising options for further development are hard to find.

The economics of occupational safety and health can demonstrate interesting incentives to companies. It has become clear the companies can benefit from better occupational safety and health (both in reducing costs and improving productivity and innovation). Much has to be done to firm up evidence and methods for decision making. In this respect, the current state of the art offers a good basis for further development.

It should be concluded that occupational safety and health has an influence on economic factors at all levels of the economy, both direct and indirect. However, the implications for the actors (workers, employers, policy makers, governments and collective resources) are not fully understood. Interests differ, leading to a debate in which cost-benefit analysis is becoming more important.

One of the important issues is the question of internalizing costs of accidents and ill health to companies, in order to stimulate preventive action. Recently, progress has been made in the development of promising incentive systems and the first experiences are available. The "European Conference on Costs and Benefits of Occupational Safety and Health 1997" offers ample opportunities to exchange experiences and opinions on a wide range of aspects of costs and benefits of OSH. It is the aim of the conference to explore options for future practice, policy development and research.

Internalizing the Costs of Occupational Injuries and Illnesses: Challenge or Chimera?

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Efficiency, Public Values, and the Promise of Cost Internalization

In 1833, the young Edwin Chadwick, an acolyte of Jeremy Bentham and the utilitarians, drafted a report of the Factory Commission. Charged with the task of documenting the conditions in England's workshops and recommending policies to deal with them, Chadwick called attention to the hardship caused by industrial accidents. These accidents could be prevented, he said, if the costs were borne by the employer. If those who managed production had to pay for the human costs as they routinely paid for materials and lab or itself, the pressure of the marketplace would become a powerful force for safety and health. To bring this about, Chadwick recommended legislation that would assign legal liability to employers rather than workers, so that compensation could be sought in the courts. In another report filed 13 years later, Chadwick extolled the virtues of his "employer-pays" strategy:

It dispenses with agencies of inspection,--and a priori regulations; it reaches where they would not reach, and renders arbitrary and troublesome interferences unnecessary--it is awake and active when authority and public attention, and benevolence and humanity are asleep or powerless.¹

This position ran against the current of the time. Jurists and public officials, under the sway of the new science of political economy, opposed any interference with the freedom of workers and mill owners to conduct their own affairs. The terms of employment could be left to the discipline of the market, it was thought, in which it was up to each party to judge for itself the costs and benefits of work and risk. If workers underestimated the dangers of employment--well, they would learn to be more discriminating in the future. Shortly after Chadwick's report was published, the British courts adopted the doctrine of "assumption of risk", according to which it could be inferred that, by accepting employment, workers accepted the predictable risks associated with it and could not obtain relief in the event of an injury. The liability was placed firmly on the side of the worker, and the costs were lifted from the employer.

Chadwick did not question the logic of the free market approach directly. He did not, for instance, argue that workers were incapable of making sound decisions, or, more subversively, that assumption of risk was an unwarranted inference altogether. Instead, he took the pragmatic view that industrial injuries and illnesses were extremely costly, and that assigning liability to employers would be the surest route to the reduction of these costs. In other words, he made public health and welfare his primary criterion, rather than freedom of contract or economic productivity. Economic incentives were to be a means, public health the end.

It comes as a shock, sometimes, to see how little distance there is between ourselves and our ancestors. Chadwick's views on public health and the role of cost internalization are behind the latest wave of thinking in this field. Whether we look at efforts to reform workers' compensation, or to replace government regulation with economic incentives, or to employ cost internalization in international trade agreements, It appears that the best practice of the Victorian era is the benchmark for the policies of the 1990s.

The promise of cost internalization becomes clearer when we consider it in the larger context of competing approaches to industrial safety. To the employer, safety is one aspect of the production process, to be managed according to the same principles and through the same decision-making apparatus as any other. To the extent that unsafe working conditions impose costs on the firm, measures may be taken to reduce them. Those who count the costs, evaluate the alternatives, and implement the correctives are members of the managerial hierarchy; they issue instructions to their subordinates and take their bearings from their superiors as would any other manager. This perspective highlights two closely related notions of efficiency as it applies to OSH: (1) the efficient allocation of resources, meaning that the costs of unsafe conditions are abated to their profit-maximizing level in their least-cost way, and (2) the efficient organization of production, in the sense that the management of safety is one element of a larger apparatus that is efficient in its use of information, its choice of options, and its implementation of results. Since real-world safety concerns are usually intertwined with essential matters of production methods, personnel management, and organizational structure, it is hardly possible that these efficiency criteria could be abandoned in the realm of safety without far-reaching consequences for the performance of the firm in general. This is the perspective of the employer.

Over the last hundred years, however, two other principles have guided public policy in this area that have little to do with efficiency. The first is that of public health. The public health view seeks to counteract threats to the health of the population; if the goal of firms is to maximize profits, the goal of the public health community is to minimize morbidity and mortality. The absolutist character of this mission, so alien to the economic mindset, draws on the tradition of medicine. Doctors, after all, do not ask whether the patient's health is worth the cost: if there is a remedy it must be taken. Health, from this perspective, is not a commodity to be traded off against other goods in the market place; its value is thought to be incommensurable - a precondition for the enjoyment of any other value. Thus, while Chadwick appealed to the measurable costs of industrial accidents and disease, he did not intend that policy remedies should be sought only to the extent of these costs. His real purpose was to persuade British public opinion that the improvement of the entire population's health status was a legitimate, even urgent, objective of government.

The second source of public activism in OSH draws on the worker's demand for justice and fairness on the job. Justice, in this context, means something very specific: no one should derive personal benefit by imposing hardships on others. (On reflection, this is one formulation of Kant's categorical imperative.) Those who share in the profits of a firm, whether as owners of highly-paid managers, should not do so at the expense of preventable risks to the workforce. This precept seems to have animated labor movements in every

industrialized or industrializing country; there is something "natural" and universal about it, even if philosophers can see problems with it. In particular, it is much more widely shared than the competing perspective of utilitarianism - that A should not impose hardships on B *unless the benefits to A exceed the costs to B*. The prevalence of kantian ethics within the labor movement has led, however, to a pattern of worker protest that has been deplored by both the efficiency and public health perspectives: workers and the general public, it is argued, focus on hazards that trigger claims of injustice rather than those with the greatest health consequences or the highest benefit-to-cost ratios of abatement². Nevertheless, the Kantian perspective continues to win the most votes, and its effects can be found in every national OSH system³.

The advertised magic of cost internalization is that it can reconcile these apparently contradictory approaches. In the passage from Chadwick quoted above, the employer-pays principle is credited not only with reducing the burden on management, but also achieving the most effective promotion of health objectives. We might even manage to incorporate worker concerns for justice into the mix, if we can convert the worker's sense of infringement to a cost to be borne by the employer. In any event, placing the full financial burden of injuries and illnesses on the firm promises to assuage the thirst for justice at its source, by dousing the suspicion that well-heeled owners and managers are profiting from disease and death. There is something for everyone, then, in this program of calculating and assigning costs: freedom from government interference for business, and a healthier and fairer workplace for the public. What's not to like?

The Current Moment in Safety and Health

Before addressing the issue of cost internalization head-on, it is important to examine the context within which this discussion is taking place. For a full century in the industrialized countries OSH policy has been driven by the public values of health and justice; only in the last decade or so has the perspective of efficiency once again vied for dominance. Why is this? Have the policies inspired by the labor and public health communities reached a dead end? Have conditions changed in such a way that efficiency is now a more pressing concern than it was in the past? Or is it simply a matter of changing fashion - driven by a changing balance of power in the political economy of the industrialized world?

The first point to observe is that public statistics suggest that working conditions are continuing their gradual improvement in the OECD countries. Each nation has a different story to tell, but the overall pattern is one of declining fatal and nonfatal risk. In the United States, for instance, the deterioration in lost workdays and lost workday cases evident in the 1980s has been replaced by steady improvement; reported injury rates approach their lowest levels, attained at the depths of the 1981-83 recession. Even rates of repetitive strain injuries, the primary growth sector in OSH statistics, have turned down for the first time. These results are not due to the changing composition of employment; they can be seen within individual industries and occupations as well as in the economy-wide aggregates. Traumatic fatalities, now more accurately measured in the Census of Fatal Occupational Injuries, have continued to decline as well, and both of these trends are heartening in light of the pro cyclical

nature of occupational injuries. Perhaps, like steady prices, declining injuries in the context of high employment is a mystery for Alan Greenspan to contemplate.

Similar evidence appears in the Canadian data; indeed, their fatality and time-loss injury rates set new all-time lows in 1994, the latest year for which information is available. Progress is less dramatic in Germany, but injury rates have declined moderately from the early 1990s to 1995. Injuries requiring four or more days of absence have declined sharply over the same period in Japan, although fatality rates (which are considered more reliable in that country) are approximately steady. Why progress stalled in some industrialized countries during the 1980s and why it appears to have resumed in the '90s is still unexplained, but it is clear that OSH policy is not obviously "in crisis" as that term is normally used. This is not to say that we ought to be complacent about the OSH status quo, of course. Risks at work remain too high. The point, however, is that current policies are making progress more or less as they have in the past. The sudden pressure to change course must have a different origin.

One possible basis for concern would be the inadequacy of the statistics themselves. Reported injury rates are unreliable in countries in which firms have the option to engage in workers compensations claims management. Fewer injury reports, as Hopkins (1995) suggest, may reflect more intensive claim suppression or contestation rather than fewer actual injuries. A more serious problem is radical under counting due to the difficulty in measuring fatal and nonfatal illnesses, as against injuries. With onset periods that may exceed the worker's job tenure, multiple causation, and overall uncertainty in identifying the etiology of these conditions, it is not possible to generate hard numbers. The American Public Health Association has estimated the incidence of fatal occupational illness at approximately ten times that of recorded fatal injuries, but this is only a guess. (Landrigan, 1992) Nor do we know whether the problem is getting better or worse. This might be reasonable grounds for concern over the adequacy of current policies, but it is not the source of the new pressure for change. Those who advocate a stronger role for economic incentives --and a weaker role for traditional regulation--are not, in general, the Cassandras of chemical exposure. More often, like Justice Breyer, they regard fears of industrial chemicals to be irrational and exaggerated.

In my opinion, there are two profound economic developments that are responsible for the "crisis" in OSH policy and which underlie the resurgent interest in cost internalization, the process of globalization and the shift toward flexibility. Each of these requires some explanation.

Globalization has become one of the most widely used, and one of the most useless, terms in popular discourse. Like "industrialization, development, and other portentously vague signifiers, its universal applicability implies a uniformity and inevitability to economic processes that are unwarranted by the facts. It is certainly true that the world has become a smaller and more tightly integrated place. Trade as a percentage of global product rises year after year, investment is generating worldwide production networks, and international treaties are providing the legal underpinnings for a unified economic space. This process

is what is generally meant by the term globalization, yet the description as it stands is incomplete. What we have experienced is not globalization in general, but a specific trajectory of globalization marked by these elements:

- * Technical convergence. Until recently different regions of the world had different technical systems. Engineers were trained differently, textbooks and journals were different, and skills were not easily transferrable. All of this has changed. A company from country A can go to country B, hire local expertise, and implement a system designed in country C, where A, B, and C encompass all of the developed countries, the developing portions of the developing world, and an increasing share of the formerly communist world. One consequence of this convergence is that national approaches to adapting technical systems are less viable.
- * The collapse of national Keynesianism and other closed economy models. In most countries, the political left governed, when it did, under the banner of economic development through bolstering effective demand or through the erection of particular national economic institutions. As economies integrated, these programs become less viable, although the fault lines have differed from one country to the next. The important point for our purposes is that the leading edge of social regulation was tied to this coalition and has shared its fate. All OECD governments are now in the hands of the Right or of a Left mimicking the Right, and no signs of change are on the horizon. This has fundamentally altered the political climate for OSH policy.
- * New trade imperatives. It is not merely the volume of trade that has changed: the purpose of trade has changed as well. In the aftermath of the debt crisis of the 1980s the developing countries came under the direction of the international financial institutions. These countries were required to adopt a strategy of export promotion based on the attraction of foreign capital, and the consequences for all of us have been profound. The developing world still hemorrhages capital due to its indebtedness and must generate trade surpluses with the OECD countries. The developed countries in turn struggle to obtain offsetting trade surpluses with one another, a game that, in the aggregate, can't be won. But the constant pressure to improve trade performance has become a dominant feature of every national economy.

Globalization might have taken a different path, but it took *this* path, with the resulting effects on health and safety policy. It makes little sense, then, to rail against globalization as such; we might envision other forms of economic integration that are more consistent with public health objectives - but that is a task for another day.

The second fundamental transformation of the last years is summed up in the term "flexibility", but there as well it is important to be precise. Flexibility can take on many meanings. As a normative value it appears unexceptionable, since who would prefer to be rigid? Yet there are many ways in which economic institutions can become more flexible, and some are in conflict with others. For instance, it is a commonplace in industrial relations to note that greater flexibility on the shop floor is purchased at the expense of less flexibility in employment levels. Moreover, there are values in the workplace about which it is not always to wise to be flexible; health is certainly one of these.

The drive for greater flexibility in employment and production systems has several sources:

- (1) New technology permits greater reliance on ad hoc management methods and less on formal rules and hierarchy. Elements of the work process can be spun off, recombined, and coordinated at a distance, all the while remaining within the firm's informatic penumbra.
- (2) The attractiveness of outsourcing in a nearfrictionless international economy has reduced the incentive to maintain internal labor markets, training systems, and other quasi-permanent labor arrangements. The era of downsizing is fundamentally about reducing the core workforce, not about reducing the size of firms in general. On the contrary, the concentration of the world's production in a small number of firms continues unabated, even as fewer workers are securely "inside" these firms. (Harrison, 1994; Standing, 1997; Storper and Scott, 1990)
- (3) Management theories based on just-in-time resources (including workers), niche production and marketing, quick strikes and nimble withdrawals from shifting markets, etc. are currently popular. These may reflect the changing incentives outlined above, or they may be due to the fashions of the moment. Nevertheless, business organization and strategy have changed fundamentally. To put the issue bluntly, a managerial ethos predicated on hierarchy and centralized control has been replaced by market-oriented values and methods *inside the organization*.

Taken together, globalization and the new cult of flexibility have enormous implications for OSH policy. Regions are pitted against one another as locations for investment, and policies that interfere with competitiveness are seen as unsustainable. It is important to consider exactly what competitiveness means with respect to safety and health. In 1993 two fires in toy factories, one in Thailand, the other in China, claimed between them 275 lives. Similar disasters, with smaller death totals, have occurred in China, Vietnam, and other east Asian exporting countries. (Hong Kong Christian Industrial Committee, 1996) Child labor is rampant throughout the developing world, according to the ILO, and many of these children work under dangerous and unhealthy conditions. (Capdevila, 1997) The transition to market economy now taking place in eastern Europe and the former Soviet Union open new opportunities for unsafe labor; official statistics in Hungary, for instance, show a deterioration in working conditions even as that country is being eyed as an export platform for the EU market. (Jancso, 1996) To recount these and other horror stories is not to reject the right of developing countries to develop, nor is it to endorse the fear that standards will be forced down to a corresponding level in the industrialized world. It simply means that employers, when estimating the burden imposed by OSH regulations, now have a lower baseline against which to compare. This can hardly fail to have political as well as economic consequences. (This may take the form of an argument to the effect that we have already achieved our legitimate goals in safety and health--see how far advanced we are over the third world exporters!--and that enough is enough.) Of course, it is because of international technical convergence that the possibility of relocation exists, not only for entire operations, but also, and especially, for fragments of them.⁴

The pressures for competitiveness and the political collapse of the left also color the interpretation given to the need for flexibility. In its most primitive form, this is equated

with the desire of business to escape regulation altogether. In more sophisticated versions, the flexible production and organization strategies of business are contrasted with rigid, rule-bound regulatory mechanisms. In this context, traditional regulation appears, and is, anachronistic. Consider:

- * Traditional regulation assumes hierarchical management and clear chains of accountability. Flexible organization stresses flat, «recombinant» management and semi--autonomous work teams.
- * Traditional regulation assumes a direct relationship between worker and employer. Flexible work systems frequently utilize leased, contract, and other forms of lab or under which workers are only indirectly related to the firms at which they work. (Abraham, 1990; Houseman, 1996)
- * Traditional regulation assumes stable employment patters, through which mandated training, safety and health committees, and other personnel practices can operate. Under flexible employment many workers have only a tenuous relationship to the firm; neither they nor their employers can be expected to make the relationship-specific investments envisioned by policy.
- * Traditional regulation assumes stable work practices that can be monitored periodically by third parties. Flexible production is fluid and uses changing technologies which are often poorly addressed by regulations drawn up years--or even months--ago.

We are now in a position to see the real “crisis” is OSH policy: the existing system of regulation is incompatible with the demands of competitiveness, flexibility, and the new political order. The problem is not that existing regulatory institutions no longer promote the public values of health and justice (although they could and should do this better); it is that the costs of regulation are seen to be more burdensome, less sustainable, and less legitimate. Professionals in the field of industrial safety and health cannot ignore these concerns: they will be pressed upon them whether they agree with them or not.

It is at this point in the argument that the larger implications of cost internalization become apparent. Organizationally, the strategy of cost allocation is consistent with the trend of business practice. It is market-driven, decentralized, and flexible. It does not interfere with the core interests of the firm in the control of production, the implementation of new methods, or flexibility in employment, product line, sourcing, and location. Since the decision-making of business is now assumed to be more efficient than that of government, the incentive-based approach also promises to achieve its objective in least-cost fashion. The turn to cost internalization is also acceptable to the new governing consensus, since it minimizes the state apparatus and has a small footprint on the state budget. Finally, cost internalization promises to address issues of international competition in a way that traditional regulation cannot. This last point has not yet received much attention, but I expect it will before long, so it is worth looking at in greater detail.

Free international importation of products made under widely different labor standards is clearly destructive of national systems of OSH regulation⁵. While the initial attempts to incorporate labor standards, including safety and health, in the international trading system have failed, it is inevitable that further attempts will be made. Eventually some form of harmonization must take place. One of the most vexing problems that international regulation

must overcome is how to respond to the different needs of advanced and developing countries. While working conditions ought to be improved for most workers in the developing world, it would be a mistake to assume that they ought to be identical to standards in the wealthiest countries. Of standards are costly, after all, countries in which resources are at a greater premium may find it in their interest to make different tradeoffs. To recognize this is to face a quandary: either standards are set at an unrealistically high level and serve as aspirational guides rather than enforceable statutes (much like the more stringent ILO conventions covering OSH conditions), or they are set at a least common denominator and provide little impetus to upgrade conditions. Is there a third alternative?

Here it is useful to compare harmonization of industrial safety with that of environmental protection. The forces advocating internationally enforceable environmental standards are stronger than those pushing for labor standards, so the issue is at a more advanced stage. While many environmentalists want international agreements to require all nations to paint themselves a particular shade of green, or at least protect countries that want to apply the paint to themselves, trade advocates, backed by the World Trade Organization (WTO) regard most of these stipulations as barriers to trade that must be removed. For instance, countries are not permitted to discriminate against imports based on their production processes, and even domestic regulations such as mandatory recycling of consumer packaging have been challenged on similar grounds⁶. In this context, cost internalization according to the polluter-pays principle has emerged as the most promising starting point for international agreement. The appropriate authority, such as the WTO, could require that products be sold at prices that reflect their full cost of production, including their environmental costs. (This would be consistent with the trade authority's hostility to the use of subsidies for export promotion.) Then trade could be conducted freely without regulatory barriers, while environmental goals could still be pursued. Indeed, cost internalization would enhance the efficiency gains from trade: goods would be produced where their total cost, including their cost to the environment, is least. Cost internalization is one of the starting points for negotiations now under way to link trade and environment⁷.

The same logic might be applied to the conflict over labor standards and trade. Rather than stipulating specific performance requirements, the WTO or a similar body might simply mandate that employers bear the full cost of occupational injuries and illnesses. They could then decide how to manage these costs: how much to invest in safer methods, more rigorous systems of internal monitoring and control, and even where to locate production for greatest gain. In as much as the full cost of a lost-time episode reflects the income foregone by the worker, these costs will be lower in poor countries than in rich ones. No barriers would otherwise be placed on the free movement of goods or the freedom of investors to determine what, where, and how to invest. In this way the employer-pays principle would satisfy both the proponent of higher labor standards and the defender of free trade.

Domestic and international arguments for cost internalization converge because free trade is, in the final analysis, the application of free market ideas to the international arena; the arguments for one are ultimately the arguments for the other. At the same time, using the power of the government to place full liability for occupational injuries and illnesses on the

shoulders of the employer is not simply laissez-faire. This approach is cognizant of externalities which, if unreflected in the employer's cost structure, would lead to excessively unsafe working conditions. The goal is not to bury the public values of health and fairness under the banner of the free market, but to achieve public values by means of private ones. This was exactly the formula pronounced by Jeremy Bentham two centuries ago: the purpose of public policy is to align individual incentives with the utilitarian calculus. In practice this is to be achieved by a judicious adjustment of the of rewards and penalties of various courses of action: an "artificial harmony of interests", as if to graft on to Adam Smith's invisible hand a prosthetic arm. This was the basis for Chadwick's proposals regarding employer liability, proposals whose time, it appears, has come - again.

Many public health professionals today will find cost internalization to be a promising direction for policy. They may choose this approach because they have become convinced that market-based solutions are inherently preferable, or they may see this it as the last line of defense, an accommodation to business and political interests that, for all its faults, is preferable to outright deregulation. In either event, they should recognize that their own wishes have had little to do with the increasing prominence of market based strategies, nor will their approval or disapproval be decisive in the years to come. Larger forces are at work in the world of business, politics, and public policy, and that is the first point of this paper. The second point has to do with the question of whether cost internalization can work.

Can Cost Internalization Be Implemented?

To analyze the potential for cost internalization it is important to be specific about what the strategy entails. The argument for market allocation goes like this: if market demand reflects the true benefit to society of having a good or service produced, and if market supply reflects the true cost to society, and if markets arrive (soon enough) at a single equilibrium, then this equilibrium also represents a social optimum. Seen in this light, the invisible hand argument translates into a set of strong claims regarding demand, supply, and the structure of markets. If these claims hold, public intervention in the economy cannot make matters better and will generally make matters worse, much like a small child taking apart and trying to reconfigure an expensive watch with dozens of moving parts. Of course, it is inconceivable that all of these claims could ever hold in the real world, so proponents of laissez-faire are brought to their fall back position I that the flaws in the market are not so great as to prevent it from operating tolerably well-- where "tolerably" means "better than the interventionist alternatives". The goal of Benthamite intervention is to bring market performance up to this tolerable level.⁸

Traditionally, economists recognize three potential wedges between market demand and supply, on the one hand, and social benefit and cost on the other: imperfect competition, public goods, and externalities. It is the last of these that concerns us here. When consumers purchase goods in the marketplace, economic theory requires that the price they pay be sufficient to cover all of the costs incurred in production. By "cost" in this context is meant not the producer's monetary outlay, but the underlying social costs which require compensation. Thus, if the building in which production takes place must be heated, the money paid for this service compensates resource owners and other producers in society for the

opportunity costs they incur in providing materials, fossil fuels, etc. (If the producer is forced to pay protection money to the police or mafia gangs, this is not a compensation for a true social cost as understood by economists.) An externality arises when costs to members of society are incurred in production but no compensation is paid.⁹

The first question that must be asked is, does the risk posed to workers by unsafe working conditions constitute an externality of production in this technical sense? That depends on whether the employer bears the full cost of these conditions. Undoubted employers bear some of these costs. From the beginning, the literature on safety management has stressed the magnitude of costs due to preventable accidents, with hidden costs often dwarfing those most easily visible. Not only is there the immediate cost to equipment and materials, the interruption of production, and mandated compensation, there are also disruptions experienced by coworkers, loss of morale, and costs of training replacements. An accident can cast a cost shadow that stretches far beyond the triggering episode. This analysis, summarized in the aphorism that "safety pays", provides the basis for Heinrich's famous "four-to-one" rule, that the indirect costs of accidents exceed their direct cost by a four-to-one ratio. Of course, this rule was only a rough guess, and more recent case studies have claimed ratios on the order of twenty-to-one. (Hinze, 1991)

Nevertheless, the sum of these costs to the employer constitute only one portion of the true social cost of injuries and illnesses; there are also the costs to the workers themselves and to their families. Suppose that the full cost to the employer, measured in increased outlays and lost production, of a particular accident is \$100,000, and that the cost to the injured worker is an additional \$100,000 beyond any compensation paid by the firm. The total social cost is then \$200,000. If it costs, say, \$80,000 to prevent this accident, the firm has an adequate incentive to act, and safer conditions will result. But if it costs \$150,000 to prevent it, the firm will regard the benefits of safety to be less than its cost--even though the sum of all social benefits exceeds the cost. This is the core of the externality problem. The solution, as Chadwick foresaw, is that the cost to the worker must be equally a cost to the employer, added on to the production costs, if it is the employer who has the power to determine the level of safety.

Is it possible that the worker's cost is already the employer's cost? An important strand of contemporary economic thought argues that this is in fact the case and that there is therefore no externality problem to be solved. How can this be? The proposed answer is that workers, sensing the dangers to which they are exposed, will demand higher wages--high enough to fully compensate them for these added risks. By paying these wages employers are bearing the full cost. Not every worker who earns this hazard pay will actually suffer an injury or illness, of course, but, the argument goes, if workers are rational the hazard pay will perfectly indemnify them; that is, the sum of the costs of the injuries and illnesses that do occur will equal the sum of the hazard pay across the entire work force. If this argument is correct we have already achieved cost internalization and can go home.

The basis for this position lies in orthodox economic theory, which shows that if all the conditions outlined above--on demand, supply, and the structure of markets--are true, then

the invisible hand works for safety just as well as it works for any other good.¹⁰ In other words, the case for free market occupational safety and health is essentially the same as the case for free trade, free markets in health care, and so on.¹¹ In fairness to those who hold this view, efforts have been made to test it empirically. In general this has taken the form of an econometric exercise in which a variety of individual characteristics, and the measured safety level of a worker's industry or occupation, are used to predict the actual wages earned by a large sample of employees. A significantly positive coefficient on the risk term, indicating that greater risk for these workers is associated with higher pay, holding other factors constant, is interpreted as evidence for the view that workers are already fully compensated. Several economists claim to have demonstrated this result¹². I do not find this claim persuasive, however, due to tendency for omitted explanatory variables to reverse these results, and due to the pattern of results across subgroups of the working population. Moreover, even if the econometric results supporting wage compensation were to stand, there is no reason to presume that workers receive the full compensation required by invisible hand theory¹³. In addition, those who claim to have measured wage compensation overlook the vast quantity of qualitative evidence, historical, legal, and institutional, that points in the opposite direction.

So let us agree that workers are not generally compensated for the risks they face, and that the task of cost internalization must be accomplished in some other way. What means are available? We could begin with Chadwick's recommendation, that employer liability in the courts could eliminate the external costs of death and disease. In the United States tort law is now being used aggressively in such related areas as consumer product safety and medical malpractice. Indeed, there was a time during the late nineteenth century when the legal doctrines shielding employers from liability were largely thrown aside, and injured workers or their estates were able to win large awards. This period ended with the adoption of a workers' compensation system that, in principle, guarantees prompt but modest awards to workers in return for employer absolution¹⁴. How the OSH liability system might have evolved in the absence of workers' compensation is difficult to gage, but the well-advertised problems with other fields of tort litigation do not inspire confidence. Critics find excessive litigation costs, erratic and unpredictable awards, and an overall atmosphere of combat that interferes with rational, cooperative dispute resolution.

The workers' compensation system self can serve to internalize costs depending on its administration. In the U.S. each state runs its own WC program, but they tend to follow national leads in compensation and premium structures, coverage, and adjudication¹⁵. In general, the states have strengthened experience-rating, with the goal of providing an incentive to firms to improve their own safety records. Similar efforts have been undertaken in Australia, as documented in Hopkins (1995). Workers' compensation premiums can be substantial, exceeding total payroll costs in a few industries; so it is reasonable to expect these costs to affect safety behavior¹⁶. A limited amount of research has investigated whether increased rates of compensation to workers, tied to premiums that reflect firm-level claims experience, provide incentives to employers to improve safety conditions, with mixed results¹⁷. In recent years attention has shifted to a different issue, whether greater compensation leads to amoral hazards on the part of workers--putting in questionable claims

in order to take advantage of the system's generosity. (Butler and Worrall, 1991; Butler et al., 1996; Ruser, 1996) These authors assume that an increase in claims, particularly for difficult-to-diagnose muscular-skeletal disorders, in response to higher levels of compensation demonstrates that the claims are dishonest. The same evidence, however, could also be interpreted as demonstrating that greater levels of compensation reduce the tendency of workers to underreport the incidence of compensable injuries and illnesses. Without additional information regarding workers' true health conditions, it is impossible to say whether the increased propensity to claim brings us closer to or further from the medically justified level. For our purposes it is not necessary to resolve this issue; it is enough to recognize that both workers and employers have discretion over their own claim behavior. Workers can report more incidents or fewer. Employers can bring workers back sooner, or keep them on the job altogether, at light duty; they can discourage workers from filing; or they can challenge a greater percentage of claims. All of these choices will influence the observed lost-time incidence and severity rates without any effect on the underlying level of safety itself. Compensation systems can alter incentives, but these incentives may remain at the level of the compensation "game" rather than trickling down to actual working conditions.

In any event, workers' compensation, even in principle, cannot provide full compensation. Workers receive medical treatment and partial wage replacement; they do not receive compensation for the pain they endure or the loss of function outside the workplace. As we will see shortly, there is as yet no adequate way to measure these costs. Moreover, even if they could be measured, it would make no sense to provide workers with monetary compensation fully equal to their intangible costs. This could be administered only on the basis of "average" intangibles, which means that many individual workers, perhaps a majority, would receive excess compensation: they would have a positive incentive to be disabled! Even workers whose compensation only approached the extent of their loss would have a dramatically reduced incentive to work safely and an increased incentive to file questionable claims. No workers' compensation system, then, can function according to the same principle as the common law--that tort victims should be made whole through penalties assessed by the court. Compensation is incomplete, and the externality persists.

This leaves one final possibility, an injury tax calibrated to the external costs not otherwise borne by the employer¹⁸. The logic of such a tax parallels the more familiar pollution tax; it is a simple exercise to show that, under favorable circumstances, such a tax can be economically optimal. Moreover, unlike workers' compensation, the firm's payments are not made to the worker, and this reduces potential moral hazard problems connected with workers' safety practices and claims behavior. It does not, of course, reduce the firm's moral hazard problem, and rigorous monitoring and enforcement would be required to determine that the tax was not being avoided. Tax systems come in a variety of shapes and sizes. One form it might take is an adjustment to the existing regulatory apparatus, under which inspections are reduced and action is taken only after an accident has taken place. According to this procedure, once it is determined that the episode was preventable in the sense that it was conditioned by a failure to enforce mandatory safety standards, the firm would be fined an amount approximately equal to the external cost. Such a fine would be, in effect, a tax. Thus, it is possible to move in the direction of an injury tax framework incrementally,

by reducing ex ante inspections and mandated improvements, while increasing reliance on standardized ex post fines. This process may in fact be under way in several advanced countries¹⁹.

Here we come face-to-face with a crucial set of questions: can cost internalization through a system of fines or taxes be implemented, would it work on its own terms, and would it work according to the criteria of public health professionals and the lay or movement? I will take them up in this order.

1. Feasibility of cost internalization. I will leave aside the question of political feasibility and focus on technical issues, although political concerns will probably have the last word in the policy arena. The central technical problem is that of measurement: how can we calculate the external cost of occupational injuries and illnesses? This in turn raises three component issues: identification, attribution, and valuation.

First, is it possible to identify all, or even most, cases of injury, illness, or death? No country can claim to do a satisfactory job at present, and if the full weight of OSH policy is to be placed on ex post health consequences rather than ex ante safety conditions, monitoring will have to be improved. This is only partly a matter of greater expenditure of resources. The incentive of firms to dissemble must be counteracted, and accurate diagnoses must be made²⁰.

Second, there must be some way to determine what role occupational safety conditions played in the etiology of illnesses. Since many health conditions have multiple causes and are stochastic ally, rather than deterministic ally, related to any specific causal factor, apportioning the share of costs to be borne by the employer is a tricky business.

Finally, there remains the problem of assigning monetary values to the subjective costs experienced by disabled workers, not to mention the subjective costs of fatalities--whatever this might mean. Elsewhere I have surveyed the techniques that have been used to estimate these values; I won't review them here²¹. Without a detailed analysis it is still possible to draw up a collective balance sheet reflecting the strengths and weaknesses of these techniques, however. The primary insights that animate modern valuation methods are that (1) the ex ante anticipation of injury or death rather than the ex post loss is the proper vantage point, and (2) the subjective valuation of risk--the willingness to pay to avoid risk or be paid to incur it, in the language of economics--is the proper basis, rather than lost income, inability to perform specific tasks, or other supposedly objective criteria. For this reason survey techniques (contingent valuations) appear to offer the most promising approach. On the negative side, all monetization exercises face several intractable problems: (1) They assume that states of disability and premature death are essentially homogeneous--a lost digit is a lost digit--whereas in real life people make distinctions based on cause and circumstance. (2) They assume that individuals possess a utilitarian calculus capable of measuring the disutility of death and disease against the utility afforded by consumable goods. This is contradicted by actual behavior. (3) They ratify the ex ante judgments of individuals regarding future health states, despite the fact that these judgments are, by definition, fundamentally underinformed. It is difficult to see how these problems can be overcome.

2. Incentive effects. Suppose that improved survey methods--or better, a futuristic neural decoder attached to the brain--prove sufficient to capture these elusive values, making it possible to assign to firms the exact cost to workers of unsafe conditions (or their actual results). There still remains an ambiguity associated with the notion of "internalizing" these externalities. The standard firm of economic theory is a point in space, a unitary center of cost, revenue, and profit. Imposing the full cost of accidents would have an instantaneous effect on the firm's profit calculation, leading to efficient changes in working conditions, product line, pricing, and other activities. Real firms, particularly the multi divisional behemoths that dominate modern output and employment, are more complex. Costs imposed by tax or fine must be allocated to the various units of the firm; it is generally only at the unit level or lower that significant OSH decision-making power resides. Hopkins (1995) provides evidence that many firms currently allocate compensation costs according to payroll, with little regard for the contributions individual units make to total cost²². Front-line management, under these conditions, has little incentive to improve performance, since the cost of unsafe conditions is dissipated over the entire organization. One advantage with old-fashioned frigid²³ regulation is that inspectors can target the specific branches of an enterprise in which workers are at greatest risk. Cost internalization measures target the entire enterprise as a single financial unit.

Second, when costs mount beyond a certain point, the cost internalization strategy comes into conflict with the limited liability basis of the modern corporation. This is not simply a hypothetical proposition. The ongoing saga of the Johns Manville Corporation, driven into receivership by occupational health liabilities in excess of its assets, is evidence that not all costs can be internalized. If the speculations of public health professionals are correct--if occupational illness claims tens or hundreds of thousands of lives each year--and if these lives are counted, valued, and placed on the balance sheets of the firms responsible for them, it is likely that a large portion of the external cost will be wiped out by limited liability.

Finally, the logic of cost internalization is premised on a view of the firm as a continuous profitmaximizer, responding to each fluctuation of cost by recalculating its optimal production program. Close students of business management, however, reject this characterization. Managers, as Simon (1976) noted long ago, have selective attention and pursue targeted, not absolute, results. Modest changes in the cost of accidents may go unnoticed by managers; even if they do notice them they may not act if their overall cost or profit targets are being met. In addition, much day-to-day policy is under the sway of management fads --re-engineering, TQM, etc.--perhaps because management is too complex and uncertain to be conducted in a strictly rational manner. Another relevant factor is the intimate relationship between working conditions and employer-employee relations in general. Mitigating the practices that result in high rates of injury or illness may require changing these relations in fundamental ways. Some firms may resist, even at the cost of increased fines or taxes, because they see their control over production at stake. These are the health and safety recidivists, no more disciplined by periodic outlays to the OSH authority than hard-core smokers are to cigarette taxes or alcoholics to liquor taxes. They are addicted to a particular style of exercising power.

3. Compatibility with public values. To the extent that cost internalization leads firms to enhance their safety efforts, it also contributes to the goals of health and justice in the workplace. There are two questions we might ask, however, to determine whether these alternative values are true comrades or merely fellow travellers: (1) Does cost internalization promote enough improvement in safety conditions to satisfy public criteria? (2) Does cost internalization prioritize different risks in a manner consistent with public criteria? In both cases the answer is strictly "no", although the discrepancies in practice may or may not be important.

It is clear that a public health "absolutists can never be content with an approach whose purpose is to balance the benefits and costs of safety. Cost internalization requires the cold-blooded acceptance of injury or death in situations in which the costs of abating the risk exceed the measured benefits. This incompatibility is seen by most economists as proof of the airy naivete of much existing public health legislation. The point is driven home in so-called "risk-risk" analysis, which converts the monetary costs of safety improvement to the poorer health status associated with lower incomes. (Graham and Wiener, 1994; Viscusi and Zeckhauser, 1994) According to this perspective, many regulations intended to reduce health risks actually increase them through their financial effects. Risk-risk analysts, while correct in their linkage of income and health, are themselves naive, however, in their assumption that cost savings due to deregulation will end up in the pockets of the unhealthy poor. The lab or movement's concern with fairness may also be in conflict with economic calculation. As mentioned earlier, the categorical imperative embodied in the no-harm-for-personal-gain rule does not make exceptions even if the personal gain exceeds the harm. Even the mere act of calculating gain and harm can be viewed as demeaning to victims: would we perform the same exercise on the perpetrators and victims of violent assault?

A similar story can be told about the prioritization of health risks. Imagine that cost internalization were introduced gradually, with first 10%, then 20%, and ultimately all of the external costs imposed on the employer. With each turn of the monetary screw a new set of risks is placed in the "to be removed" column. Looking down the list, we move from the high-priority candidates--those which require only a small degree of cost internalization to compel action--to lower-priority risks that require full internalization.²³ Their ordering is partially a result of the relative weights of internal and external costs, and partly a result of the size of the gap between their full social cost and the cost of abating them. Not every hazard can be addressed at once, and this ranking offers an indication of the order a cost internalization strategy will adopt. It is clear that the health and justice principles would each provide a different prioritization. Public health requires that the greatest threats to health, the most severe and widespread threats, be addressed first, irrespective of their abatement costs. Justice would require that risks be ranked according to their degree of voluntariness and the extent to which they yield profits to the perpetrators. In practice, these three sets of criteria actually do lead to wildly opposed regulatory agendas. This is a major flash point of dispute in the field of risk regulation.

On both grounds, the degree of intervention and its prioritization, the principles of economic efficiency, protection of public health, and opposition to injustice are ultimately incompatible.

This is not to deny that, in many situations, it may be possible to forge tactical alliances based on the persistence of health and safety risks that are egregious on all counts. Nevertheless, transforming this alliance into a merger--not to mention a hostile takeover--will have far-reaching consequences for the regulatory agenda. Perhaps the greatest difficulty lies in the fact that all three approaches have real merit; it would nice not to have to choose.

The inevitable conclusion is that the cost internalization perspective provides a useful critique of the public values that have traditionally guided OSH policy in the industrialized countries, but that, as an alternative approach, it too has shortcomings. This is the second major point of this paper, and it is an unsatisfying one. Further research can sharpen our understanding of the convergences and conflicts between economic, health, and justice considerations, but it cannot remove the underlying dilemma. It is not ordained that this analysis should end on such a pessimistic note, however, since another door remains unopened. It bears the nameplate institutional reform.

Indirect Cost Internalization through Institutional Reform.

The potential for institutional reform can be examined by comparing cost internalization to its close cousin, profit maximization. Most businesses want to make as much money as they can, and it is often in the public interest as well that they operate profitably. We have economic theories to guide us on this path, and economists have the tools to measure how much profit is being made, within a margin of error at any rate. One could imagine a public agency whose goal is to make production profitable within the nation's borders. (This is one of the goals of industrial policy, although there are others.) This agency might take it upon itself to draw up instructions to firms: do this or that in order to be profitable. In response to critics, they may measure the performance of these firms to see how profitable these instructions proved to be. Profits earned by following the agency's regulations would have to be compared to a standard of potential profitability to determine the success of the program. This would require the employment of many accountants, economists, and others, generate vast amounts of information, and occasion an endless string of conferences on the measurement and regulation of profit. The idea is not entirely far-fetched; some variation on this theme might actually be appropriate for economies undergoing the transition to market coordination. Yet we would regard it as wasteful and unnecessary in most of the developed world, since businesses, whatever else they do, can usually be counted on to amass profits on their own initiative. To put it differently, if profitability is made a goal of public policy, having the right set of institutions can achieve this end in the absence of detailed systems of regulation or copious studies of firms' accounts.

By a similar logic, if we want to internalize the full morbidity and mortality costs of production, we may be able to achieve this through institutional change, even if we can't measure these costs ourselves or instruct others on how to measure them. Sometimes those directly involved in a situation can sort out the benefits and costs to themselves, drawing on local and tacit knowledge unavailable to outsiders--even highly credential Ed outsiders affiliated with public agencies. As we will see, devolving safety and health policy to the front lines does not eliminate the need for expertise and public guidance, but it can realize

the benefits of cost internalization more effectively than programs based primarily on third-party measurement of costs and benefits.

Most of the elements that make up the strategy of institutional reform are familiar; the function of the rationale that I will offer is to see them as a coherent system, capable of further development. The elements, all of which currently exist in one locale or another, are these:

- * Responsible front-line OSH decision-making. This can take the form of union safety representatives, works councils, and joint safety and health committees, working when possible in consultation with the firm's own safety managers. It is essential that these individuals and groups have access to external resources, as well as real power to implement their proposals.
- * A public health presence in the firm. Firms should utilize public health professionals on either a full time or shared basis, stationing them at an accessible location. Ideally, these professionals should be paid by a third party--by the government or out of the proceeds of an insurance fund. Whoever signs their paycheck, however, they should be accountable to a professional organization of their peers. Their role is analogous to that of accountants, who have, in effect, been deputized by most industrialized economies to monitor the financial integrity of business record-keeping.
- * A right to know. Both workers and the general public should have unimpeded access to information bearing on the risks generated by production. This information should be made intelligible through a corresponding right of access to public health expertise.
- * A right to act. Workers should have extensive rights to refuse dangerous work. While most countries permit the exercise of this right in extreme circumstances, it would be valuable to extend this principle to a wider range of risks. This might be accomplished by permitting negotiation over the partial waiver of this right. (Risks would then be covered either through hazard pay or the right of refusal.) Protection of the rights of whistle blowers is an essential element of both the right to know and the right to act.
- * Action plans. The higher-level OSH decision-making of the firm can be opened up to both workers and the general public through the use of action plans. Under this procedure, firms would hold public hearings at which the nature of safety problems and possible solutions would be discussed. Based on the evidence gathered, action plans would be drawn up, specifying procedures and targets for the coming year. At the end of the year (or more generally the plan period) another round of hearings assesses the plan's performance.

Taken together, the purpose of this strategy is to transform the firm into an institution which, by its own internal mechanisms, functions to bring together the full costs and benefits of investments in OSH. Ideally, workers and safety officials would together identify the benefits of safety, production managers would identify the costs, and through a joint process the two would be compared. Public scrutiny, through on-site professionals and the periodic evaluation of action plans, would monitor this process to make sure that the benefits were given an equal weight. In principle, the firm would internalize costs in the same way it pursues profit: by combining and coordinating the daily work of its employees who themselves pursue this goal. Seen in this light, a useful comparison could be made between the

institutional reform model of OSH policy and team production methods that devolve efficiency concerns to the front line.

For institutional reform to work, decentralized decision-making must be invested with real power. Binding decisions about health and safety must be made at the point where all benefits and costs can be brought to the table, not referred for approval elsewhere. (A similar point can be made about team production; true decentralization of power separates the power-sharing from the merely manipulative forms of work organization.) This presents a real challenge to the existing structures of governance in most firms, and suggests that OSH policy cannot be contemplated apart from larger questions of political economy. Realistically, this undermines the political prospects for the institutional strategy, although public health advocates in most countries may have to reconcile themselves to a hostile political environment in any event²⁴.

Institutional reform has the potential to bring about cost internalization without external measurement of these costs, but it cannot reconcile the conflicts between the principles of economic efficiency, public health, and justice. What it can do is relocate them. Instead of ideological combat at the level of public policy, we can, if the system works, find different priorities negotiated on-site at the level of the workplace. It may be possible for immediate conditions, the particularity of the individual players, and other highly relevant but local factors to influence the pattern of outcomes. Of course, this process may be driven by ignorance or gross imbalances of power, so there is a residual need for public regulation and guidance. Health officials may set an upper limit for risk exposure and may periodically check on the performance of troublesome sites. Monitoring may also require these officials to estimate, however crudely, economic benefits and costs in order to identify instances in which the system can be presumed to be not working.

These tasks are particularly important where nonstandard work arrangements, such as leased and contract work, interfere with the implementation of the institutional model.

Because it is process-based rather than directly instrumental, the institutional approach also holds promise in the area of international lab or standards. Workplaces in rich countries and poor ones may be held, with justification, to different performance standards, but standards governing decision-making are applicable to all. There is no reason, for example, why all workplaces could not be required to adhere to a modest version of the rights to know and act, nor why shared decision-making on health and safety questions could not be made a mandatory standard for the production of traded goods. On reflection, it is the tendency of the institutional reforms sketched above to approximate cost internalization that explains their appropriateness as a basis for international lab or standards.

The resurrection of Edwin Chadwick and his vision of public health through economic incentives is understandable, deplorable, and valuable. It is understandable that, in response to the pressures of globalization and flexibility, defenders of public health would turn to this least-intrusive of approaches. It is deplorable that, in the process, many are willing to sacrifice their legitimate adherence to the principles of justice and health itself. And the insight

that, through proper public action, the enterprise itself can be made an engine of social progress is too valuable to ignore. In Chadwick's day the challenge was to create a government apparatus competent to regulate the private economy; in our day it is to relocate much of this apparatus to private economy, staffing it with the individuals whose interests in economic progress, health, and social justice are directly at stake.

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Notes

1. This excerpt from Chadwick's 1846 report on railroad labor is quoted by P. S. Atiyah (1979), p. 334, who in turn found it in Lewis (1950). Atiyah provides a detailed account of Chadwick's views on occupational safety and health; for discussion of Chadwick's seminal role in the field of public health see Brundage (1988).
2. For a critique of environmental and OSH regulation that draws on both economic and public health arguments, see Breyer (1993). Breyer is now an Associate Justice of the U.S. Supreme Court and may have the opportunity to implement some of his suggestions for greater regulatory scrutiny. A more balanced approach can be found in the debate documented in Finkel and Golding (1994).
3. In Dormann (1996) I argue that a Kantian stance may be rational in a context in which repeated conflict occurs over working conditions. By focusing on risks that benefit the employer and which are clearly discretionary, workers can more readily influence the severity of future risks. The costs of this stance in forgone attention to "non-Kantian" risks--which often have greater health and safety consequences--remain, however.
4. No studies have been performed on the effect of OSH costs on patterns of industrial location. There is a large parallel literature on the effects of environmental regulation on trade; Goodstein (1994) summarizes it by concluding that the tradeoff between environmental standards and international competitiveness is a "myth. While I am less convinced by the weight of evidence concerning environmental protection--it is subject to problems of excessive aggregation and omitted variables--I think the primary cause for concern with respect to OSH is that worker protection generally assumes a larger share of total cost. Whatever the impact of environmental regulation on trade, the impact of OSH regulation should be greater.

5. Proponents of mainstream economic trade theory, such as Paul Knugman (1997) and Jagdish Bhagwati (1996) would regard this statement as an error of logic. I have outlined why I disagree with them, and why the theory of comparative advantage does not hold in the real world, in Dorman (1995).
6. The GATT ruling against the United States in the tuna-dolphin dispute set a precedent in the area of national regulations tying import privileges to production methods; laws mandating specific forms of consumer packaging, such as Ontario's requirement that beer be sold in recyclable bottles, have also been challenged as barriers to trade.
7. Esty (1994) provides an extended brief for the cost internalization approach to trade and environment.
8. I discuss the nature of the invisible hand argument in greater detail in Dorman (1997). The issue of "market incompleteness" as against "market failures, and its regulatory implications, are discussed in Dorman (forthcoming).
9. Strictly speaking, this is a detrimental externality of production". Externalities can be either positive or negative, and arise in either production or consumption. A positive externality is a benefit to some members of society for which they pay no compensation; an example of a positive externality of production would be worker training which benefits other firms after the worker switches jobs.
10. The most precise exposition of this case is that of Rosen (1974).
11. The free trade argument can be found in any trade theory text. For a recent application of free market theory to health care, see Epstein (1997).
12. The main proponent of this view is W. Kip Viscusi; see especially Moore and Viscusi (1990), Viscusi (1993) and Viscusi (1996).
13. Arguments and evidence against the wage compensation literature can be found in Leigh (1994), Dorman (1996), and Dorman and Hagstrom (1997).
14. In practice, the U.S. workers' compensation system offers only partial compensation to a subset of those entitled to receive it. The increase in litigation suggests that "guarantee" may be a misnomer and can also undermine promptness. In one recently reported case, a permanently disable worker in New York State has been in the courts trying to obtain compensation since 1962. (Johnston, 1997)

15. Nevertheless, there are enough state-level differences to support a small army of analysts who interpret each obscure, local wrinkle. There are also important differences in record-keeping, provision of health services, and tie-ins to other OSH-related agencies.
16. In one extreme case, the workers' compensation base rate for steel erection-structure in Minnesota was approximately \$1.30 for every dollar of payroll. (Center to Protect Workers' Rights, 1997)
17. Hopkins (1995) summarizes this research. Much of it is of dubious validity, inasmuch as measured differences in compensation rates are largely driven by statutory compensation caps applied to individual workers. Wage replacement of higher-income workers is limited by these caps, lowering their effective compensation rate. But this raises the question of whether it is this effective rate of WC wage replacement or the characteristics of high-wage workers that explain differences in occupational safety, claims behavior, etc.
18. This too was an idea of Chadwick's; see Atiyah (1979) for references.
19. The enforcement practices of the U.S. Occupational Safety and Health Administration have changed dramatically under the Clinton administration. Inspections fell by nearly half from 1994-96; the system provides advice before an accident and fines afterward. (Quintanilla, 1997)
20. As the costs to the firm of reported accidents increases, so does the incentive to disguise them. The Japanese experience documented in Wokutch (1992) is instructive in this regard.
21. This monetization problem is a central theme of Dorman (1996).
22. Wage-risk studies, referenced previously, purport to measure the same thing, but are vitiated by the "impurities" of the lab or markets they analyze.
23. Not on the list are risks whose cost to the employer alone already outweighs the cost of abatement, and those which will stay off the list even under full internalization. These latter risks were the subject of the previous paragraph.
24. Corporate governance is inching toward the public agenda in the United States; see Blair (1995, 1996).

What Answers Do We Have?

A presentation of cost/benefit studies

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Introduction

Both from a social and a corporate perspective, occupational safety and health is a humanitarian and social task in itself. From the very beginning, economic arguments only played a subordinate part - if they featured at all. Economic benefits were merely coincidental results. But economic aspects are now becoming more and more important.

What are the reasons behind this ever more poignant demand for demonstrable economic benefits of occupational safety and health? One reason certainly is the realization that occupational safety and health costs and thus competes with other corporate and national expenditures. A second reason can be derived indirectly from the results that have so far been obtained with occupational safety and health. The closer the ideal situation in terms of working conditions is approximated, the more expensive further results are; prevention of the last accident will be infinitely expensive. In the end, all those involved in occupational safety and health have a very pragmatic rationale to look for economic justification. They are the only decision-makers in the company having to use negative incidents as arguments. Only occupational safety and health is measured in terms of "accidents that have not yet been prevented" or "absenteeism that has not yet been avoided"; and these figures themselves are high at best.

Occupational safety and health, then, consists in the prevention of harmful incidents, which, however, are not visible and cannot be calculated in terms of economic consequences - nothing has happened in actuality. The real accident rates and cases of illness - i.e., the incidents that have not yet been prevented - constitute the reduction potential, which expresses the benefits of occupational safety and health. This potential is an appropriate basis for linking occupational safety and health with national economy and business economy objectives. How such reduction potentials can be used through actions in the realm of occupational safety and health, and what occupational safety and health can contribute to the improved productivity and competitive strength of companies, are questions that have been studied in several research projects in the Federal Republic of Germany over the course of the years (figure 1). The most important results will be briefly discussed below.



Figure 1 Overview of German research programme (Source: Thiehoff, 1992)

The Problem

The field of occupational safety and health and economic efficiency encompasses a wide range of complex and important issues, varying from the costs of individual occupational safety and health measures to the problem of internalization or externalization of costs within or outside of the company, and includes the benefits resulting from and the prevention of work-related injuries and their consequences in society.

With regard to companies, for instance, it can be said that most precautionary measures taken with corporate financing benefit all other economic elements: employees, health insurance, accident insurance, long-term care insurance, other companies when employees change jobs, etc. The part of the benefit that "flows back" to the initiator of the preventive action is in most cases bound to fall short of the costs incurred for it.

Problems intensify when prevention is aimed not only at accidents, but also at work-related diseases. Here, most positive effects are external. And even if they are internal, they usually only become noticeable in the very long term. If, for instance, a company compares the

costs and returns of resource commitment in prevention activities, the deduction of unaccrued interest on returns that do not transpire until long after the decision to invest is made, often leads to a distinct cost surplus. Business enterprises with a rational decision-making process usually have much better capital investment options.

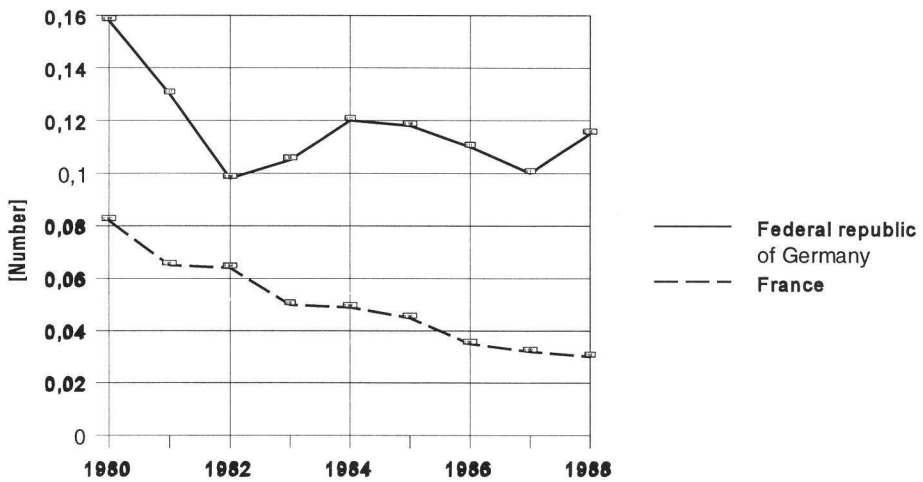
National economy perspective

The potential benefits of occupational safety and health for the national economy are determined on the basis of various analyses. Absenteeism due to accidents and diseases results in a loss of resources that could put considerable pressure on the national economy. In 1989, for instance, losses due to industrial and road accidents in Germany were estimated at DM 43.2 billion. This includes not only the loss of resources in terms of labour, land and capital, but also recovery and treatment costs as well as the loss of leisure time that is used productively.

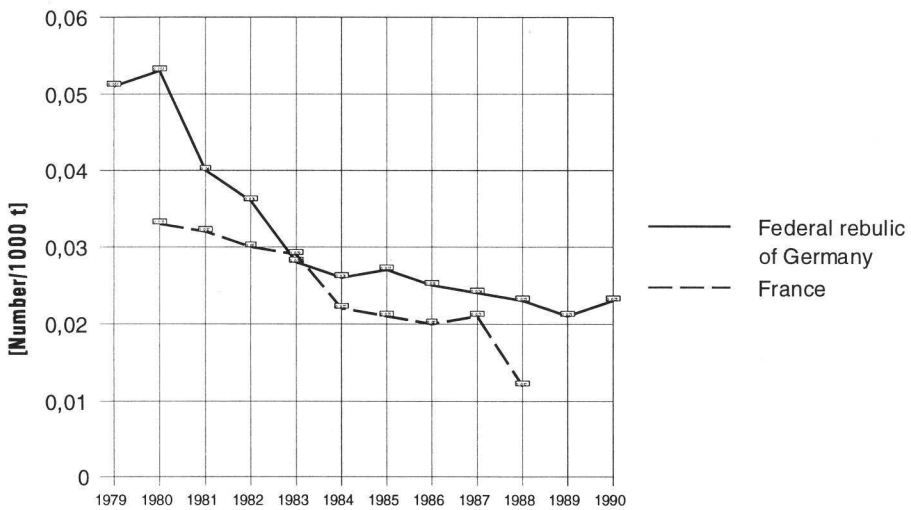
A second example concerns the estimations of production losses. The Federal Institute for Occupational Safety and Health calculated that the loss of the production factor labour in the Federal Republic of Germany amounted to approx. DM 92.2 billion in 1995. Danish, Swedish and Norwegian studies indicate - and this is corroborated by experience in the Netherlands - that the share of work-related diseases on average represents some 20-30% of the total volume of diseases. This means that the reduction potential amounts to DM 27 billion a year. This could be achieved by means of occupational safety and health measures.

Even if the assumption of work-relatedness is ignored because of the complex and multifaceted cause-effect connection, it may be assumed that one third of all cases of absenteeism can be prevented. This can be derived from studies of absenteeism in companies, which indicate that 30-40% of absenteeism can be influenced and, in theory, prevented by means of health promotion activities. One should not forget, however, that the potential benefits of resource savings should offset the costs of the corresponding preventive measures. As such, loss of resource calculations are, strictly speaking, only valid in case of full employment.

Krüger et al proposed a measurement concept to measure the overall economic efficiency of intercompany national occupational safety and health systems. This concept includes the key figure for working days lost per physical product unit, e.g. "working days lost per ton of steel". If output cannot be expressed in these terms, it is also possible to use a production value instead, for instance "working days lost per million DM of production value". This sets a standard for the humaneness of production that can serve as a handle for corporate and national economic action (figure 2).



Development of reportable accidents at work per employee



Development of reportable accidents at work in terms of the production of iron and steel

Figure 2 Health measures and absenteeism, development (source: Krüger et al, 1993)

Loss of resource estimates and overall economic efficiency measurements are aimed at the optimization of production processes in a national economy. The effects of occupational safety and health on a company's competitive strength or on the stabilization of the social security systems are two further issues under intense discussion. The self-control of the

"economic asset" occupational safety and health is a long-term goal, which we have not yet reached by a long shot, neither theoretically nor practically. We know far too little about how far individual companies and employees are willing to pay for occupational safety and health. Accident insurance and meanwhile also health insurance use no-claims bonus systems as an incentive for occupational safety and health and corporate health promotion measures. The demand for further economic incentives for occupational safety and health, e.g. tax abatements or subsidies, is fascinating at first glance. At second glance, however, it is riddled with questions. Ultimately, the entire social security system is at issue: what status is to be attributed to occupational safety and health? And, above all, how will the relation between compensation and prevention develop?

Business economics perspectives

Whereas at national economy level the concept only seems to bring up an abundance of questions, it seems to have gained some footholds from a business economics point of view. The direct economic effects of occupational safety and health have been studied more intensively in Germany in recent years. Occupational safety and health experts have for a long time attempted to determine the benefits of avoidable lost time by means of cost of accident calculations - which have the same starting point as the national economy loss of resource calculations. Comparative calculations correlated losses of resources and profits ensuing from accidents at work and work-related diseases with the costs of individual measures for improvement of safety and working conditions. But the assumption that operating profits can be increased by individual measures could not be empirically demonstrated - except in some very rare events. This has two main causes:

- It is generally not possible to demonstrate a causal connection between individual occupational safety and health measures and incidents that did not take place - the accident that was prevented or the disease that was avoided.
- Losses of human resources have an impact on a company's financial results if planned production can no longer be achieved by appropriate substitutional measures. Built-in flexibility, reserve capital or planned and unplanned production buffers are in most cases able to absorb lost production time.

Despite these limitations, company's cost calculations can be used to determine starting points for the classification of reduction potentials. The following example will explain this. In one medium-sized company, absenteeism in 1990 exceeded the average determined by the health insurance authorities (figure 3). Absenteeism was decreased by the implementation of a specific programme for the improvement of working conditions, leading to significant savings in lost time costs every year. For the management of the company, this proved to be sufficient ground to invest in occupational safety and health measures. A well-known car manufacturer has been using the health rate as a key indicator for the company's health policy for many years (figure 4).

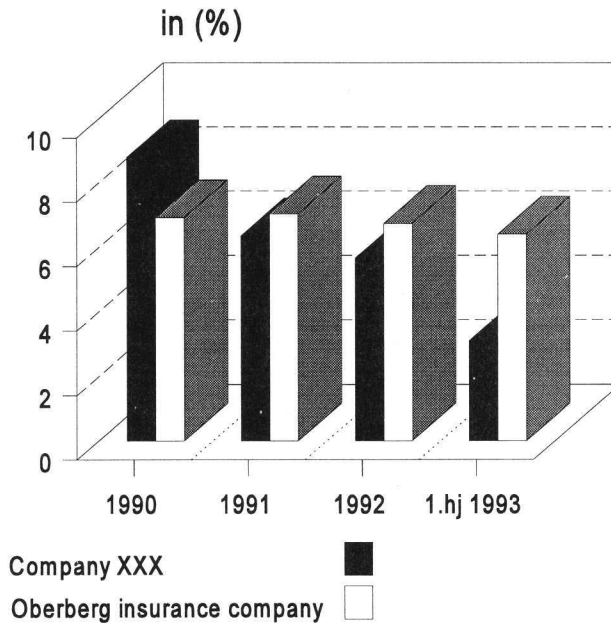


Figure 3 Health promotion measures and the development of absenteeism due to sickness (source: AOK Oberberg)

	1988	1989	1990	1991	1992	1993	1994	1995
Wage earners	90.7	91.0	91.0	90.6	91.8	94.8	94.6	94.4
Salaries employees	96.3	96.4	96.2	96.2	96.5	97.3	97.7	97.6
Total	91.7	92.1	91.9	91.6	92.7	95.4	95.2	95.1

Figure 4 Development of health rates at Volkswagen AG (source: Volkswagen AG Corporate Health Service, 1996)

A significant economic advantage of a corporate occupational safety and health system is the potential high availability of the production process; in other words, the largely uninterrupted business operations. Rather than being measured directly, this has to be measured indirectly by means of indicators such as the number of uninterrupted working hours (defined as the number of procured working hours minus the hours lost due to, for instance, accidents). When the costs of the occupational safety and health system are divided by the number of uninterrupted working hours, this yields the efficiency indicator for the economic valuation of changes in input and output (figure 5). Controlling of occupational safety and health costs and other forms of managing the occupational safety and health

systems can be used as instruments to determine whether the occupational safety and health measures instigated actually yield the best possible revenue in terms of minimized work interruptions.

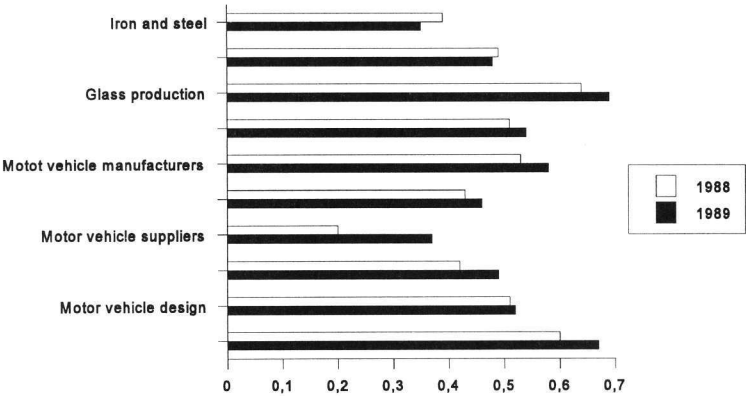


Figure 5 Branch comparison: costs per uninterrupted working hour (DM/hour) in two companies per branch (source: Krüger et al, 1991)

Economic input-output analyses of occupational safety and health systems can be used to control the efficiency of different measures and programmes. This at least requires appropriate targets to be able to manage the cost efficiency of occupational safety and health, health promotion or, for instance, ergonomic measures. The optimal mix of measures can be determined by means of cost-effectiveness analyses, as already tested in practice for health protection.

Evaluation according to the principle of cost-effectiveness analysis requires a comparison between evaluated target effects and the costs of a measure (figure 6). The central issue of valuation thus consists in establishing the occupational safety and health targets aimed at, and determining the concomitant effects of measures (effectiveness analysis). Zangemeister et al have developed a corresponding planning and valuation method, which is currently being tested in pilot projects in several companies.

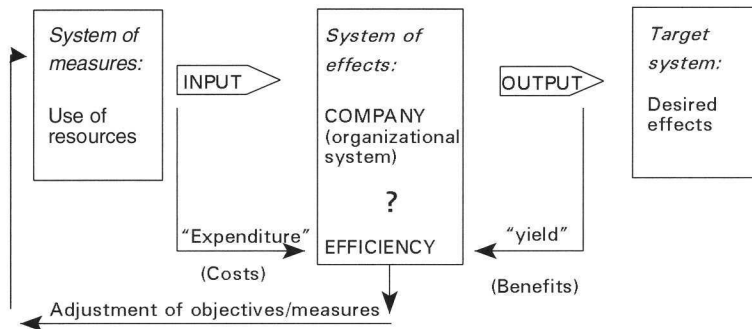


Figure 6 Principle of efficiency analysis (source Zangemeister, 1995)

The direct competitive effects of occupational safety and health help companies guarantee their uninterrupted operational functioning. In addition to occupational safety and health, there also are other operations such as environmental protection, maintenance or quality control that help guarantee and maintain production processes and may possibly improve their quality, without their benefits being directly attributable to the product. They can be characterized as "corporate safety assets" and as such they are prerequisites for production. This means that companies must have certain concrete target effects in order to be able to achieve and control the desired availability of production factors. Consequently, input-output comparisons of subsystems are the most appropriate instruments for efficiency management of corporate safety assets.

Occupational safety and health is, however, also an indirect competitive factor, both in terms of a decrease in production costs and as a new advantageous element of the product or service provided, e.g. as added value for productivity, flexibility or quality. It cannot usually be quantified unequivocally, nor can it be expressed as a profit increase down to the last penny. Proven in actual practice, the main effects of an efficient occupational safety and health system are as follows:

- Guaranteed continuity of the production process by increasing personnel presence (reduction in time lost due to absenteeism and fluctuations).
- Flexibilization of production by higher intracompany availability and increasing awareness of bottlenecks.
- Increase of the quality standard by reducing rejects in the context of a self-enforced safety philosophy.
- Generation of improvement proposals by means of working in task forces in occupational safety and health.
- Higher personnel qualifications due to increased understanding of the integral nature of production processes.

- Improvement of the corporate social security system, increased job satisfaction, improved work climate and willingness to cooperate, and last but not least
- More prestige on the labour market, supply market and demand market.

To improve planning certainty and encourage innovative solutions, more comprehensive profitability analyses in business practice have now become an indispensable instrument. They supplement the conventional method of investment appraisal with a specially geared utility value analysis for valuation criteria that cannot or only with great difficulty be expressed in monetary terms (organizational value analysis). Weighted point values can be used to determine what benefits can be expected from the various investment alternatives and how favourable these benefits will be compared to other function criteria when planning is in accordance with occupational safety and health.

Periodical comparisons of the expected and the realized utility value points can furthermore be used to test whether planning and realization are in accord. If these utility value analyses are performed regularly, the quality of the production process will as far as occupational safety and health is concerned - become a quantity that can be planned.

Integral investment planning allows inclusion of employees as the key to success of the profitability of an investment. Various departments will have to cooperate to achieve this, including investment planning, production planning, controlling, marketing, personnel affairs, etc., but above all occupational safety and health, environmental protection, maintenance and quality control. This theme is as new as it is fascinating and has an undreamed-of significance in terms of product liability.

However, occupational safety and health as a product's added value depends on the customers' willingness to pay for it. It may be clear that an ergonomically sound car can be sold for more money than a non-ergonomic one. Whether this car was made under healthy working conditions should only be of interest to customers when this brings about a decrease in costs and, therefore, price. Very few customers would be prepared to accept a higher price because of better working conditions during production. If you would like to know how many such customers exist, just ask a well-known furniture manufacturer, who offers the same rug at two different prices: one produced with and one produced without child labour.

Final remark

The economic themes connected with occupational safety and health are multifarious. But one should not set one's hopes too high with regard to occupational safety and health as a new competitive factor. Nevertheless, integral and controlled inclusion of occupational safety and health in organizational planning does have certain effects that benefit competitive strength - if occupational safety and health learns its business economics lesson.

Occupational safety and health is an important business objective. It should, therefore, be an element of a company's management processes in order to become an inherent factor in corporate decision-making. Efficiency control of occupational safety and health requires standardized targets. Each company has to determine itself which requirements uninterrupted

production has to meet - even beyond the standards set by the law and in accident prevention regulations.

Guaranteed production, improved productivity and a decrease in disease-related personnel buffers are only the most visible potential benefits of occupational safety and health. Companies are increasingly committing themselves to making production leaner and introducing teamwork. The more reserve capacity, especially in terms of personnel, is decreased, the more important the attendance, employability and willingness to work of the remaining employees becomes.

The estimated costs of occupational safety and health in Germany amount to approx. 1-2% of the average total costs of one working hour. Given the fact that one working hour in Germany costs about DM 45 (compared, for instance, with DM 0.83 in Poland until recently) it may be clear that occupational safety and health hardly puts any pressure on international competition. On the contrary: only when we manage to further improve the productivity standard of the European economy by means of excellent jobs and working conditions will the member states of the EU be able to take part in international competition.

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2 Methodology at the macro level

Introduction

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At the macro level two type of cost-benefit studies must be distinguished. The first type can be characterised as Cost of Illness (CoI) studies. These studies have as a goal to estimate all costs that are related to occupational safety and health in one country. Mostly, in these studies damages or losses due to ill-health, absenteeism and accidents are calculated. The second type, Cost-benefit Analyses (CBA) are ex-post and ex-ante evaluations of in changes in policies or measures. Both the costs of implementing and the benefits, often in terms of cost reduction, are estimated and balanced. In some countries experience with cost benefit analysis at the macro level is available, for instance Denmark, the UK, the USA and The Netherlands.

Several approaches are in use. This chapter presents two cases of current practices in the UK (McCrea) and The Netherlands (Van Polanen Petel). Three studies give more detail to the use of data (Andersen et al., Lunde-Jensen and Velthuijsen et al.). The weaknesses of current methodology are many. Ashford and Placer offer two possibilities to further improvement.

The Health and Safety Executive (HSE, UK) has carried out cost-benefit analysis of all significant proposals for safety and health regulation since 1982. The CBA is seen as an aid to policy makers, but is not the sole criterion. McCrea describes the experiences with the cost-benefit analysis of the display screen equipment regulations. It turns out that the benefits are particularly difficult to estimate. Both in ex-ante and ex-post assessments the benefits were hard to quantify, though the overall impression is that the benefits to employers may be significant.

A similar cost-benefit analysis is performed by Van Polanen Petel with respect to the introduction of a standard for manual lifting in The Netherlands. Only the costs and benefits for companies are included. Essentials of the approach are a survey into the extent of heavy lifting in The Netherlands, cost estimation of solutions and an estimation of the benefits. The latter includes reductions in sick leave, less disability and improvements in production (productivity and quality). Productivity gains are estimated at 25% of the investments. All costs and benefits are capitalised over a period of 15 years. From the study it is concluded that the costs for companies exceed the benefits, however the research also showed that individual companies can benefit financially from efficient solutions to heavy manual lifting.

The issue of international comparison is raised by Lunde-Jensen. He focuses on work stress as an example. In international comparability, reliable data of work related sickness is one of the major problems. Currently data can be found in epidemiological studies, general health

surveys and notification data. Between countries large differences exist. Using the etiologic fraction in epidemiological studies Lunde-Jensen gives an illustration of the cost of work related stress and compares the results for Sweden and Denmark. The calculation is made on a common cost of illness scheme in which three cost components are included (health care, sickness absence and early retirements and deaths).

The need for objective and valid information on workers' safety is also stressed by Andersen et al. He suggests that an occupational health file and a national cohort for working environment studies may supplement traditional notification data. International use of both tools is possible, though agreement on proceedings, definitions and standardisation are essential.

Velthuijsen et al. use occupational safety and health surveys as a basis for model construction. The model describes the relation between policy and investments on the one side and outcomes in terms of costs and benefits on the other. Regression analysis is used to construct a simulation model, that has some predictive power and can be used to evaluate costs and benefits. The benefits are restricted to reduction of absenteeism only. The data used does not allow for estimations of productivity gains.

Kuhn elaborates on the theme of efficiency indicators in occupational safety and health economics, starting from the economics of accidents. Indicators may be profitability (as a result of efficiency and costs), which increases with higher efficiency and/or lower costs. Indices could be for instance; sick leave rates, fluctuations, accidents, proportion of undisturbed working hours, productivity, quality and company image. Economic assessments in practice give a number of problems at the measurement level. Often it is difficult to find accurate indicators and situational factors highly influence the outcomes. Organisational dependencies are mostly neglected as there is an unawareness in this regard. Further questions concern the accountability and the problems including innovations in products and production processes, which is also addressed by Ashford. In Germany, the total costs are about 1% of the hourly wages, the total cost of absenteeism are 92.2 billion DM (1995).

One of the difficult shortcomings of today's practice is to adequately address the benefits and future costs and benefits. From an analysis of a number of American cost-benefit studies, Ashford concludes that technological innovation is an important factor. Both future costs and benefits are influenced by (technological) developments in the market and in company practice. The cost of compliance will lower, additional benefits in materials, energy and water conservation are achieved and technological changes can result in less environmental damage. Current ways of analysis give little attention to technological development and its potential to reduce workplace hazards in a cost-effective way. Intelligent effort will lead to improvements that achieve both hazard reduction and better production. The traditional methods of cost-benefit analysis are likely to overestimate the costs and to underestimate the benefits. As a consequence, Ashford argues, reliance on traditional methods leads to suboptimal safety and health.

One of the drawbacks of the use of cost-benefit analysis in policy making is that the process may easily evolve to a technocratic procedure. According to Placer, the integration of democratic values in the rather technical process of cost-benefit analysis is one of the major

challenges in collective risk management. Advantages of the democratic model are its participatory nature and the opportunities to increase trust and confidence. The tendency of social amplification of the risks and the cost of implementation are seen as drawbacks. Placer reviews a number approaches and concludes that recent advances in experimental economics offer the opportunity to integrate democratic opinions in a more participatory process. However, practical must show that this way of policy evaluation increases social welfare the most.

It is obvious that the topic of methodology is neither strictly scientific nor a pure research discussion. Methodological issues often turn up in political debates, as it is clear that current estimation methods have a number of deficiencies. With the shift of responsibilities towards the company level, policy development will become more and more a negotiation issue. Social partners tend to exploit shortcomings in methodology and lack of reliable data in their interest. With respect to the data used, it can be concluded that current datasets, such as notification data and epidemiological studies are not fully adequate for cost of illness studies or cost-benefit analysis. The experiences of McCrea and Van Polanen Petel is that the benefits are often difficult to estimate, whereas the costs can be valued more easily and more reliable. In these studies, data is obtained by performing surveys.

The inability to make sound estimates of the benefits is a disadvantage for new safety and health regulations.

It can be argued that for the support of the debate sophisticated cost-benefit analysis techniques are not always a prerequisite.

The current view is to follow accountancy principles that reflect company practice and everything that can be estimated in monetary terms should be calculated. Meantime, it should be recognised that not every health and safety effect can be calculated. Some views have been added to the common practice, namely an epidemiological approach, the integration of public opinions and the effects of technological development.

Occupational Health Surveillance by a national cohort and national hospitalization data

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Introduction

The further improvement of workers safety, health and well-being will be an important issue in the coming years. To achieve this improvement, a highly effective occupational safety and health policy is needed at both the European and the national level. It is also needed, that this improvement has a high priority on the agenda among employers and employees at the trade and company level. Cost-effectiveness is, however, also an important issue. Policy makers, authorities, the organisations of employers and employees and companies therefore need valid objective information about workers safety, health and well-being for priority setting and for objective measurement of the development of these parameters with time. The same information is also needed for benchmarking, for estimating the need for adjustment of the nature and intensity of preventive measures and for cost-benefit analyses.

The traditional objective information used in the occupational setting is notifications of accidents and occupational diseases. These notifications are very valuable, but due to deficiencies in the number of notifications and variations in the number of notifications caused by variations in the public awareness to given conditions or diseases, they are not ideal surveillance tools. Their use in cost-benefit analyses will also cause a serious underestimation of the cost of unsafe and unhealthy working conditions.

Is it possible to create better surveillance systems, which give a valid description of the safety, health and well-being in the occupational setting and therefore provide valid information on cost-benefit analyses?

For several decades, the question "how much does workers' health reflect the work environment and how much the way of life?" has been discussed (Fox & Adelstein 1978). Different analytical methods have given different results (Tüchsen & Zebitz 1990) and all methods have some limitations. Further it is a very demanding task to separate the components in the health burden into those which are caused by occupational exposures and those which are due to the life style.

From a holistic viewpoint it is of little importance if a worker cannot work due to an illness caused by his/her job a work-related disease or a life style which has caused a disease. If the worker is not taking care of his or her job, somebody else has to do it; otherwise the job will not be done. In any case there will be a cost for the employer.

The present occupational health policy in most countries encourages employers and employees to take upon them more and more responsibility and to find their own solutions. This means that future actions for improving workers safety, health and well-being to a greater extent probably will be an issue for negotiation between the social partners and therefore a pragmatic

mixture of improvements of working conditions and improvement of workers life style by workplace health promotion (WHP).

By means of an objective surveillance system the main interest of the government will thus be to supervise, that the improvements agreed upon are implemented within a given time limit.

The primary needs in the development of future national surveillance systems are that the systems should:

- provide a true picture of safety, health and well-being at the national level and in the most important trades or job categories. This means, that objective as well as subjective parameters should be included.
- be able to locate "hot spots" such as trades with exceptionally bad safety and health conditions.
- describe the potential for improvement which means the distance from results in "hot spots" to the best results of a nation, trade or job category ("active benchmarking")
- describe time trends which for the relevant parameters mean, that reinvestigations are needed with intervals of 3 to 5 years.
- not be too expensive to use which means that data collected for other purposes should preferably be used.

As a first step in the establishment of such a national surveillance system for the occupational setting, The National Institute of Occupational Health in Denmark has developed two new tools - an occupational hospitalization register (OHR) and a national cohort for working environment studies (NCW).

The Occupational Hospitalization Register

Whereas we in Denmark with a population of about 5 mill. people have app. 60.000 deaths per year, which is not sufficient to allow for a grouping into all relevant occupational categories, about 1 mill. hospital admissions are registered per year. By combining hospital admissions and total number of deaths, it is possible to obtain a morbidity close to the incidence of fatal and non-fatal diseases and to allow for subgrouping at the trade and job level.

OHR itself is a register in which data mainly originate from linking records of two independent registers - the Employment Classification Module and the National In-patient Register (Jensen, Tüchsen & Bach 1994) (see figure 1).

Record linkage epidemiology

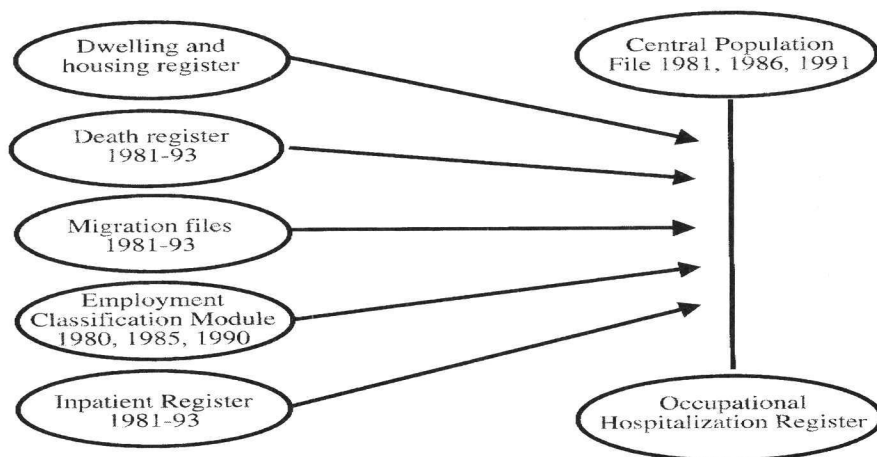


Figure 1 The components of the Occupational Hospitalization Register

The OHF was established to examine the variations in hospitalization frequencies and cases classified according to occupation. As it is based on linking of existing registers, the costs for establishing and running have been moderate, even if the register includes all relevant persons and all somatic hospital admissions and deaths in Denmark. The most important limitation is that we have to live with the available classifications, for which reason we cannot examine the morbidity for occupations inappropriately placed in the classification.

We have been able to demonstrate considerable variations in the morbidity between occupations for selected diagnoses. For this presentation, I will concentrate on ischaemic heart disease and prolapsed lumbar disc disease. In order to compare hospitalization rates of different occupational groups, we have calculated age Standardized Hospitalization Rates (SHR) of each occupational group.

SHR (Standard Hospitalization Ratio) for ischaemic heart disease (males 1981-90)

		Hospitalized	Hospitalized & dead	
	N	SHR ₁	SHR ₂	95% CI
Architects, engineers	17	37	37	21 - 59
Dentists	20	42	43	26 - 66
Farmers	2139	70	69	66 - 72
Metal workers	349	131	132	119 - 147
Bus drivers	37	168	161	113 - 221

Figure 2 SHR for ischaemic heart disease in different job categories

Ischaemic heart disease is an important work-related disease which often needs hospitalization (Tüchsen, Bach, Marmot 1992). From figure 2 it appears, that there are great differences between different occupational groups. Architects, engineers and dentists as well as medical doctors and university teachers have a very low SHR, about 40% of the national average, whereas different groups of drivers, e.g. bus drivers have an SHR 3 to 4 times higher - from 130 to 160. Driving appears to be a risk factor, and from figure 3 it appears that the overall SHR for all drivers is 127 with a 95% confidence interval from 123-132 which means a significant increase. In 10 out of 13 categories of drivers the SHR is significantly increased. The highest increase is found in the categories taxi drivers (SHR:174) and taxi cab owners (SHR: 165).

SHR (Standard Hospitalization Ratio) for ischaemic heart disease (male drivers 1981-90)

	N	SHR	95% CI
Taxi drivers	48	174	133-223
Taxi cab owners	150	165	142-191
Garbage & cleaning	1038	120	114-127
Carriers van	279	122	109-136
Driver at forwarding agents	229	126	112-141
All drivers	2499	127	123-132

Figure 3 SHR for ischaemic heart disease in drivers

Over time there is no change in SHR for taxi drivers (figure 4), whereas there is a significant increase over time in male bus drivers (figure 5). The time trend in the latter group could be due to a heavier traffic intensity, a tight traffic schedule, more traffic pollution, increased tobacco consumption etc. It is obvious, that there is a great potential and need for improvement and that preventive measures in the work place and work organization as well as improvement among drivers of life style are relevant measures to introduce.

SHR (Standard Hospitalization Ratio) for ischaemic heart disease in male taxi drivers and 95% confidence intervals

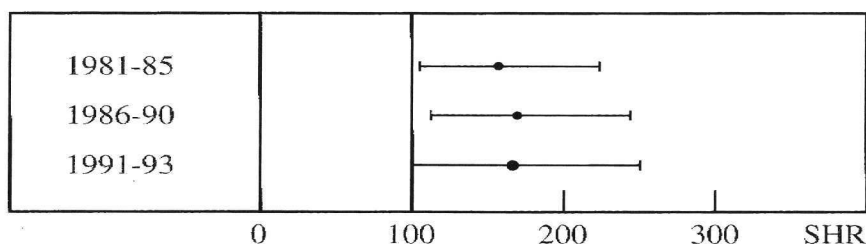


Figure 4 SHR for ischaemic heart disease in taxi drivers 1981-1993

SHR (Standard Hospitalization Ratio) for ischaemic heart disease in bus drivers and 95% confidence intervals

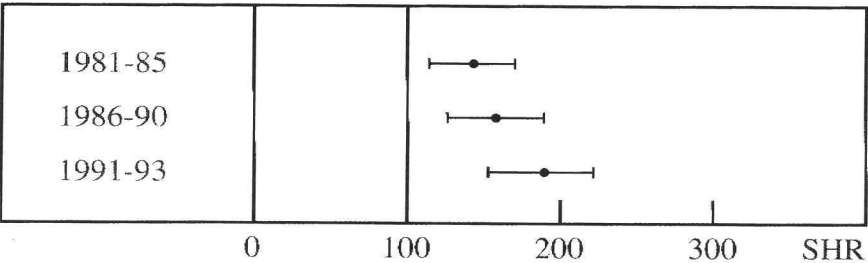


Figure 5 SHR for ischaemic heart disease in bus drivers 1981-1993

Prolapsed lumbar disc disease is another important work related disease, which often needs hospitalization (Jensen & Tüchsen 1995). The lowest SHR - 51 - is found among architects and engineers, whereas the highest SHR, almost four times higher - 178 - is found among nursing assistants. Bus drivers also have an increased risk with an SHR of 155 (figure 6). We have also found that a prolapsed disc in the neck is increased in five different categories of drivers. Driving seems thus to be an important risk factor for slipped disc disease.

SHR (Standard Hospitalization Ratio) for prolapsed lumbar disc disease (males, 1981 - 90)

	N	SHR	95% CI
Architects, engineers	18	51	30 - 81
University teachers	132	68	57 - 80
Teachers	271	79	70 - 89
Slaughterhouse workers	97	153	124 - 187
Bus drivers	71	155	121 - 196
Nursing assistants	129	178	150 - 211

Figure 6 SHR for prolapsed lumbar disc disease in different job categories

We find that OHR is a very useful tool for locating jobs with an increased risk of hospitalization for non-fatal diseases or hospitalization and death for fatal diseases. Also the potential for improvement can be calculated by comparing the job categories with the lowest SHR. For each disease and job category the direct cost of the hospitalizations can be calculated from the number of days hospitalized with the price per day at the given hospital department.

A further development of the OHR could be achieved by linking the disability pension file and the out-patient treatment file. Important work-related diseases which do not need hospitalization such as skin disease, hay fever, musculoskeletal disorders could thus be included in the surveillance system.

At present we standardize for age and compare with the national average of the given disease. There is a need for agreement about proceedings to standardize for social group and for calculation of SHR. Instead of comparison with the national average, comparison could be made with e.g. the lowest level in the same social group or in all social groups.

The national cohort for working environment studies

As the OHR only covers the most serious conditions which need hospitalization, it is necessary to supplement with data on diseases and conditions which do not require the service of a hospital and with data on workers occupational environment and their well-being and functional status. These data are not collected for other purposes.

To collect these data, we have established a national cohort for working environment studies (NCW). A cross-sectional design would also be relevant but we find that there is an added value in a cohort design. Firstly, each person is acting as his/her own control, as he/she answers the same questions on working environment conditions, health conditions, well-being etc. with an interval of some years. Secondly, it is possible in the second and subsequent investigations of a cohort to compare health effects with environmental conditions in the previous studies. Thirdly, the fate of the subjects can be monitored by other registers and e.g. hospitalization, death, job mobility etc can be monitored. However, occupational cohort studies are expensive, as they are described for this purpose only and as they have to enroll subjects in a number, which allows for subdivision into the relevant number of trade or job categories.

Our Danish cohort was set up in 1990 and at that time it consisted of about 10,000 subjects, 18-59 of age as a random sample of the total population. 6,000 of the total cohort were employees and they were interviewed by telephone about personal data, working environment conditions, health and functional status (Nord-Larsen, Ørhede, Nielsen & Burr 1992). In 1995 the participants in the cohort were asked the same questions again plus some new questions. About 5,600 wage-earners and 2,500 unemployed were interviewed in 1995 (Borg & Burr 1997) (figure 7).

National cohorte, age 15+

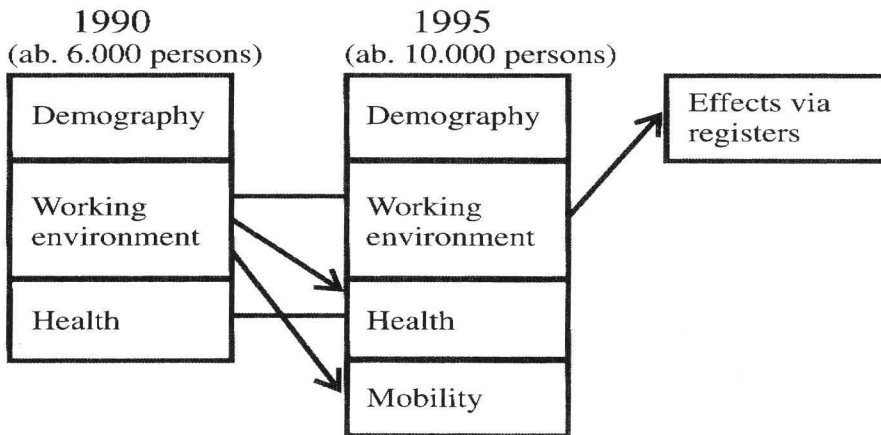


Figure 7 The composition of the National Cohort for Working Environment studies

The size of the cohort allows for subdivisions into about 55 job categories. In the cohort there are not enough persons with ischaemic heart disease or a slipped disc to make a meaningful study of such diseases at the trade or job group level. Low back pain, however, is an example of a very common condition (Xu, Bach & Ørhede 1996). It appears from figure 8 that building construction workers, health care and social care workers as well as drivers have a higher incidence of self-reported low back pain than the average population. The prevalence in these occupational groups is 2 to 3 times higher than the lowest prevalence in management, administrative and clerical work. This means that in spite of an increased use of mechanical handling equipment, there is still a great potential for improvement.

Low back pain in Danish employees (working environment cohort by occupations 1990)

	OR	Ci
Building construction work	1,97	1.41-2.74
Health care and social work	1,52	1.28-1.80
Managerial, adm. and clerical work	0,62	0.54-0.71
Road transport work	1,38	0.96-1.98

OR: Odds Ratio Ci: 95% Confidence interval

Figure 8 Low back pain in different job categories

Self-reported reduced working capacity due to health problems varies in different occupational groups. It appears from figure 9 that one out of 6 drivers and building construction workers reports reduced working capacity, whereas only 1-2% in creative work, engineering etc. report the same condition. The combined impact of suboptimal working conditions and life style thus means that the risk of reduced work capacity due to suboptimal health is 16 times higher in some occupational groups than in other occupational groups.

A national cohort is also a very useful tool for following time trends. In Denmark the social partners have agreed upon a 50% reduction of health damaging monotonous work from year 1990 to year 2000. We have compared the 1990 and 1995 cohort figures on self-reported monotonous work with occupation and as shown in figure 10, there has been no statistically significant improvement in working conditions with monotonous work during the first 5 years period. This means that extra resources are needed if the reduction agreed upon in year 2000 shall be achieved.

**Self-reported reduced work capacity due to health problems (males 18 - 59 years, only significant OR's)
National cohort for working environment studies 1995**

	% with reduced work capacity (age adjusted)	OR
Heads	2	0.16
Engineers, architects	1	0.17
Journalists, edt, creative	2	0.26
Manufacturing	9	1.21
Drivers	17	2.33
Building construction workers	16	2.63
All male wage earners	8	

Figure 9 Self-reported reduced work capacity in different job categories

**Self reported monotonous work by occupation in %
(males and females 18 - 59 year)**

	1990	1995	
Drawing office work	4	5	ns
Cleaning	38	31	ns
Metal industry	26	36	ns
Plastic industry	35	42	ns
Fish industry	74	60	ns
The five occup. groups	28	28	ns
N	498	473	
All wage earners	10	10	
N	5,940	5,575	

Figure 10 Self-reported monotonous work in different job categories

Conclusions

There is a need for new objective and valid information on workers safety, health and well-being for priority setting, for objective measurement of the development over time and for cost-benefit analyses.

An occupational health file (OHR) and a national cohort for working environment studies (NCW) are two new surveillance tools which supplement the traditional, low number of notifications of occupational accidents and diseases. We have demonstrated that there are large differences in safety, health and well-being between different trades and between different job categories and that it is possible to locate "hot spots", i.e. trades or jobs with

exceptionally bad safety and health conditions. Time trends of serious and/or common diseases at the trade or job category level are objective measures of the combined effects of preventive environmental measures and workplace health promotion measures. Before the two tools can be used for international benchmarking, an international agreement about proceedings to standardize age, social group and to compare results from different categories is needed.

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Integrating lay public opinions in cost benefit valuations¹

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Abstract

This paper briefly reviews the main challenges of integrating democratic values into the management of collective risks. On the one hand, democratic values are appealing to public decision makers because they reinforce the perceived credibility of risk management decisions. But, on the other hand, integrating democratic values or lay public opinions can be disadvantageous for long term or equity concerns. Future generations, for example, whose opinions cannot be accounted for directly could be inequitably treated if the present is too highly valued. We therefore study how the methodology of cost benefit analysis could be improved to reconcile democratic with technocratic values.

Introduction

Democracy is based upon the conviction that there are extraordinary possibilities in ordinary people. H. E. Fosdick. (1878-1969)

The voice of the majority is no proof of justice. F. von Schiller (1759-1805)

In all kind of human organizations (firms, administrations, or even countries), the collective decision making process varies between two extreme archetypes : dictatorship - where decision power is guarded - and strict democracy - where decision power is extensively shared. Concrete organizations barely meet those extremes. Stakeholders' involvement in collective decision processes remains however a topic of sharp interest. As far as risk management is concerned, we think studying this issue should be given a high priority. In the near past, lay public have been given opportunities to disapprove collective decisions about health or environment taken without their explicit consent. In several cases (contaminated blood transfusion, asbestos or 'mad cows'), underpinning rationales of past decisions from the public sector were thoroughly blamed *after their negative consequences had occurred*. Involving lay public opinions during the decision process could be a way to increase social trust on these issues and would ease the enforcement of risk regulations. As it could nevertheless reduce the ability for long term anticipation of the whole process, further research will be needed to study whether such a change would improve the quality of decisions.

In this paper, we would like to present how cost benefit valuations could be designed to allow public preferences to have a direct impact on the selection of risk mitigation measures. This could be a means to combine experts' knowledge and public appraisal. In the first part of this paper, we will present two opposing models of collective risk management. In the second part we will present how the general framework of cost benefit analyses could integrate certain democratic values.

Two models for collective risk management

As indicated in the introduction, integrating lay public opinions is currently a highly debated topic in risk mitigation policies². According to the importance given to lay public opinions, there are two opposing models for risk management: the *technocratic model* and the *democratic model*³. We define the technocratic model as an archetype of a highly centralized management structure in which priorities would be set and the competing risk mitigation programs would be evaluated and selected by a limited committee composed of politicians and scientific experts. Contrarily, in the democratic model, risk mitigation priorities would be publicly debated and be selected by a kind of voting procedure. Obviously, those models do not describe current risk management process. By opposing extreme descriptions we intend to underline the main differences.

To our mind, none of these two models is normatively preferable to the other. We think they should be considered as antithetical: the strengths of one being the weaknesses of the other *et vice et versa*. Table 1 illustrates this idea:

Table 1 Comparison of two models of collective risk management

Model	Technocratic	Democratic
	- Scientific knowledge supports risk assessment	- Participatory
The case for...	- Long term anticipation - Political incentives, lobby	- Trust increasing (Slovic, 1993) - Social amplification of risk (Kasperson et al., 1988)
The case against...	- Credibility of the decision makers must be high	- Cost of implementation

On the one hand, the technocratic model may be appealing because scientific knowledge can be used to account for the best estimates available of the risk components. With respect to this point, many empirical studies showed that social risk perceptions are often at odds with expert judgments. Individuals tend to use simple heuristics to assess subjective probabilities, their estimates being significantly influenced by recent disasters, media coverage or social networks. [Kahneman & Tversky, 1974 ; Kasperson et al., 1988]. Can social risk perceptions thus be a rational basis for collective action ? According to Cross « *the values of scientific method are far more valid than some of the values underlying public risk perceptions* ». On the other hand, the technocratic model might allow that politicians seek to maximize their own interests rather than social welfare⁴. Lobby's power, for example, can be a limit to the rationality of the technocratic process. The democratic model is on the contrary completely transparent and each individual would have a chance to express his views but it has two major drawbacks : its practical implementation would be very costly (referenda remain quite expensive) and it favors the viewpoint of present generations over future generations whose opinions cannot be accounted for directly.

We think that people now demand that social choices in risk mitigation become more explicit. The credibility of the public decision makers could thus gain from a slight shift toward a more democratic process. According to Fiorino [1989]⁵, this could be reached by refining

the practice of economic valuations to integrate lay public opinions along with experts' judgments about risks. In the following section, we will show how integrating lay public opinions in the practice of Cost-Benefit Analyses (CBA) could be a way to reconcile technocratic and democratic values.

Building a participatory methodology for CBA

Performing CBA to appraise health or safety related regulations often sounds unethical and incompatible with a democratic process. Any regulation that allows to improve health or safety for at least one individual could be seen as desirable. But there may be a different way to think about it. In our daily life, we all take some risks for which we are not ready to protect ourselves⁶. Somehow unconsciously, we have balanced the perceived benefits with the cost (or just the annoyance) of protection. It seems to us reasonable that collective risk management try to assess the social desirability of mitigation measures. As noted by Viscusi, Vernon & Harrington [1996], « *The basic issue is one of balance (...) the mere presence of a risk within the domain of a regulatory agency is not in and of itself a reason to institute a regulation* ». According to us, CBA can be viewed as an analytical tool to evaluate consciously collective actions in a way that is consistent with unconscious calculations from individuals. This does not mean that this tool has an unlimited power and should be considered as the sole basis for collective decisions. The general methodology of CBA provides public decision makers with a framework that is consistent with both technocratic and democratic values. Linking this framework with recent advances in experimental economics would be a way to make a compromise between these two influences.

In simple terms, CBA computes the net present value (NPV) of a given policy the authorities wish to implement: it represents the difference between all the social benefits and social costs this regulation would imply when transformed in a monetary unit and discounted with respect to the time at which those gains or losses will occur. If the NPV is positive, society seems to be better off with the policy; if it is negative this policy seems to be socially undesirable. So described, CBA may well be considered as a highly technocratic tool whose formalism and conclusive result will discourage negotiation. We would like to note that i) the NPV of a regulation must be considered as indicative, policy makers are not constitutionally obliged to follow the result of a CBA, ii) this brief description hide all the choices an analyst has to make to compute the NPV, choices that could easily be discussed with the stakeholders involved in the process or deducted from individuals in an experimental setting. With regard to this latter point, we would like to take two examples to show that CBA diagnoses can well be the result of a participatory process.

Discounting and individual choice over time

The choice of a criterion to value future effects is a delicate step in CBA. Health and safety regulations generally imply present or near costs for far future benefits. According to standard discounting technique, analysts should choose a constant discount rate to compute the present value of future benefits. This technique seems inappropriate for long term risk management because the NPV of any public policy will be rather insensitive to long term benefits (Weitzman, 1994). Moreover, this technique is not consistent with empirical experiments. Using a constant discount factor implies that society is sensitive to an absolute increase in

the time distance while Lowenstein & Thaler [1989] showed that individuals are sensitive to a relative increase in the time distance⁷. Heal [1997] shows that logarithmic discounting is consistent with those empirical findings and allows long term effects of a policy to have an influence on the final decision. [With a 10% discount rate, the present value of receiving 1\$ in 50 years is only 1 cents using standard discounting while it is roughly 70 cents using logarithmic discounting]. Integrating such methodological improvements in the general framework of CBA would be a practical and easy way to reconcile individual and collective rationality. Experimental survey plays here a great role in determining assumptions on how individuals discount future benefits⁸.

Valuing non market goods and the contingent valuation method (CVM)

Most of the benefits regulators expect from health or safety public policies are not usual economic goods with a given market price. As CBA requires all effects to be expressed in a monetary units, economists have designed several techniques to determine the monetary value of preventing additional risks to life and health. This point has led to a highly controversial debate among economists we have no possibility to sum up here⁹. According to us, rejecting these techniques means, in fact, rejecting CBA for health and safety regulations. Having already explained to what extent we favor using CBA in a health and safety context, we would like to discuss how to value health and safety improvements rather than why. To simplify the presentation, we will take the example of the value of life (V.O.L.).

As for the choice of discounting methods, there are several techniques available influenced either by technocratic values or by democratic values. They are divided in three categories : human capital method, indirect method and direct method.

According to the human capital method, the value of a human life saved in year “equals the present value of the incomes this individual should have earned between” and the end of his life¹⁰. Using this method implies that society has no other goal than to maximize its national income and penalizes non-working individuals in society. It doesn’t account at all for lay public preferences. As it is not really used anymore in our context, we will not describe it further.

The indirect method takes into account individual choices for safety and health as a *spy* would do: by observing relevant markets, economists or analysts try to reveal a demand curve for safety. Dardis [1980], for example, computes an implicit value of life from the market for sprinklers. Brookshire et al. [1985] have proposed a more interesting technique : when risk varies geographically [like seismic risk or air pollution], they propose to use a hedonic price function, to derive a risk premium from the housing market. In their famous study, they showed that, among a lot of other attributes [like view, surface...], housing prices in California were significantly influenced by the level of seismic risk in the living area. The risk premium thus obtained can also be a basis for deducing an implicit value of life. This value is more consistent with public preference than the determinist method but can only be computed in limited situations.

The direct method (or “*contingent valuation method*”) is theoretically the most consistent with lay public opinions. It is also a current fruitful ground for experimental studies. Through opinion polls, this method asks a representative sample of the population, who benefit from the mitigation policy, to reveal directly their willingness to pay for the expected risk reduction. By taking an average (or median) of those willingness to pay and multiplying by the total population, one obtains a value for the benefits of the policy. This method is the most recent one. It has generated a huge controversial literature. On one hand, it is an important step toward a participatory process. Through sampling techniques, it allows to integrate lay public opinions at a lower cost than by referendum. The value obtained can potentially reflect use and non use value, individuals’ concern for the safety of others (altruism)... On the other hand, many researchers have pointed that individuals’ willingness to pay may be influenced by many response mode effects or framing effects (Mitchell & Carson, 1989 ; Casey & Delquié, 1995 ; ...) and others even doubt the value obtained have any economical relevance (Kahneman & Knetsch, 1992).

Reviewing the main arguments in favor or against using the contingent valuation can well be the purpose of an entire book and is not this ambition of this short paper¹¹. Nevertheless, we have showed on this second example that the general framework of CBA may be consistent with several techniques of non market goods valuations, each of these techniques reflecting more or less lay public preferences.

Conclusion

The idea that initiated this review was to link two rather separate bodies of the general literature on collective risk management. In the first part, we presented the conflict between technocratic and democratic values in collective risk management. In our view, it is not yet desirable to adopt a strict normative position to recommend which would be the ‘best’ influence, each of these two models having its own limitations. Current risk management process in our developed countries could however find advantage in a slight move toward a more participatory process. As shown, in the second part, the general Cost Benefit Analysis framework may be a means of reconciling those two sets of values. Though often assumed, performing Cost-Benefit Analyses is not a constraint for negotiation. Once the idea of balancing social benefits of a regulation with its costs has been accepted, analysts and other participants in the decision process can then make many methodological choices. Recent advances in experimental economics offer the opportunity to integrate lay public opinions to design a more participatory process. Experts’ knowledge and lay public opinions could then meet in the decision process to select the mitigation policy that increases social welfare the most. Practical applications are now required to test whether this conclusion is too optimistic or not.

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Notes

1. I'm grateful to Claire Mays (SYMLOG) for helpful comments on an early draft of this paper. Any error remains my own.
2. Although we chose to focus on public policy, the design of participatory processes is also a current trend for health and safety decision in firms : [Mays & Poumadère, 1989 ; Wynne, 1994 ...]. For a general introduction on the participatory model in firms, see George [1996].
3. Though already studied, this opposition have not yet received a fixed terminology : Fiorino [1989] opposes the technical model to the democratic model while Mays & Poumadère [1996] oppose the *authoritarian model* to the *socially responsive model*. Using the word « technocratic » rather than « technical » seems to us more accurate to highlight that the opposition refers to the actors of the decision process.
4. Noll [1996] even argues that « *political actors will behave more or less like most citizens concerning the development of politics towards catastrophes, except when this behavior conflicts with their prospects for electoral success* ».
5. Fiorino [1989] think that further research should try to adapt « *those analytic model we continue to use so that they incorporate lay values more effectively* »
6. ex : not buckling our seat belt to drive a small distance.
7. Under standard discounting technique, value depreciation between any 2 years is constant if the time interval is the same (ex : the depreciation of value between year 1 and year 2 equals the one between year 100 and year 101. With logarithmic discounting, value depreciation between any two years is constant if the relative change between those two years is constant (ex : the depreciation of value between year 1 and year 2 equals the one between year 50 and year 100).
8. Readers interested by other experimental studies on this topic can also see Horowitz and Carson [1990] and Cropper et al. [1994].
9. For a justification see for example Viscusi, Vernon & Harrington [1996] p 685-686 ; for a critique, see Lave [1996], p 113-115 .
10.
$$VOL = \sum_{t=0}^{\infty} \frac{P_t \cdot Y_t}{(1+r)^t}$$
, where P_t is the probability in year t that the individual will live until year t ; Y_t , the income of an individual in year t and r , the discount rate.

11. For two opposing viewpoints, see Portney [1994] and Diamond & Hausman [1994]

The importance of taking technological innovation into account in estimating the costs and benefits of worker health and safety regulation

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Abstract

Regulation of worker health and safety is acknowledged to result in health benefits to workers and economic costs to employers. The latter are sometimes shared by workers and consumers in the form of lower wages/salary increases and higher prices. However, the history of occupational health and safety regulation in the United States over the last twenty years reveals that this simplified view of regulation neglects the important role that technological innovation plays in (1) reducing the actual costs of compliance with a new regulation to a fraction of pre-promulgation estimates, (2) yielding a benefit in terms of savings in material, water, and energy costs, and (3) changing the nature of process and product technology, resulting in reduced environmental damage and its associated costs and compliance burden. The U.S. Office of Technology Assessment recently completed an investigation of the technology-forcing aspects of standards promulgated by the U.S. Occupational Safety and Health Administration (OSHA) over the last twenty years and found that (1) technological innovation usually resulted from stringent regulation and (2) traditional cost-benefit analysis performed prior to a standard's implementation failed to anticipate significant economic benefits accruing to the innovating industrial firm. Research done by the author and his colleagues at the Massachusetts Institute of Technology over the last 15 years suggests that there is a strong theoretical, as well as an empirical basis, for predicting that technological innovation will result from stringent standards, and further, that cost-benefit analysis should be revised to include its effects.

Introduction

The reductionist version of neoclassical economic theory predicts that since health, safety, and environmental regulations impose non-productive investment by industry on pollution control, regulation can only be a drag on innovation, and hence on economic growth, because of the diversion of resources from R & D¹. A more modern view currently in vogue is the so-called Porter Hypothesis, put forth in 1991, which argues that regulations may actually stimulate growth and competitiveness². In fact, that suggestion and the empirical evidence that supports the hypothesis goes back to a series of publications from researchers at MIT beginning twelve years earlier^{3, 4, 5, 6}, although Porter does not seem to be conscious of it⁷.

There is ample evidence that regulation--if properly designed and implemented--can prompt the kind of technological change that can significantly reduce human and environmental

exposure to toxic substances. Prior work at the Massachusetts Institute of Technology has developed models to explain the effects of regulation on technological change. The particulars of this model--the nature of the regulatory stimulus, the characteristics of the responding industrial sectors, and the resulting implications of the model for explaining technological responses to regulation and for designing innovative regulatory strategies--are discussed elsewhere⁸.

Cost-Benefit Analysis Examined

During the past two decades, cost-benefit has become the dominant method used by policy makers to evaluate government intervention in the areas of health and safety. As conceived in theory, cost-benefit analysis (1) enumerates *all* possible consequences, both positive and negative, that might arise in response to the implementation of a candidate government policy; (2) estimates the probability of each consequence occurring; (3) estimates the benefit or loss to society should each occur, *expressed in monetary terms*; (4) computes the *expected* social benefit or loss from each possible consequence by multiplying the amount of the associated benefit or loss by its probability of occurrence; and (5) computes the net *expected* social benefit or loss associated with the government policy by summing over the various possible consequences. The reference point for these calculations is the state of the economy in the absence of the government policy, termed the "baseline".

The mechanics of constructing a cost-benefit analysis can be seen with reference to Table 1, which presents a relatively disaggregated matrix of the various positive and negative consequences of a government policy for a variety of actors. The consequences are separated into economic, health and safety, and environmental effects, and those affected are organized into policy-relevant groups of actors, such as firms, workers, consumers, and "others". Initially, the consequences are represented in their natural units: economic effects are expressed in monetary units; health and safety effects are expressed in mortality and morbidity terms; and environmental effects are expressed in damage to eco-systems, etc.⁹

Table 1 Matrix of Policy Consequences for Different Actors

Group	Economic Effects	Health/Safety Effects	Environmental Effects
Producers	C _g		
Workers	C _g	B _{H/S}	
Consumers	C _g	B _{H/S}	
Others	C _g	B _{H/S}	B _{Environment}

All of the consequences of a candidate policy (or regulation) are described fully in terms of the times during which they occur. What traditional cost-benefit analysis does is translate all of these consequences into "equivalent" monetary units (since a dollar in an earlier time period could be invested to earn interest over time) by discounting each to present value

and aggregating them into a single dollar value intended to express the net social effect of the government policy.

The cost-benefit calculation can be expressed in simple mathematical terms by the following equation:

$$V = \sum_{i=1}^n \sum_{j=1}^m \frac{B_{ij} - C_{ij}}{(1+r)^i}$$

where B_{ij} and C_{ij} are the j^{th} type of policy benefit and cost, respectively, in the i^{th} year after the policy is introduced and B and C are expressed in monetary units; r is the appropriate discount rate; and V is the (discounted) present value of the policy.

Elsewhere the author has argued that health, safety, and environmental benefits should be treated differently than costs in computing their present value¹⁰. One approach would allow for discounting of non-monetizable benefits, but at a lower discount rate. This approach can be defended in terms of a belief that certain amenities, such as health, become more valuable relative to other goods in this society as time passes and the standard of living improves. The following relationship would separate the factors affecting the present value of health impairment prevented in year n :

$$B_n = \frac{B(1+\epsilon)^n}{(1+r)^n}$$

where: B = metric, expressed in person-years of health impairment prevented in any one year, ϵ = the subsequent annual fractional increase in societal value of health impairment prevented, and r = annual discount rate. For small values of r and ϵ , this is equivalent to:

$$\frac{B}{(1+r-\epsilon)^n}$$

Thus, the "effective discount rate" ($r - \epsilon$), or time rate of preference, will be less than the discount rate used for monetary benefit or cost calculations. Note that, in principle, if the society's valuation of health benefits increases rapidly, the effective discount rate for benefits could even be negative! Thus, instead of the traditional cost-benefit approach which is biased against interventions which require the expenditures of costs early with the yielding of benefits later, such as is the case with chronic disease, this treatment makes long term investments in health much more attractive.

When there is only one policy option, cost-benefit analysis dictates that option should be implemented only if its anticipated net social effect is positive. In general, however, numerous policies or sets of policies are possible, where each policy can be differentiated according to the various features—type of policy instrument, policy level or stringency, firms covered, etc.—that comprise it. In this situation, according to the cost-benefit criterion, the policy with the largest expected net social benefit, when compared to the baseline, should be implemented.

As a decision-making tool, cost-benefit analysis offers several compelling advantages. First, cost-benefit analysis clarifies choices among alternatives by evaluating consequences in a systematic and rational manner. Second, it professes to foster an open and fair policy-making process by making explicit the estimates of costs and benefits and the assumptions on which those estimates are based. Third, by expressing all of the gains and losses in monetary terms, discounted to their present value, cost-benefit analysis permits the total impact of a policy to be summarized using a common metric and represented by a single dollar amount.

As a practical matter, however, cost-benefit analysis possesses several serious limitations discussed below. Note, however, that the ensuing dissection of cost-benefit analysis is not intended to suggest a wholesale rejection of the technique, but to caution against the uncritical application of an imperfect methodology and the unqualified acceptance of its results¹¹.

Problems in Estimating Public Policy Benefits

The benefits of a specific government policy concerning occupational health and safety are generally the reduced social costs associated with a decrease in the number (or severity) of job-related injuries and illnesses, where the decrease is brought about by the policy in question. Prominent examples of policy benefits include reductions in medical expenses, productivity losses, physical disability, pain and suffering, and loss of life. Estimation of the policy benefits in cost-benefit analysis is a formidable task because it is difficult to predict the reduced risk of injury and disease and to monetize the associated benefits.

There are many problems in trying to determine the effects of a government policy on the incidence of job-related injuries and disease. The baseline occupational risks may not be scientifically established. In most cases, the precise relationship between exposure and disease is simply not known. Estimating the effects of the policy on worker exposure levels may also be rather uncertain, depending as it does on assumptions about firm and worker behavior as well as on technical production relationships.

Additionally, many of the benefits of government policy, such as reductions in physical disability, pain and suffering, and loss of life, have no clearly-defined economic value (as compared to the market prices established for labor and medical services). The traditional methods of monetizing these benefits—surveys and market studies—have been, to a large extent, unsuccessful. Interviews and questionnaires asking individuals what they would be willing to pay for a stated reduction in risk have inherent limitations since answers to hypothetical questions have been shown to be poor indicators of a person's behavior. Imputing the value of risk reduction from an individual's market behavior is also a seriously

flawed approach¹². Individual actions are normally undertaken for a variety of reasons, and it is difficult to isolate what portion is motivated by a desire to reduce the risk of bodily impairment, pain and suffering, or a premature death. Furthermore, consumers are rarely well-informed about the risks confronting them and have a well-documented history of being unable to process the risk information at their disposal in an expected manner^{13, 14, 15}. As a result, the assumption of economic efficiency underlying attempts to value risks from consumer market decisions is untenable in practice.

Where policy analysts have most frequently turned to derive the value of a reduction in risk is the job market itself. Recall that, according to economic theory, the risk-compensating wage premium represents the workers' valuation of job risk. But, the same job market imperfections that produce a socially-excessive level of workplace risk and create a need for government intervention also undermine the usefulness of the risk premium as a measure of the worker's risk valuation. For example, job-related diseases that the worker does not know about will not be reflected in the wage premium for risk. Moreover, workers may have difficulty in understanding risk information. In theory, they are just as likely to overreact as under-react to hazard information, but in practice, worker risk perception appears to be dominated by an "it-can't-happen-to-me" attitude¹⁶. This results in known risks being understated and therefore undervalued. Another job market defect, externalities, causes the observed wage premium for risk to measure only the *worker's* valuation of an incremental risk, but not the value family members, friends, and other interested parties attach to the risk. Furthermore, models of the risk-compensating wage differential assume a perfectly-competitive job market; violation of this assumption means that the resulting estimates will "misinterpret" the true wage premium for risk. This is a particularly serious problem, since there may be no way to adjust the estimates to correct for the mis-specification.

Problems in Estimating Public Policy Costs

Although the costs imposed by a government policy seem rather easy to identify and to express in economic terms, they are usually no more certain or reliable than the benefits. One reason is that policy analysts rarely have access to detailed, independent information about actual—and potential—production relationships and associated costs in an industry. Instead, they must depend to a large extent on industry-provided data to develop estimates of the costs to industry of complying with the public policy. Since higher compliance costs make a policy less attractive, industries adversely affected by the policy may choose to inflate their reported compliance costs.

In addition, compliance cost estimates often fail to take three significant factors into account: (1) economies of scale, which reflect the fact that an increase in the production of compliance technology often reduces unit costs; (2) the ability of industry to learn over time to comply more cost-effectively—what management scientists refer to as the learning curve; and (3) compliance costs based on present technological capabilities ignore the role played by technological innovation in reducing those costs¹⁷. The last factor is particularly crucial. A recent retrospective analysis of eight OSHA regulations issued between 1974 and 1989 by the U.S. Office of Technology Assessment concluded that the agency's estimates of economic impacts systematically and significantly overestimated compliance costs by ignoring

the innovative response of industry to the enacted standards¹⁸. Five of these regulations addressed toxic substances and are discussed in detail below.

The OTA Study

The results of the OTA study are summarized in Table 2 for the five health standards investigated. The study concluded that:

OSHA's current economic and technological feasibility analyses devote little attention to the potential of advanced or emerging technologies to yield technically and economically superior methods for achieving reductions in workplace hazards... Opportunities are missed to harness leading-edge or innovative production technologies (including input substitution, process redesign, or product reformulation) to society's collective advantage, and to achieve greater worker protection with technologically and economically superior means.

[I]ntelligently directed effort can yield hazard control options--attributes that would, no doubt, enhance the "win-win" (for regulated industries and their workforces) character of OSHA's compliance requirements in many cases and support the achievement of greater hazard reduction .

Thus, there is overwhelming and convincing evidence that failure to include technological innovation in assessing the costs and benefits of workplace regulation renders cost-benefit analysis of minimum use in efforts to protect workers from occupational health hazards. Estimates of costs using traditional approaches over-estimate the costs of protecting workers and under-estimate the health benefits that would be achievable by developing or adopting superior technologies. Thus, reliance on traditional cost-benefit analysis leads to a suboptimal level of occupational health and safety¹⁹.

Table 2 OTA Case histories

- Vinyl Chloride
 - significant process (polymerization) innovation
 - final compliance costs = 1/4 of pre-promulgation best estimates
- Cotton Dust
 - aggressive re-tooling of entire production process yielding significant productivity improvements
 - final compliance costs = 1/3 of pre-promulgation best estimates
- Lead (secondary smelters)
 - lack of enforcement, plus exercise of the option of paid medical removal of workers, yielded a small fraction of predicted compliance costs
- Ethylene Oxide
 - because of fear of legal liability, the hospital industry chose to replace existing sterilization equipment with innovative technology, thereby reducing the ambient level well below the required standard
 - engineering costs were, however, about the same as predicted, although new technology was adopted
- Formaldehyde (metal foundries)
 - significant innovation by formaldehyde resin suppliers
 - costs = 1/2 of pre-promulgation best estimates

Source: Gauging Control Technology and Regulatory Impacts in Occupational Safety and Health—An Appraisal of OSHA's Analytic Approach. Washington, DC: U.S. Congress, Office of Technology Assessment (OTA-ENV-635); September 1995.

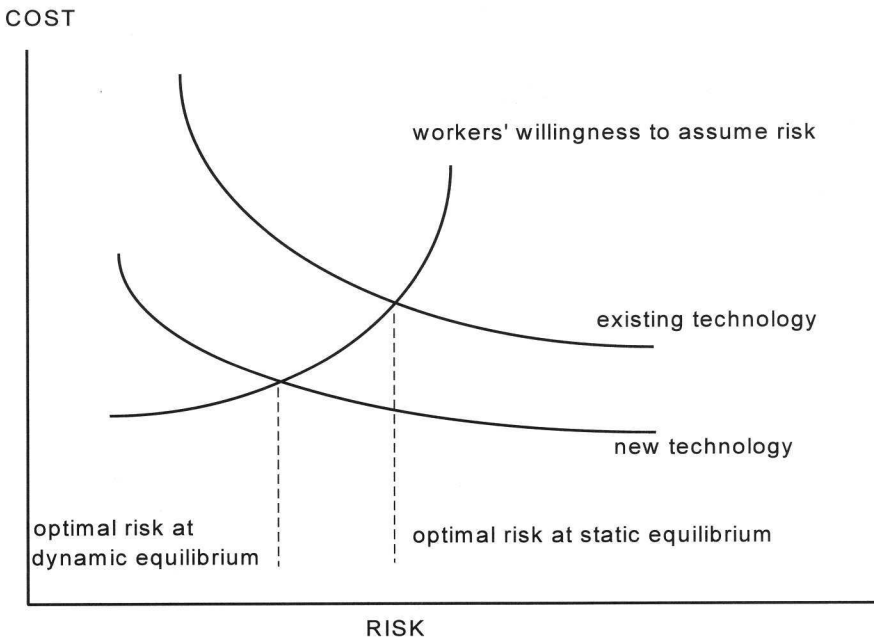


Figure 1 Optimal risks at static and at dynamic equilibrium

Notes

1. For a recent review of this perspective, see Jaffe, A., Peterson, S., Portney, P., and Stavins, R., "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us? *Journal of Economic Literature*, Vol. 33, March 1995, 132-163.
2. Porter, Michael E., "America's Green Strategy," *Scientific American*, April 1991, p 168.
3. Ashford, N.A., Heaton, G.R., and Priest, W.C., "Environmental, Health and Safety Regulations and Technological Innovation," in Technological Innovation for a Dynamic Economy, C.T. Hill and J.M. Utterback (eds.), Pergamon Press, Inc., NY, 1979, pp. 161-221.
4. Ashford, N.A. and Heaton, G. R., "Regulation and Technological Innovation in the Chemical Industry," *Law and Contemporary Problems*, Duke University School of Law, Volume 46, Number 3, Summer 1983, pp. 109-157.
5. Ashford, N.A., Ayers, C., and Stone, R.F., "Using Regulation to Change the Market for Innovation," *Harvard Environmental Law Review*, Volume 9, Number 2, Summer 1985, pp. 419-466.
6. Ashford, N.A. "Understanding Technological Responses of Industrial Firms to Environmental Problems: Implications for Government Policy," in Environmental Strategies for Industry: International Perspectives on Research Needs and Policy Implications, K. Fischer and J. Schot (eds.), Island Press, Washington, DC, 1993, pp 277-307.
7. For a recent review of this perspective, see Jaffe, A., Peterson, S., Portney, P., and Stavins, R., "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us? *Journal of Economic Literature*, Vol. 33, March 1995, 132-163.
8. See notes 2-4 this page. See also Ashford, N. A. "An Innovation-Based Strategy for the Environment," in Worst Things First? The Debate Over Risk-based National Environmental Priorities, A. M. Finkel and D. Golding (eds.), Resources for the Future, Washington, DC, 1994, pp. 275-314.
9. Note that a single cell in the matrix could contain both policy benefits and policy costs. Employers, for example, incur the costs of complying with an occupational health regulation, but also derive economic benefits in the form of productivity improvements and reduced risk hazard pay premiums paid to workers. However, in order not to confuse monetary benefits with other health or safety benefits, we would describe the sum of the monetary costs and

benefits as net costs C_s .

10. Ashford, N.A. "Alternatives to Cost-Benefit Analysis in Regulatory Decisions," *Annals of the New York Academy of Sciences*, Volume 363, April 30, 1981, pp. 129-137. See also Ashford, N. A. and Caldart, C. C. "Economic Issues in Occupational Health and Safety", Chapter 5 in Technology, Law and the Working Environment, Revised Edition, Island Press, 1996, 641 pages.
11. An alternative approach to cost-benefit analysis, trade-off analysis, has been suggested (see Ashford and Caldart, note 10). In this approach, like cost-benefit analysis, the matrix depicted in Table 1 is a starting point for the analysis. However, in trade-off analysis, the matrix elements are expressed in their natural units, such as monetary costs, mortality and morbidity statistics, etc. No attempt is made to place a monetary value on health, safety and environmental effects. The time period in which each effect is experienced is fully described, but the health, safety, and environmental effects are not necessarily discounted. Trade-offs between worker health and costs to producers, consumers, and others are made in a transparent manner by the politically-accountable decision maker. Thus *accountability*, rather than accounting, is fostered.
12. Fischer, G.W., "Willingness to pay for probabilistic improvements in functional health status: A psychological perspective." In: Mushkin, S. J and Dunlop, D. W., eds. Health: What Is It Worth? Measures of Health Benefits. New York: Pergamon Press; 1979.
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17. Ashford, N.A., Ayers, C., and Stone, R.F., "Using Regulation to Change the Market for Innovation," *Harvard Environmental Law Review*, Volume 9, Number 2, Summer 1985, pp. 419-466.

18. Gauging Control Technology and Regulatory Impacts in Occupational Safety and Health—An Appraisal of OSHA's Analytic Approach. Washington, DC: U.S. Congress, Office of Technology Assessment (OTA-ENV-635); September 1995.
19. Full application of cost-benefit analysis dictates that solutions to worker health and safety problems be "economically efficient", i.e., that intervention is justified until the marginal benefits of further protection no longer equal marginal costs. Using the costs of existing technology in this calculus leads to *static* efficiency. Instead, if the costs of new technology were factored into the calculus, a different, *dynamic* efficiency would be achieved, with a greater level of worker protection at lower cost, leading to a "win-win" situation (see Ashford and Caldart, note 10). See Figure 1 for a graphical representation of dynamic versus static efficiency.

Can we compare the costs of work-related diseases between countries?

Methodological considerations based on a study on the costs of work stress.

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Abstract

The methods used to quantify the volumes of work-related diseases in society should receive more attention in economic analysis. The ideal basis is epidemiologic studies which associate exposure (risk factors) at work with excess sickness occurrence. The excess sickness occurrence can be prevented if exposure is removed, which is exactly the kind of results needed for regulatory cost-benefit analysis. To compare or transfer data between countries, we "only" need reliable exposure data. The European Survey of the Working Environment can supply such data, both concerning organisational and ergonomic factors. Estimates in these areas could be as reliable as traditional accident costing studies.

The socio-economic costs of cardiovascular diseases related to work strain in Denmark and Sweden have been estimated to 125 and 175 millions ECU respectively. A rough attempt to cover additional diagnoses that could be related to work strain adds up to 450 millions ECU for Sweden's workforce of 3.9 million.

Introduction

The question of comparability is made topical by two features: firstly, insufficient data on the impact and socio-economic cost of work-related diseases in many countries; and secondly, the increasing demand for EU-wide data, e.g. to be used in impact assessment of EU legislation. Among the socio-economic cost-of-illness studies published so far¹, comparison of costs between countries do not necessarily reflect differences in the working environment, even when the economic methodology is similar. Comparability can only be ensured at the level where the volumes and consequences of work-related diseases are estimated. If results can be compared at that level, the question of economic methodology is of secondary importance at least from an administrative perspective, because various principles could be applied to the further analysis.

This paper is based on a study conducted for the European Foundation, Dublin (Levi/Lunde-Jensen 1996). The epidemiological background for our calculations are primarily found in Olsen/Kristensen (1991).

The volume of work-related diseases.

The methodological core problem is to establish a firm basis to quantify the volume of work-related sickness occurrence. The data basis may be found in notification data, in general health surveys or in results from analytic (etiologic) epidemiology, which establishes associations between exposure and excess sickness occurrence.

Notified cases

For most official purposes, cases notified to an insurance company, to company registers or to national registers is assumed to be the best source of information. However, all notification systems is heavily influenced by the incentives to notify and by the attention to workplace exposure or risks in the health system. Both factors leads to bias against "new" work-related diseases. Furthermore, notification systems rely on the proposition that the work-relatedness of each individual case can be demonstrated, which is not the case for e.g. lung cancers or cardiovascular diseases.

The influence from the administrative and legal system is reflected even between the Nordic countries, whose national registers are technically rather similar (Nordic Council of Ministers 1996). International comparison of data requires both a common classification system and a careful validation of data for each country. This seems to be most realistic for work accidents.

General health or workforce surveys

Most of the published, national cost-of-illness assessments have therefore turned to general health surveys, e.g. workforce surveys or surveys of contact to health and social sectors, to obtain a data base on work-related diseases (HSE/DWES 1995). Data are easy to aggregate to the national level, e.g. total costs of work-related diseases or the percentage of sickness occurrence with a disease which can be related to work.

By choosing this strategy, the problem with "notification incentives" is by-passed. However, as the work-relatedness is based either on self-reporting or on the judgement by general practitioners, both the problems of "knowledge and recognition" and of determining causal factors in individual patients remain. The links to the workplace risks or exposure at the workplace have been weakly reported so far, though it is not inherent in the methodology. This procedure is likely to be the only feasible way to collect a "grand total" estimate, covering all significant work-related diseases within a country. A comparison with other countries may be useful as a rough measure of reliability - but variations between countries are likely to reflect different levels of attention to working environment problems as well as different risk levels.

Even if this problem was solved, a work-related percentage within a diagnosis found in one country can only be transferred to populations that are quite similar both with respect to the numerator (exposed population) and the denominator (lifestyle and other factors that influence total sickness occurrence). The minimum prerequisite to assess the costs of illness (or to use such data coherently for EU-wide cost-benefit analyses) is therefore either national studies or EU level -studies.

Exposure and excess risk

The ideal data strategy is to start from the prevalence of workplace exposure factors which can be associated with an excess risk of a specific sickness occurrence. This can be obtained from epidemiologic studies that establish causal relationships between exposure and a specific health outcome, provided that the risk of the exposed is compared to the risk of the general population who are not exposed to this particular factor (relative risk). The etiologic fraction (fraction of total sickness associated with the specific exposure) can be calculated from prevalence [P] and relative risks [RR], with the simple formula:

$$\frac{(RR - 1) * P}{(RR - 1) * P + 1}$$

If the risk of persons exposed to work strain is twice the risk of the control group (RR=2), and the prevalence of work strain is 12%, the formula gives $1 * .12 / 2 * 1.12 = 10.7\%$.

A workplace exposure must be assumed to be equally dangerous - i.e. lead to the same excess risks - across countries. Different levels of other exposures or lifestyle factors may influence the total level of cardiovascular disease, but the excess (relative) risk for a population exposed - e.g. to stressors at work - are measured by comparison with an "normal" situation, where "competing" risks may also exist. The relative risk should therefore apply to all countries. Consequently, the etiologic fraction varies only due to different levels of exposure, and the preconditions to make EU-wide quantification are present - at least from a theoretical point. A number of further preconditions must be met (Olsen 1997). Firstly, etiologic fractions should be founded on more than one studies. Secondly, many studies use occupation as a proxy for exposure. A direct measure of exposure or risk factors is preferable, as work practises may vary between countries even within the same industries.

According to theory, the etiologic fraction quantifies the sickness occurrence that would not have occurred if the risk factor had not been present (Olsen/Kristensen 1991). This concept is therefore closer to the ideal requirements of the regulatory cost-benefit analysis, compared both to current notification data and other direct measures of sickness behaviour. Because exposure may change more rapidly than sickness occurrence, data are also less biased by historical conditions compared to the other two methods.

Defining work stress and stressors at work

Stress and stress reactions in individuals can be caused by multitude of exposures - many of which are found at the workplace. In the report on which this paper is based (Levi/Lunde-Jensen 1996), a wide range of workplace stressors are outlined, and the number of persons exposed to them - at least temporarily - are potentially very large.

The preliminary publication of results from the Second European Survey of the Working Environment includes a figure of "28% of the European workforce is exposed to stress".

These statements cannot, however, be measured by well-defined sickness occurrence. The economic analysis requires precise definitions of stressors at the workplace and these stressors should be associated with "hard" health outcomes in epidemiological studies. Among the possible definitions of stressors at work, Karasek's and Theorell's "job demand -job control" model (e.g. Karasek/Theorell 1991) is tested thoroughly, and these stressors have been associated with excess sickness occurrence, mostly with excess morbidity from cardiovascular diseases, but also excess sickness absence.

The excess sickness occurrence associated with "stress" or "job strain" as defined above can be quantified only for cardiovascular diseases. The relative risk (excess risk) have been quantified in a number of studies, with relative risks ranging from $RR=1.4$ to 4, meaning that the excess risk is 40% to 400% higher than the risk of the unexposed population. In the meta-analysis of international studies by Olsen and Kristensen (1991), the figure $RR=2$ was chosen as the most likely quantity.

The prevalence of job strain in EU countries can be estimated by means of the European Survey of the Working Environment (1992), using the questions concerning "working to tight deadlines", "working at high speed" combined with "short repetitive tasks" to define the high demand - low control working conditions of Karasek's and Theorell's model.

To ensure coherence with the studies in which relative risks were estimated, we only included persons working under these conditions for at least 75 % of the time. This definition is more restrictive than the "official" results of the European Survey quoted above. Under these assumptions, the prevalence of work strain in the total European workforce can be calculated to 9%-11% for men and 9,5%-10% among women. Depending of the quality of general health statistics, cardiovascular morbidity and mortality related to work strain - and subsequent socio-economic costs - could be calculated for a wider range of EU countries based on these figures.

Illustrative cost estimates for Denmark and Sweden

Due to availability of models and appropriate health and social data, cost estimates was made for Denmark and Sweden only. Three estimates of the cost impact of job strain was made:

- a) The costs of cardiovascular diseases related to job strain in Denmark, based on the "most reliable" $RR = 2.0$ for both sexes. Prevalence of exposure 6% for males and 14% among women.
- b) The costs of cardiovascular diseases related to job strain in Sweden. This is based on Theorell/Karasek (1989), which estimates RR for women to 1.4-1.6, RR for men aged up to 70 to 1.2-1.5, and men aged below 55 to 1.5-2.3 ("high estimate"). Prevalence of work strain was quite high, 25% among women and 15% among men, indicating a less restrictive definition of job strain (which could explain the lower RR values).
- c) The costs of total sickness absence (all diagnoses) related to job strain in Sweden. The volume of excess sickness absence of the exposed was calculated directly in Vogel et al (1992). The results are not likely to be transferable to populations with a different sickness behaviour or different social security coverage.

Our socio-economic cost-of-illness model builds on a limited number of components that can be found or calculated on the basis of general health and social statistics (table 1). This cost-of-illness model adds the direct costs of health care and loss of potential output (production) caused by sickness absence, retirement and premature death. The value of worktime lost due to sickness was fixed at the average wage costs per workhour, i.e. assuming that marginal output equals marginal wages. This procedure measures potential output, and it is not claimed that this potential could be appropriated under all circumstances². The results of the calculations, which cover only job strain-related cardiovascular diseases, appear in figure 1. For Denmark, costs add up to 125 millions ECU, or 50 millions ECU per million work active. For Sweden, the similar figure is 155 to 175 millions ECU, or 40-45 millions ECU per million in the work force. The higher costs in Denmark reflect higher levels of cardiovascular mortality in age groups below 65 and of early retirement.

These results are narrow both on the "exposure" and the "health outcomes" dimensions. The scope can be enlarged by using Swedish data to include excess sickness absence associated with job strain, which accounts for approximately 5% of the total volume of sickness absence in Sweden. On this basis, a "maximum" total of 450 millions ECU can be estimated. Empirical evidence suggests that job strain are associated with various musculo-skeletal, psychological and unspecified symptoms, so it seems likely that the exposed would react by absenteeism. However, other cost components (early retirement, hospitalization) are less influenced by behavioural factors, and further extrapolations to account for the balance up to the "28 percent of the EU workforce exposed to stress" cannot be justified.

The Karasek/Theorell model and its subsequent operationalization may be correctly criticized for narrowing the concept to an industrial work organisation which is declining in the advanced economies (repetitive functions, machine-paced work). However, as long as other concepts of stressors have not been associated with precise and severe health outcomes, there is little alternative, and considering the quantitative results, the problems associated with "stressors" according to that definition must still be considered to be very important.

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Table 1 The economic model

Cost component	Valuation principle	Data and methods
Health care	market price or production costs	Health statistics by diagnosis, age adjustment
Sickness absence	loss of potential output Output per hour (both sexes), working week for men and women respectively	Sector-specific absence statistics, distribution by diagnosis
Early retirement and deaths	Loss of potential output in remaining work active years survival adjustment, output per year as above	Statistics on retirement and death causes by diagnosis, discounted 4%

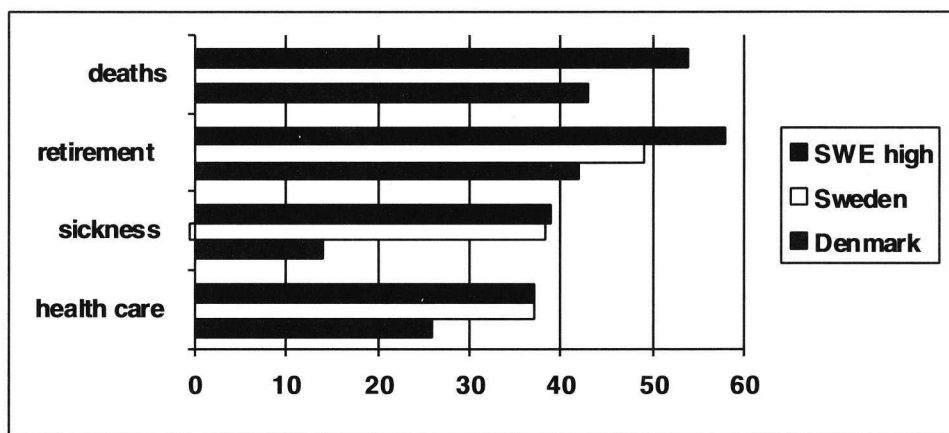


Figure 1 Socio-economic costs of work stress in Sweden and Denmark (1993/1992) Millions ECU

Towards an Econometric Occupational Safety en Health (OSH) Model.

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Introduction

The first theoretical economic experiments to model the working conditions in the choice process of the employee took place in the early eighties. Working conditions were mainly related to (economic) labour market studies, in which dangerous and unhealthy working conditions are compensated by higher wages.

Recently, there has been a revival amongst economists for occupational safety and health (OSH), but the approach is different. Now the approach is mainly from the employers' point of view and the question asked is: *is it possible and useful to make a cost-benefit consideration of OSH measures?* It is recognized that the employer has a key role in improving occupational safety and health. Rational economic decisions within companies certainly influence company's policies on occupational safety and health. Though it is recognized that decision making within companies is not rational at all times, neo classical economic theory is useful.

Not only at the level of the individual firm, but also at the level of the industrial sector and even at a national level, comparisons on costs and benefits of OSH policies can be made.

An economic theoretical framework is proposed for a cost/benefit model for OSH and a prototype of an econometric model is constructed. Estimation of such a model is best done with data that are collected explicitly for this particular aim. Unfortunately, existing data-sets lack the necessary information needed. In this article the estimation of an econometric model is performed with existing data sets on work and health in various sectors in The Netherlands.

Proposal for an economic theoretical framework

In this section we instigate a model on neoclassical foundations in which investments in OSH measures can be explained.

We concentrate on the decision making behavior of the employer on the subject of OSH policy and illustrate this decision making process of the employer to invest in OSH with a simple - for now static - model. We consider a neoclassical firm with one output, called

y , and two production-factors, labor L and capital K . A Cobb-Douglas production-function with constant scale-factor gives us the combinations of L and C to produce y ,

$$y = F(K, L) = K^\alpha L^{(1-\alpha)}$$

We assume that other production-factors, like energy, don't influence the optimization considerations between labor and capital. Further we define:

$$\begin{array}{ll} c & = \text{cost of capital per unit} \\ w & = \text{cost of labor per unit} \end{array}$$

Without losing generality we can normalize the production level to 1. The advantage is that we can look at L as labor intensity and so, $1/L$ is the labor-productivity. We introduce the possibility that not only the employer can choose from a optimal level of capital-goods, but on top of that can choose from a range of capital-goods with equal capital-productivity, but with different labor-productivity. So a unit capital-cost depends on labor-productivity:

$$c = c(L), \text{ with } c' < 0,$$

and we assume

$$c'' > 0.$$

The cost minimization problem now is:

$$\begin{array}{l} \text{minimize } C = c(L)K + wL, \\ \text{subject to } y = K^\alpha L^{1-\alpha}. \end{array}$$

The first order conditions of this problem are:

$$0 = c'(L)K + w - \lambda (1-\alpha)F()/L \rightarrow (w + c'(L)K)L/C = 1 - \alpha$$

$$0 = c(L) - \lambda \alpha F()/K \rightarrow cK/C = \alpha$$

$$y = K^\alpha L^{1-\alpha}$$

where “ λ ” is the Lagrange multiplier and C is total costs. Now we have three equations with three unknown parameters, K , L and “ λ ”. Because of the property of the production-function being concave and because $c'' > 0$ the second-order conditions are fulfilled for finding a minimum. Because of the dependency of a unit capital-cost on labor-productivity the

derivatives of the (conditional) demand-equations and their properties are not trivial. We introduce the following specification for c :

$$c(L) = k\phi^{-1}L^{-1}$$

where k is a scaling factor (scaling for Dutch guilders for example) and ϕ (> 0) is a parameter for later use. The closed form of the conditional demand for labor is:

$$L = (\alpha^{-1}\phi^{-1}k\omega^{-1}y^{\frac{1}{\alpha}})^{\frac{\alpha}{1-\alpha}}$$

Now the total costs for a firm, given a certain production level, are:

$$C = c(L)K + \omega L = k\phi^{-1}y^{\frac{1}{\alpha}} + \omega L$$

So, the marginal costs of an extra unit labor are:

$$\frac{MC}{ML} = -\alpha^{-1}k\phi^{-1}y^{\frac{1}{\alpha}}L^{-\frac{1+\alpha}{\alpha}} + \omega$$

So, the marginal revenues of an additional unit labor reduction equals the saved labor-costs ω . The marginal costs equals the first part after the equal-sign and is a descending curve in L .

Until now we left ω unspecified. The costs of an employee are more than just wages. Suppose we know the short term percentage absenteeism, z . Now we define w_z as the price one has to pay for a sick worker. The wage-costs per unit labor is now defined as:

$$\omega = w_1 + zw_z$$

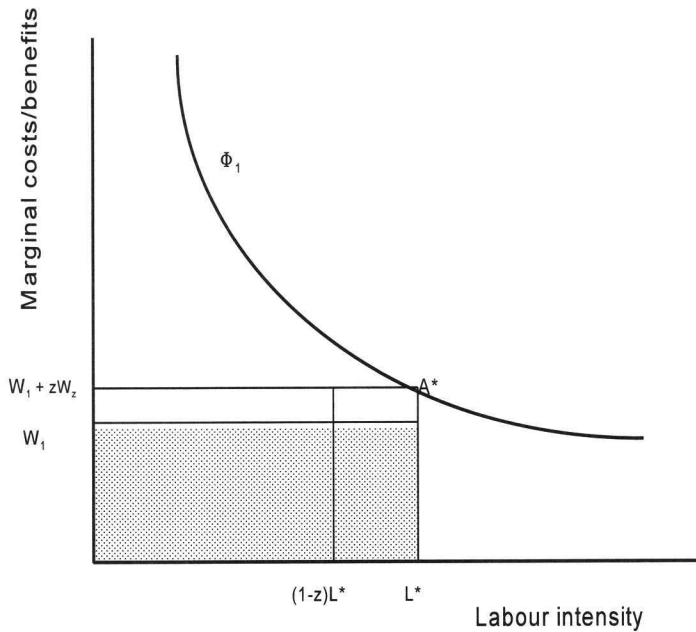


Figure 1 Marginal costs and benefits of labor-intensity reduction by the absenteeism-percentage z .

In the figure 1 we show the integral labor-cost-level, w , and the accompanying optimal labor-intensity, L^* , giving the theoretical optimum A^* . Since only $(1-z)L^*$ of the labor capacity of the firm is active, the firm is working sub-optimal. If absenteeism decreases with labor-cost per unit staying equal, than in the first place the number on non-productive employees becomes less and A^* shifts to the right in the direction of the theoretical optimum. The financial situation of the firm has improved and the employer can show that in the ways, by:

1. increasing the wages,
2. increasing the production,
3. less employees.

So far we only discussed the economic behavioral mechanism, but legislation and rule-setting are instruments to influence the behavior of the employer to. Rules-setting or normalization can easily be incorporated in the model.

Figure 2 shows the known balancing problem of the employer. Given some circumstances like: labor-costs per unit product w_1 , the price of a unit capital α_1 , the production possibilities α and production level $y = 1$, the employer will choose for position A^* and labor-intensity L^* . Along a third axes we have drawn costs of capital per unit $c(L)$, who are assumed to be a descending function of labor-intensity and convex to the origin. The choice for labor-

intensity L^* implies capital which costs $c(L)$ per unit. So, capital with a certain OHS quality, say k_1 . Lets assume some OSH-norm becomes obliged, which implies that the OSH quality of the capital-goods in the company has to raise until the k_2 level. The employer now in not free any more the choose the optimum on the costs/benefit curve. He has to take care for a higher labor-productivity, represented by, at most, the lower labor-intensity level L_2 . The loss of freedom of choice increases the employers costs. Here the extra costs equal the marked area.

There is a interesting second way to force the employer to OSH quality k_2 , i.e. to fix the labor-costs at level w_2 . This can be done by government by increasing the premiums for the absenteeism act.

Remarks on neo-classical theory

Like absenteeism, we can expand w with claims of disability benefits and failing off personnel. The mechanisms work identical: repel of disability benefits and failing off personnel can be improved by more OSH measures which increases the profit. With other words, OSH policy can pay itself back.

Dynamics play no role in this draft of the model. The dynamic in the triplet absenteeism, entrance, failing off personnel are considered given in a economic behavioral model, but have to be added in an explanatory model. Second the combination of capital and labor becomes more productive through the process of “embodied technical change”. Third legislation has in practice its dynamics. The premium for the absenteeism act depends on the absenteeism of the company in the year before.

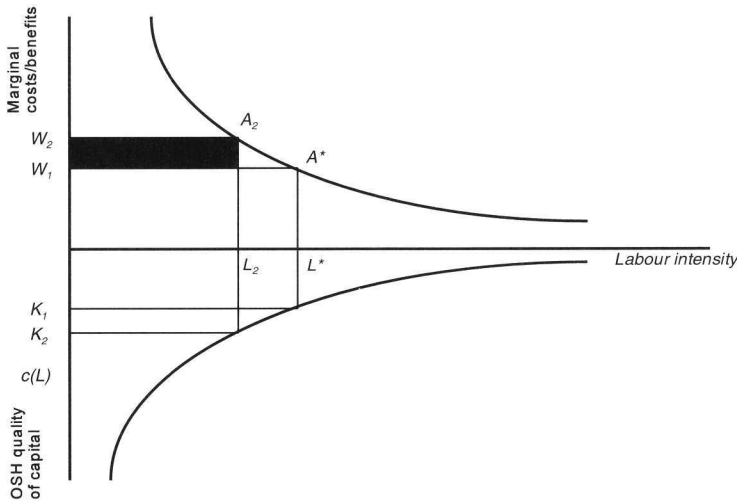


Figure 2 Marginal costs and benefits of reduction of labor-intensity by OSH-normalization

The choice for the neo-classical approach lays in the minimal number of behavioral axioms necessary, an excellent mathematical representability and explanatory power of observed phenomena. The model in its pure form has its limitations, because in practice one can not always meet all the assumptions.

How rational is the assumption of a maximizing employer? Neo-classical economists believe that employers optimize, although not always all the time, but the average employer optimizes. All employer together cannot be wrong systematically.

Theory assumes perfect security and complete information. In case of no perfect security the employer has to decide on expectations. In this case decisions depend on how much risk the employer is willing to take. If information is not complete the employer can for example abandon OSH-measures on the grounds of assumed not cost-effectiveness. Government can stimulate here by providing free information.

In practice OSH-measures have transaction- and adjustments-costs. So, it important to make these costs visible and try to reduce then or subsidize them.

In practice the capital market is not perfect. There exist a variety of financing possibilities. The consequence is that financing investment can vary and influences the extend of remunerative OHS-measures.

Neo-classicists assume a perfect factor- and consuming market. In case a company is a monopolistic power this assumption does not hold.

Finally this neo-classical approach applies best to small companies. The model is less suitable for large complex companies and for not-for-profit organizations. In these companies the principal of maximizing the profit does not hold.

It can be shown that the business administrative cost/benefit calculation-methodologies correspond perfectly with marginal approach in the model. The continuous marginal costs-curve is nothing else than a ordered series of OSH improvement options.

The theoretical economic model gives string clues for the choice and the form of an operationalisable version of the OSH-model. The labor-medical relations are still missing. They are unknown the economist and have to be incorporated in model by the concerning disciplines, as well theoretically as operationally.

Model construction and estimation

Cost-benefit calculations are based on a economic evaluation scheme to which occupational safety and health are added (see figure 3).

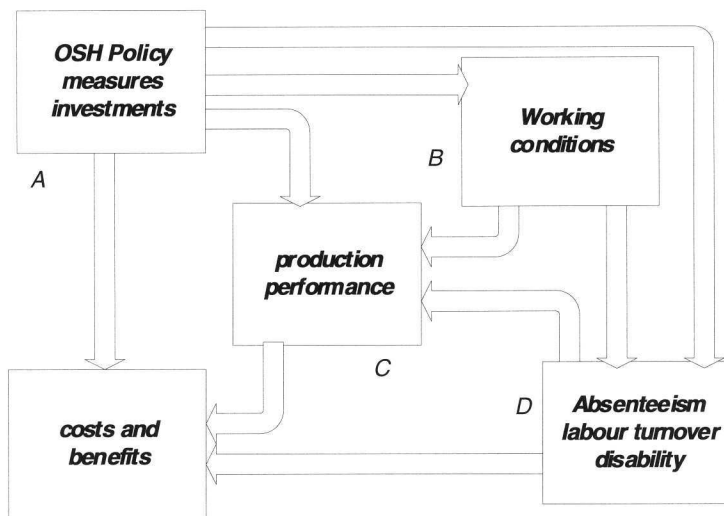


Figure 3 Relation between factors contributing to the costs and benefits of occupational safety and health policies or investments in companies.

The costs and/or benefits are a function of three components:

- costs of occupational safety and health policies and investments in measures that are taken (A);
- cost effects of changes in production performance (C).
- cost effects of absenteeism and labour turnover (can be positive and negative) (D);

Common cost-benefit evaluations of in-company projects generally focus on the first two factors.

Any policy or measure affects both the working conditions (both the physical work environment as the organization of work), as the way products or services are produced. Changes in absenteeism and labour turnover are described as a result of improvements in the conditions of work (B). Also there is a direct effect of measures and policies on absenteeism and turnover.

Production performance (C) is seen as a variable, consisting of a number of components like productivity (the volume of the output per amount of labour or time), flexibility and product quality. Also other production related cost factors such as changes in energy costs and facilities are seen as a component of the production performance.

The production performance is a function of:

- occupational safety and health policies and measures that are taken (A);
- working conditions, for instance ergonomic improvements are usually designed to improve production processes also (B);

- absenteeism and labour turnover example: replacements have to be trained or have lower productivity (D).

The complete model can be described in mathematical form as a set of three functions.

Next step is to estimate the model. Part of the model is estimated from a logistic regression analysis of the monitor stress and physical workload. This survey in nine sectors links occupational safety and health policies within companies with working conditions and stress risks and with health complaints. Two linked data sets are available: employees (n = 4000) and companies (n = 780). From the logistic regression only part of the relations in the model can be estimated (see table 1). In particular cost data and effects of measures, working conditions and absenteeism on production performance are missing.

In order to complete the econometric model, a number of external data sources must be used:

- cost data on labour (wages in various sectors) completed with data on the way companies deal with absenteeism (are absent workers replaced, is work done by colleagues);
- cost data on common measures and policies;

Though case studies show that the impacts of increased production performance can be quite large, there is insufficient statistical data to make a reliable estimate. For general application the economic effects of increasing production performance are left out.

Table 1 shows how effects are estimated. The OSH conditions influence the variables absenteeism, disability compensation (WAO) entrance and failing off personnel. OSH conditions are, amongst others variables, the structural form of physical and psychological stress. To get to these structural forms one has to estimate (explain) the OSH conditions from general characteristics of the company and OHS investment-policy. Since the available data were not optimal for this exercise, one should not pay too much attention to the estimation results.

Table 1 Absenteeism, failing off personnel and disability compensation (WAO) entrance explained by the structural forms of physical workload and psychological stress at work.

<i>Left censored normal distribution</i> <i>on $\ln(P / (1 - P))$, with P = one of the three fractions</i>	estimations (standard errors)		
	fraction absenteeism	fraction failing off personnel	fraction WAO- entrance
Intercept	0.0671 (0.0049)	0.1256 (0.0245)	0.0022 (0.0037)
Estimated structural equation Physical workload	-0.0003 (0.0011)	-0.0034 (0.0057)	0.0001 (0.0008)
Health complains due to Physical workload	0.0102 (0.0052)	-0.0307 (0.0261)	0.0047 (0.0039)
Problems for the company due to Physical workload	0.0047 (0.0057)	0.0077 (0.0282)	0.0027 (0.0043)
Reported Physical complains, last 12 months	0.0082 (0.0039)	-0.0241 (0.0197)	-0.0002 (0.0030)
Estimated structural equation Psychological stress	-0.0010 (0.0007)	-0.0179 (0.0035)	-0.0005 (0.0005)
Health complains due to Psychological stress	0.0016 (0.0054)	0.0196 (0.0272)	-0.0016 (0.0041)
Problems company due to Psychological stress	0.0015 (0.0060)	-0.0121 (0.0301)	0.0036 (0.0045)
Reported Psychological complaints, last 12 months	0.0018 (0.0038)	-0.0232 (0.0194)	0.0027 (0.0029)
Reported Health complains, last 12 months	0.0057 (0.0072)	0.0446 (0.0362)	-0.0009 (0.0055)
Percentage absenteeism lower last year	-0.0166 (0.0040)	---	---
Percentage absenteeism lower last two years	-0.0079 (0.0058)	---	---
Percentage failing off personnel lower last year	---	-0.0700 (0.0258)	---
Percentage failing personnel lower last two years	---	0.0207 (0.0407)	---
Percentage disability entrance lower last year	---	---	-0.0280 (0.0039)
Percentage disability entrance lower last two years	---	---	0.0047 (0.0074)
Log Likelihood	1283.240	58.150	629.919
N	734	727	754

Practical application

Based on the economic theory and the econometric estimation a simulation model can be constructed. In this simulation model we compare some basic situation with the situation where OSH measures are optimal. Figure 4 pictures the overall structure of this model. The model starts with the profile of the firm, given in the upper bloc. There are two kinds of

characteristics. First the general characteristics like the industrial branch, the number of (full-time and part-time) employees. Second we distinguish the current OSH policy. At the moment in this research we operationalize the policy with thirteen indicators from the available data in the monitor physical workload and stress (Houtman, 1995).

The basic situation, without OSH policy, is modeled by structural equations and the general characteristics of the firm. See the bloc structural equations in figure 3. From the structural equations follow indicators for psychological- and physical-stress of workers of a firm with a certain profile that has no OSH policy at all. The outcome of these indicators is measured by absenteeism, claims of disability benefits and failing off personnel.

Now we can compare the basic- or null-situation with a situation where a certain bundle of OSH measures is implemented. The benefits of OSH policy is measured by changes in absenteeism, claims of disability benefits and failing off personnel. We can distinguish between direct and indirect payoffs.

Theoretically, it is possible to simulate the economic weighing process of an employer with such a model. Now the user of the model starts with implementing OSH measures in the sequence of cost-effectiveness. The optimal OSH policy emerges at the moment the costs of the employers actions equalize the benefits. In practice there are some catches. Neither is it simple to implement in regression equations the effects of measure on psychological- or physical-stress or absenteeism, disability entrance and failing off personnel, nor are there enough data to accomplish the costs of measures and their sequence of descending cost/benefit balance.

Although the OSH model is a micro-simulation-model: is generates output in the level of one firm, it is possible to simulate on the level of an industrial sector applying some reweighting technique.

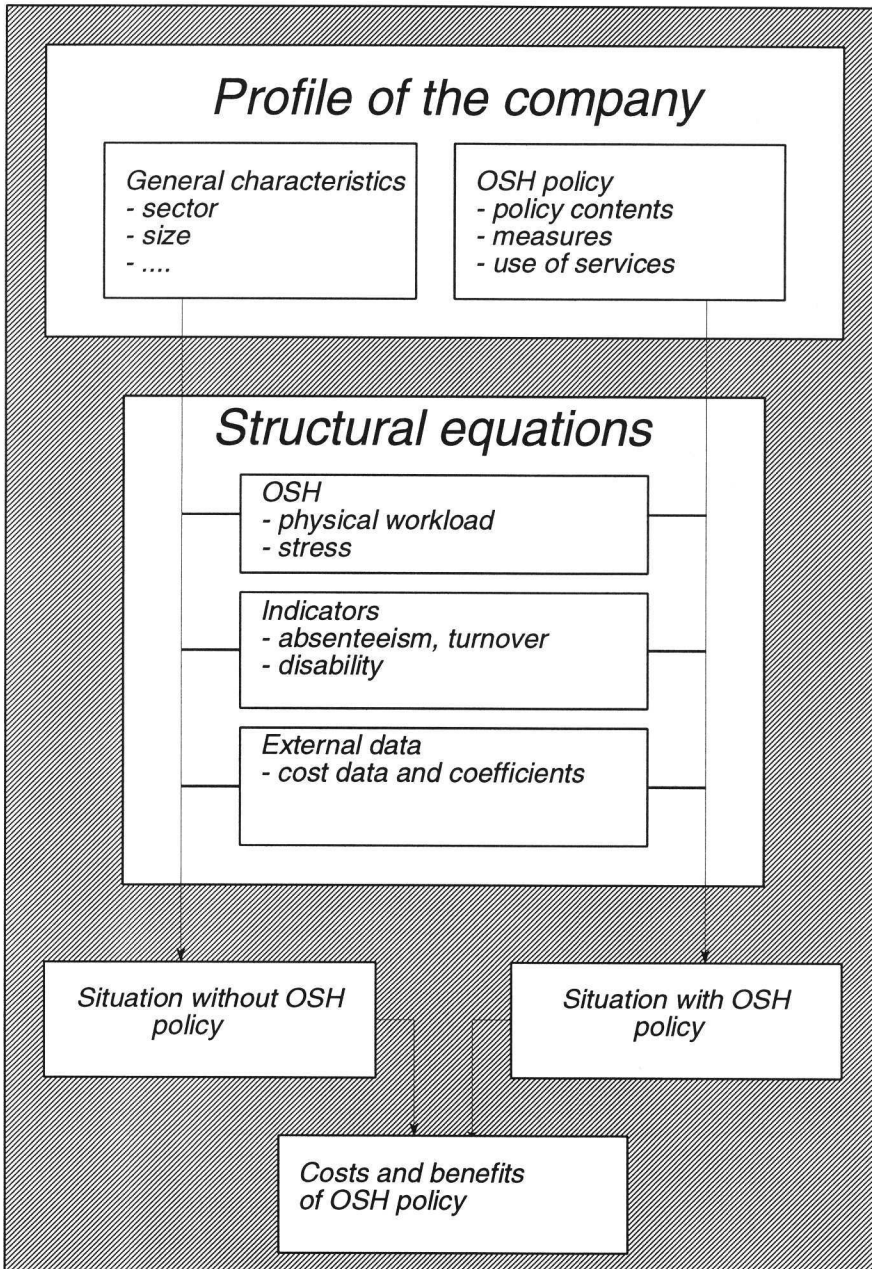


Figure 4 Scheme of the first prototype of the OSH-model.

Conclusions and recommendations

Since our research led to the conclusion that it is indeed possible to construct a cost/benefit model of OSH policy, we now shall focus on the necessities for refining the model.

First we want to emphasize that the ideal model does not exist. They are just a mathematical representation of reality and are based on various assumptions. To build an empirical model one needs data. In general the builder of the model only has samples to his disposal, so he has to make use of estimations of parameters and these estimations have estimation errors which are at the best zero at average. So, an integral model of all measures, all costs and benefits of all company-processes in every company is an illusion. We have to constrain ourselves to some optimal combination of applicability, reliability and costs. The development of a model has to proceed gradually. It is not wise to start with the development of the integral model

Practical models will focus on a limited number of industrial sectors separately, which can be combined into a single model at a later stage. Also it is advisable to start with a limited number of well defined OSH measures.

To determine the effect of OSH measures insight in causal relations, for instance panel-data. Some measures show an effect after some period of time. It is recommended to start with a zero measurement moment to investigate the whole OSH situation, with some references to the past, and repeat this investigation after say one or two years. One can even think at experiment with control groups.

There exist long lists of all kinds of OSH measures, but without almost exception these lists and catalogues lack the economic component. A database of OSH measures with their economic value, like costs of implementation and expected effects on working conditions and production performance will enhance the possibilities for making cost-benefit analyses at the company, sector and national level.

Macro-economic efficiency indicators of Occupational Safety and Health Policies

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It has been to a large extent recognised that because of the increasing expenditure in the individual areas of the social services and the inadequacy of subsequent corrective interventions, that preventative elements in our social system must be intensified. In the long run this has not only economic advantages. For the individual, crucial prerequisites in leading a humane and active life in society are the prevention of illnesses, the promotion and maintenance of working ability as well as securing work places for example by appropriate organisation of work and technology and by training activities. Only the most important aspects of the large spectrum of argument on costs and benefits in Occupational Safety and Health can be discussed here; the diversity of methodical, substantial and ethical problems is too large to cover the whole range of subjects in one paper.

The history of prevention at the workplace by means of governmental safety provisions is a history of long conflicts. In this connection the economy of the enterprise was seen as a contrast to the employees' safety through improved working conditions. This contrast was much more distinct in the US than in Europe as the economical aspect was given a higher rank there. That way even the American president Ford questioned - stating wrong facts - whether it is useful to burden the consumer with "as much as 30 billions US-dollar to reduce the level of occupational noise exposure by approximately five decibels." As a result of these arguments, the governmental steering of quality at the workplace, which is often designated with the derogatory term regimentation, has developed very differently in many countries. The so-called "voluntary compliance" of the American OSHA (similar to the British system of self-regulation) is based on an understanding of occupational safety that differs completely from the concepts in Germany or in Scandinavia. As a result of this development questions of profitability took a higher rank in the US than previously in Europe. The "voluntary compliance" had to be substantiated much earlier.

A few steps of this development shall be mentioned briefly. Originating from the roots of Taylorism, the so-called safety movement came into existence in the US. With the conviction that prevention of accidents would pay, its participants felt especially obligated to put this prevention into action. The reasons existing at that time are still partly valid in the US today:

- prevention of interruptions in the production,
- improvement of social relationships and moral (motivation) at the workplace,
- diminution of fluctuation (it often worked out to 100 per cent per year in the US at the turn of the century),
- leave public authorities "out"
- prevention of trade union organisations inside of the enterprise.

Not only do these diminished accident rates lead to a reduction of costs due to lower contributions to the accident insurance. The "Scientific Management" discovered the motivation and related to it the existing benefits for the enterprise; technical measures as well as safe modes of operation became a part of this movement which has to a great degree influenced the work organisation at the beginning third of this century.

The discovery of the economical costs of occupational accidents has lead to early efforts in dealing with the possible calculation of these costs. Already in the thirties the American H. W. Heinrich developed a method for the estimate of costs. He claimed that indirect costs in form of first aid, transportation of the sick, lost working time, loss in the income and new employees are four times higher than the direct costs: In the fifties the model was further developed by Simonds and Grimaldi; they compared the insurance costs of an enterprise with its non insurance costs while at the same time considering the total costs. In consideration of the accident costs Compes differentiated between fixed and movable costs. The movable costs cover all single costs that are caused directly by the accident; the fixed costs on the other hand are not directly influenced by the single accident. The so-called accident cost calculations have increased rapidly after World War II.

The registration of the overall accident costs forms the basis of the "profitability calculation" of most of the authors. With it the efficiency of safety measures shall be proved. In case of an occupational accident all costs that result from this accident for the enterprise are ascertained. These costs are balanced against the costs which would have been undertaken to of prevent this accident. Example: While attempting to remove superfluous fat from the press, an employee loses all five fingers of one of his hands, because he was able to reach through an opening that was not secured. The resulting costs for the enterprise amount to 3373.63 DM. If a hinged security grating had been attached, the resulting costs would have been 190.- DM. These 190.- DM make up only 5.6 per cent of the accident costs.

With the help of such cost comparisons, the profitability of future investments in safety measures is to be evaluated too. In this connection, it is an occupational accident that might take place and not one that has taken place already that forms the starting point of the considerations. Numerous problems, however, occur here: As follows, it is not clear which costs have to be attributed to the accident. If so-called accident overhead costs are included, the profitability of safety measures changes according to the number of occurring accidents. This change results from a decrease of the total costs of an accident due to effects of digression. Moreover one can not be sure whether an implementation of safety measures can really prevent an occupational accident (in addition to other secondary injuries). If no accident took place without the safety measure either, then it is only the safety measures which occurred costs. They are contrasted with the costs of a non occurring accident which leads to the fact that an uneconomical measure is 'calculated as profitable. In principle, such model calculations are not suitable as a means of evaluating the profitability of occupational health. Krüger and Meis determine with good reason that the neglecting of important factors like capacity utilisation of the enterprises and the in homogeneity of the work factor makes them completely unfit for an economical employment of any kind whatsoever. That, however, does not mean that accidents are not "calculable". A successful accident prevention (this is also applicable to health related questions) diminishes the 'slack' in the enterprise (production buffer, reserve capacities, lasting personnel reserve); and that

can be calculated. An example of this is the "slack model" developed by the Norwegian Matson that is recommended to the enterprises by the Swedish association of employers.

Economics of safety and health

The field of occupational safety and health and economics, envelopes a whole range of complex and important questions, which stretch from the costs of individual occupational safety and health measures to the problems of internalisation and externalisation of internal and external company expenditure, but also includes the benefits and the prevention of work related injuries and their social consequences.

At the expenses of the enterprise on occupational safety an average of about 1.4 per cent of the wage total accounts for accident insurance; about 1 per cent of the wage total is added - this results from the average costs of 0,38 DM for the "uninterrupted working hour" in an enterprise. Roughly estimated, this totals up to 1 per cent of the average hourly wage. Consulting the average wage increase at wages rounds as a standard of comparison, it becomes obvious that occupational safety in the enterprise does not form a "driving factor" at all. This becomes all the more evident when this figure is contrasted with the costs of the sick rate of the enterprise.

In a current research project of the Federal Institute of Occupational Safety and Health (BAuA) the part of the disease-related personnel costs in the personnel costs was projected as a function of the sick rate for a model plant (one with 100 employees, one with 1000 employees). At a supposed sick rate of 5.5 per cent (employees 3.3 per cent, workers 6.1 per cent) these illness related personnel costs amount to 2.8 per cent for white collar employees and to 5 per cent for the blue collar employees of the model plant; this is high above the costs of the enterprise for occupational safety. The higher the above mentioned sick rate is, the greater is the potential economical advantage of measures of occupational health.

Health economy mainly deals with two subjects that are directly relevant to "the public efforts to prevent diseases and to promote health" - according to a definition in use by Public Health:

- (1) how is health "produced" on an individual level and
- (2) how do the health care systems function from the economical point of view?

In this connection the most current analysis in Germany deals with the function of the legal health insurance. The topic of the "production" of health forms another important analytic aspect.

The actual aim of prevention and other interventions in the health care sector is the improvement of the population's state of health. Thus the central empirical problem in evaluating the efficiency of the health system deals with the question of how much improvement of health is achieved by which employment of means. This is the field of economical evaluation, which also forms an important part in the so-called "medical technology assessment".

A variety of methods exists for the economical evaluation of the health system which differs in regard to the cost and benefit components as well as to the used evaluation proceedings that are both to be included in the analysis. The development of the evaluation proceedings, however, is not terminated at all. In this connection it is continuously attempted to validate

the previous methods and to improve them with the help of a transfer of proceedings from other disciplines like social sciences, operations research and econometric.

In a cost-efficiency-analysis the costs are compared to interventions like the modification of the parameter of the lung function that is caused by medical treatment. The so-called cost-benefit analysis goes one step further. It attempts to express the effects of intervention in form of a change in the state of health that is specified by a special index. If this is successful, different concepts of intervention can be compared to each other, too. The methodology of such measurements is in a phase of quick advancement. Here health economy touches upon other disciplines like psychometric, the theory of decision and research on life quality. Thus it is hardly surprising that different concepts are employed in practice. This is also valid for the measurement of costs.

Sick rate of the enterprise

According to a statistic of the former Hoesch AG the disease costs of this enterprise for the year 1992 - including all wage earners and salaried employees together - amounted to 105 millions DM. The potential of the saving in costs becomes even more obvious if one compares the disease costs of 105 million to the shown balance profit of the former Hoesch AG. This came to 71 millions DM for the business year 1991. A reduction of 1 per cent of the sick rate at the Volkswagen AG would mean a diminution of costs to the amount of 100 millions DM.

As outlined above the costs of the sick rate add up to about 5 per cent of the total wage average of the enterprise. Thus the costs of work incapacity are not irrelevant to the enterprises; but as the sick rate is changeable those costs can be influenced in a positive way with the help of preventive measures.

At the moment four theories on the explanation of the sick rate are discussed: The theory of strain supposes a connection between working conditions, diseases and certifications of diseases. The misuse theory imputes that the scope of work incapacity is used in an abusive way. The coping-theory proceeds that short periods of work incapacity due to strains are accepted on purpose so that an improved state of health is achieved again. The theory of selection claims that the proportion of men and women who, as a result of restrictions of work, suffer highly from work incapacity, increases in the enterprises in correspondence to the level of their occupational degree. Although it would be fascinating to discuss the several dimensions of the sick rate on the background of these theory attempts, we want to leave it at the statement that every single attempt provides explanations for single aspects of the health rate.

Volume of sickness leave in Germany

According to a projection, about 560 millions absent days were lost with 32 millions depending employees in 1995. These 560 millions days of work incapacity related to diseases and accidents are equivalent (divided by 365) to about 1,553 million non-productive years.

The average gross income of wage earnings amounted to 60.100 DM in Germany in 1990; projected this totals to a non-productive volume of the production factor work of 92,2 billions DM.

Taking a closer look at the work incapacity it becomes evident that almost 80 per cent of all work incapacity cases of compulsory insured people cover 5 groups of diseases. In this connection, the work incapacity is distributed over the diagnosis groups as follows:

- diseases of the skeletal and muscular systems: 164.65 millions days of work incapacity (this is equivalent to 23.26 billions DM of non-productive costs of production of the factor work),
- respiratory diseases: 104.32 millions days of work incapacity (14.74 billions DM),
- injuries and toxicopathies: 96.15 millions days of work incapacity (13.6 billions DM),
- gastrointestinal diseases: 65.67 billions days of work incapacity (7.7 billions DM),
- heart and circulatory diseases: 29.85 millions days of work incapacity (4.2 billions DM).

The 560 millions days of work incapacity mentioned are equivalent to an average sick rate of about 5.1 per cent.

Duration of work incapacity

Despite the fact that 50 per cent of all cases of work incapacity occur during the first week (1 to 7 days), these certifications of diseases account for 11.75 per cent of the total work incapacity volume only; here only 3 per cent of the total days of work incapacity occur during the first 3 days. Thus it becomes evident that all "political" measures that use these first three days as a starting point are hardly able to cover the actual problems. Moreover they would not be in a position to disclose greater saving potentials to the enterprises at all - completely disregarding the health-political problems of such considerations.

If an enterprise wanted to reduce its sick rate in a successful way it would have to focus on medium and longer work incapacity. In this connection, it has to be considered that within a year about 48 per cent of all employees do not show any periods of absence which are related to accidents and diseases; 21 per cent of them have not reported any work incapacity during the past three years. Two thirds of all work incapacity cases last less than 15 days; they make up for 30% of absence cases.

The diseases of the skeletal and muscular systems are at the head of the "hit-list" of the diagnosis groups - their proportion has continuously increased during the past ten years.

Profitability

Occupational Safety is a basic element of social policy. The success achieved in occupational safety is reflected in a reduction of social costs, a decrease of both accident, disease and death figures and particularly in a lesser utilisation of medical, social and rehabilitative services. In addition to this, integrated occupational safety reduces the costs of the enterprise and can contribute a considerable benefit that is not measurable in terms of money.

Moreover it needs no special mention that occupational safety is bound to ethical aims. Namely it creates the preconditions for each individual person to lead an active and humane life in society and to further develop his or her personality with the help of the securing of workplaces and the prevention of accidents, diseases and exposures to danger. All working conditions that endanger the long-term maintenance of health must be acknowledged as strains and improved by occupational health. By gaining knowledge about the dangers, occupational safety can set priorities in its safety aims. In order to put the basis of action in the field of

occupational safety on solid grounds, statements that serve as guidelines of action are necessary. This is the only way preventative targets can be successfully realised.

Basically five cases can be pointed out that speak in favour of an improvement of profitability and thus of the input-output ratio:

- the increase in efficiency turns out to be higher than the additional bringing in of funds
- the cost saving outcores the loss in the output
- the same output is achieved with lower costs
- despite constant costs, efficiency can be increased
- an increase in efficiency goes side by side with a reduction in costs

Economic assessments are usually complex and in practice confront unsolved problems. The following problems can be mentioned: there is the problem of measurement level. It is often very difficult to find indicators or measurement levels which accurately reflect the economic changes. Because there are a number of possible measurement levels in relation to costs as well as efficiency, a choice is often necessary. A further problem is the nature of the situation. In the evaluation of economic improvement measures, the actual utilisation is often generalised. Such a procedure does not however take into consideration that the economic assessment can produce very different results depending on situate factors. Location, different forms of organisation, qualifications of the staff or legal peculiarities have for example an often underestimated influence on profitability.

A third open question is depicted by the problematical nature of the network. The labour in organisations is divided to a high degree. There are always several workplaces involved in the carrying out of a task. Strong dependencies between the participating systems of work occur in this connection. As a consequence of the unawareness of the connections between the different services one is often attempted to regard parts of the organisation as isolated (e.g. clerical work) and to reorganise and automate them. It has therefore become apparent that to ignore the interaction between those individually regarded sectors and the environment could result in a deterioration of the economics even though the work in the isolated sectors has been more "productive" or the number of staff members has been cut down.

A further problem exists in the question of accountability. The problem of accountability of cost and efficiency effectiveness is revealed in two ways particularly: there is a time delay in the cost and effectiveness results (e.g. in the organisation of visual display stations, stresses and demands of the user were not foreseeable during the planning phase and a costly arrangement of additional breaks had to be met); cost and effectiveness results occur at different times for example when the use of poor quality cheap working materials delivered by a subcontractor leads to an expensive image damaging return action.

A fifth point refers to innovation difficulties. The employment of new methods or the development of new organisational measures basically take two directions: in comparison to the previous measures they influence the factor share. The current calculations to compare the costs apply in this case (question of whether the substitution pays). Innovations, however, lead to a discovery of new possibilities for the most part: new products, new applications, new working conditions. Especially the innovative effects which bring about notable benefit make an overall evaluation of the economical measures even more complicated

Social Costs

Social costs are understood as all expenditure occurring in a society when new values are established. This includes expenditure in the narrower economic as well as in the non-economic fields of society. Furthermore, costs are defined as complete costs of a society and not as additional costs. This includes for example, the internal and external costs of an enterprise. The term 'subsequent costs' indicates a cause-result connection.

In occupational safety and health, only those costs resulting from the neglect of work and health protection measures in the production process, are integrated. If one assumes that neglect of work and health protection always precipitates in a short or long term reduction in the health standard of the workers, the resulting costs of the reduced standard of health must be taken into account. Here again, the narrower as well as the wider non-economic costs are included.

From the perspective of a widely defined prevention, all ensuing costs should be regarded as avoidable even at the price of production termination. There is no denying that this alternative is only an intellectual consideration. It should be thus made clear that it is solely question of sensible and economical expense to what extent the subsequent costs can actually be avoided.

An example for instrumentalising the ensuing social costs is the so called 'net-benefits-estimates' of the national product account of the Federal Institute for Statistics. A further example is represented in the social balance sheets of companies. With this, companies want additionally to balance the social costs and benefits in relation to their labour economy. Business and social balance can together produce a statement on the social - net - benefits of a company. Ultimately, the same aim is achieved as with an economic - net - account. The workplace health promotion programmes are named here as a third theoretical approach. Companies carry out workplace health promotion programmes to help avoid health related production losses (and at the same time as a marketing action, giving the company a positive image). With this approach, the company tries to ascertain the ensuing costs resulting from the neglect of occupational health and safety activities in order to assess the value of safety measures.

The discussion on resulting costs is of value only when led with the aim of avoiding these costs. Detailed information on all 'repair costs' are not necessary. The resulting costs should be regarded as avoidable and only then should the possible use of these measures be evaluated. Accordingly the additional question arises on what expenditure is needed to avoid which resulting costs: possible measures can be usefully applied to avoidable resulting costs. It is necessary to compare the cost of these measures with the benefits (compared to the avoided costs). Where the cost-benefits relationship of the measures is larger than 1, they are to be recommended from an economic point of view.

The question whether for such an assessment pure 'costs - benefits - analysis' or 'costs - effectiveness - analysis' or the 'potential - use - analysis' is the most suitable, can here be ignored as a methodical problem of secondary importance. It is important though, that the calculation of resulting costs is presented only as a preliminary step in the assessing of recommended action.

Costs and Benefits of the UK Health and Safety (Display Screen Equipment) Regulations (1992) - Background and UK Approach to Cost Benefit Assessment and Post-Implementation Evaluation

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The UK Health and Safety (Display Screen Equipment) Regulations (1992) were introduced on 1 January 1993. They implement the Display Screen Equipment Directive (90/270/EEC), adopted in 1990. The Regulations place a number of requirements on employers (referred to later in this paper) where there are people who "habitually use DSE as a significant part of their normal work". It is estimated that there were around 51/2 million such users in the UK in 1995.

The UK's Health and Safety Executive (HSE) has carried out cost benefit assessments (CBAs) of all significant new proposals for health and safety legislation since 1982. CBAs have become an established part of the policy process, and ensure that proposals are scrutinised during the development phase. CBA is seen as an important aid to policy-makers, but is not used as the sole criterion to judge whether a proposal should go ahead.

Monitoring and post-implementation evaluation of policies after implementation are also important elements in the policy process, providing the means for feedback which can influence future policy. All Significant health and safety proposals in the UK have to include plans for monitoring and post-implementation evaluation. Member States are also required to report to the European Commission on the implementation of the DSE Directive.

Estimates of the costs and benefits of health and safety proposals before their implementation are often subject to considerable uncertainty. Although there are also difficulties in assessing the impact of a proposal even after its implementation, monitoring and post-implementation evaluation can provide a check on the accuracy of assumptions made in CBAs and can yield useful information and lessons to inform future appraisals.

Comparison of CBA and Post-implementation Evaluation

Methodology

HSE's CBAs are usually prepared using existing information and statistics, limited enquiries of affected parties (e.g. industry) and internal assumptions based upon HSE's knowledge or judgement. A draft CBA is then normally issued with the draft Regulations to a wider audience for comment, and, if necessary, subsequently revised.

The DSE Regulations affected nearly all sectors of the economy and in 1992, when they were in preparation, there was little or no information on the extent to which employers were already in a position to comply with them. The estimated costs were therefore especially reliant upon internal assumptions and consequently subject to potentially wide margins of error. The aim of the CBA was to indicate the broad scale of possible costs, which elements

of the Regulations would be most/least costly and to attempt to compare these costs with the potential benefits of the Regulations.

The post-implementation evaluation of the DSE Regulations was in two parts. Firstly, a survey of some 54 (mostly large) employers was carried out in 1995 by HSE and local authority inspectors (hereafter referred to as the HSE/LA Study). This focused on employers' awareness and response to the Regulations. The second and main part was carried out by the independent Institute for Employment Studies (IES). This looked in more detail at actions taken by employers and their perceived costs and benefits. The IES study involved: a literature review; a postal survey of 3000 employers and 30 follow-up interviews; and a survey of more than 1000 employees and 100 employee representatives.

The IES postal survey, carried out in the middle of 1995, covered employers of all sizes (except sole-traders) and in all industries (except agriculture). The aim was to have enough contacts to provide a representative picture of the impact of the Regulations across the economy as a whole and (through the follow-up interviews) to explore particular issues in more depth. HSE compared the results of the post-implementation evaluation with the pre-implementation CBA and, where possible, revised its assessment of the cost and benefit impact of the Regulations.

Results

Overall Cost Estimates

Table 1 presents the original CBA cost estimates together with those based on the results of the post-implementation evaluation.

Table 1 Overall Cost Estimates: CBA and Post-implementation Evaluation

<u>Type of Requirement</u>	Present value of estimated costs, £m, 1995 prices		
	CBA 10 Years ¹	EVALUATION 2½ Years (1993 to mid- 1995)	EVALUATION 10 Years ²
Risk Assessment	89 to 114	56	170
Risk Reduction/ Minimum Requirements	59 to 111	58	180
Protection of Eyes	238 to 283	24	80
Vision Screening	not included	6	20
Glasses	negligible	5	20
Information and Training	44 to 58	50 to 100	100 to 300
TOTAL	430 to 566	200 to 250	570 to 770

¹ Adjusted to 1995 prices. ² If Costs incurred so far follow the profile assumed in the CBA

Overall, the CBA estimated ten year present value costs to be between £430m and £566m (£340m and £470m in 1991 prices - the original price base for the CBA). This equated to an average one-off expenditure of between £50 and £70 per work station, or about 1 to 1 1/2 per cent of the cost of equipping a new work station (although the CBA noted that for some work stations it could be up to 7 1/2 per cent). Around half was the cost to employers of paying for eye tests, and about a fifth was in assessing risks.

Using the findings of the post-implementation evaluation it was estimated that costs incurred between the introduction of the Regulations at the start of 1993 and the time of the post-implementation evaluation survey (at mid-1995) could be around £200m to £250m. Costs over a longer period are even more uncertain. However, if they follow the same profile as assumed in the CBA, then ten year costs could be around £570m to £770m in present value terms, on average about a third higher than anticipated.

We can see from table 1 that there is much more variance in the composition of the cost estimates. In particular, the cost of the right to eye tests paid by the employer was much less than expected, and the cost of providing information and training much higher. These, and other more detailed findings, are discussed below.

More Detailed Cost Estimates

Table 2 presents results from the IES study which were used to generate the overall cost estimates. About half of users had been covered by a risk assessment, at an average estimated cost per user of £20. The staff time involved in a typical assessment was between 20 and 40 minutes, on average slightly higher than expected. The comparatively high estimated cost for the staff time involved suggests a greater involvement of trained staff and consultants than anticipated, although some employers may have over-estimated the monetary cost of the staff time involved.

IES estimated that around 2 1/2 million work stations had been altered by the middle of 1995. However, the large majority of alterations were due to non-health and safety reasons such as office/IT upgrades. Only 17 per cent had been altered following a risk assessment. A smaller percentage had been altered Specifically to meet the minimum requirements. Nevertheless, more workstations appear to have been altered because of the Regulations than had been expected in the CBA, although the average cost per work station was similar.

Table 2 Assumptions Used in Revised Cost Estimates (Based on Post-implementation Evaluation Results)

<u>Type of Requirement</u>	Number of users affected (millions)	Cost per user (£) 1995 prices	Costs incurred to mid-1995 (£millions) 1995 prices
Risk Assessment	2.8	56	56
Risk Reduction/ Minimum Requirements	0.58*	100	58
Protection of Eyes	0.96	25	24
Vision Screening	0.41	15	6
Glasses	0.1	55	5
Information and Training	1.4 to 2.8	35	50 to 100
TOTAL	-	-	200 to 350

* Based upon assumption for percentage of work stations altered to meet minimum requirements

The CBA assumed that half of the DSE users would take up the offer of a free eye test. IES estimated the proportion to be far lower, at 18 per cent (around 1 million users). Around 10 per cent (nearly 100,000) had been prescribed special glasses, more than expected at the time of the appraisal.

IES were unable to estimate how many users had received information and training. However, HSE assumed that, as a maximum, all those covered by a risk assessment (2.8m) would have received information and training, with half this as the low point of a range. There was particular difficulty in trying to estimate the cost of this provision but indications from employers were that initial costs were substantially higher than anticipated, although the continuing costs may be closer to the CBA estimates.

That employers should plan the activities of each user to ensure periodic breaks or changes of activity was already a feature of HSE guidance and, in many cases, it was thought that periodic breaks or changes of activity are likely to increase productivity. It was therefore judged that this requirement would not lead to significant costs. The findings of the post-implementation evaluation provide support for this. The IES found that most workers do other work during breaks from DSE work.

Benefits

The CBA noted that the Regulations should help to reduce the incidence of upper limb disorders, temporary eye-strain and headaches suffered by some DSE users. Since the extent of these problems is unknown this benefit could not be quantified. However, it was noted that if 10 per cent of DSE users were to take one and a half fewer days sick leave as a result of actions taken then the resultant gain in output (calculated using wage data) would more than offset the additional costs.

Not surprisingly, the post-implementation evaluation revealed that many employers found it difficult to quantify benefits. Many could not identify benefits that could be specifically

attributed to the Regulations. Others felt it was too soon to assess likely benefits. Nevertheless, the post-implementation evaluation did produce some interesting results (see table 3).

Table 3 Benefits of the DSE Regulations Reported by Employers (Post-implementation Evaluation - IES Survey)

Type of Benefit	Percent of employers agreeing (of which, per cent strongly agreeing)
Improved staff morale	36 (4)
Reduced staff stress	30 (2)
Increased productivity/quality of output	28 (4)
Reduced sickness absence	15 (1)
Reduced labour turnover	4 (0)
Fewer compensation claims	4 (0)

The IES findings indicate that improved staff morale, reduced stress and increased productivity are the most common perceived benefits (this is supported by the findings of the HSE/LA survey), with in each case around a third of employers agreeing they had experienced these benefits. 15 per cent of respondents indicated that the Regulations had reduced sickness absence.

Overall, the findings of the IES survey suggest that the benefits of the DSE Regulations to employers may be significant. Benefits to individuals and society in general, such as reduced pain and suffering and medical costs, were beyond the scope of the IES study but are clearly relevant to a wider analysis of the benefits of the Regulations.

Impact on Small Firms

All HSE's CBAs include an assessment of the particular impact of the proposal on small firms. The DSE CBA noted that most of the costs are likely to be roughly proportionate to the number of DSE work stations, and therefore to firm size, but that costs may be disproportionately higher for small firms where there are economies of scale in carrying out assessments and where discounts are offered to larger firms by opticians. It may also be the case that small firms are less likely to have their work stations equipped to the minimum requirements than larger firms. The IES findings supported this view.

Conclusions

The DSE Regulations are an example of a proposal where it was particularly difficult to estimate overall costs and benefits before implementation. The post-implementation evaluation showed that there are also considerable constraints in making an assessment post implementation. Despite these difficulties, the post-implementation evaluation provided some useful findings.

The results have increased HSE's knowledge of the impact of the Regulations and this has helped to firm up HSE's assessment of their cost-benefit impact. They suggest that the CBA's estimate of the overall cost impact of the DSE Regulations was reasonably accurate, although

probably on the low side. Revised costs would also have been higher if a greater proportion of employers had carried out risk assessments and provided information and training. The overall scale of cost is usually particularly important information to policy-makers, especially where benefits cannot be quantified.

The CBA was less accurate in assessing the relative contribution of each requirement to overall costs. However, the post-implementation evaluation did not reveal any major costs that had been missed by the CBA or costs that had been grossly over-estimated. A possible exception is the right to eye tests, but even here there remains the potential for costs to rise if take-up increases.

It was not possible to quantify benefits either pre or post implementation. To help policy-makers make a judgement about the likely balance between costs and benefits, the CBA made an assessment of the reduction in sickness absence required to offset costs. The post-implementation evaluation could provide little evidence on this but generally indicated that the benefits to employers may be significant.

Costs and benefits of Occupational Safety and Health regulation, The Dutch case of manual lifting

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Abstract

In 1995 NEI conducted on behalf of the Dutch Ministry of Social Affairs and Employment a research project on the costs and benefits of regulation of manual lifting at work. The costs and benefits had to be evaluated from the point of view of the private sector, the enterprises; social costs and benefits were not included. Starting point was the use of the NIOSH equation to assess manual lifting situations. In a double stage survey, the Dutch Central Bureau of Statistics approached eventually almost 1,500 employees who have regularly manual lifting activities. The questionnaire used was developed by TNO Prevention and Health, CBS and NEI, and was validated by TNO Prevention and Health. The main finding was that 25 per cent of the Dutch work force have manually to lift loads with a weight above the recommended weight limit as can be calculated from the NIOSH equation. Differences between industries and occupations are large. In a following step, experts on working conditions provided solutions for situations with manual lifting above the NIOSH standard. Many of these solutions were discussed with industry experts, in order to arrive at an estimate of the costs involved. They were estimated at (discounted) ECU 280 million a year. The benefits were derived from literature. The estimate of the share of "manual lifting at work" related low back pain complaints in total low back pain complaints is 15%. Subsequent benefits to be reaped are not only related to less sickness absence and less occupational injuries, but also to some extent to productivity gains due to the investments. The final estimate of the benefits arrived at ECU 180 million a year (discounted). This means that the balance between benefits and costs is negative; this is so even with a less strict standard as the NIOSH equation provides. However, depending on the solutions chosen and the assumptions made, the balance can be much more negative, but also a bit positive. Finally, the research also showed that use of efficient solutions can bear financial fruit for the individual company.

Introduction

Legal aspects

Implementing the EU directive for manual handling of loads, the Dutch government issued in 1993 regulations as regards physical stress (Physical Stress Decree). Specifically, for manual lifting the government prepared guidelines for the labour inspectorate. These guidelines are still in discussion between employers', employees' representatives and independent experts, before they will or can be put into effect.

Goals, main questions

In order to provide relevant background material, the Ministry of Social Affairs and Employment asked for advice. Firstly, the Health Council of the Netherlands was asked for a risk assessment of manual lifting. Their report became public on March 30, 1995. Secondly, the Ministry asked the Netherlands Economic Institute for an estimate of the costs and benefits for Dutch enterprises due to regulation of manual lifting. For this, NEI worked together with TNO- Prevention and Health and the Central Bureau of Statistics; furthermore, many experts have lend their knowledge and time in order to accomplish this not so easy task.

Several questions arose from this main goal. First of all, we did not know to what extent risky manual lifting existed. "Risky" could be defined in several ways, but we used the following: manual lifting tasks with a Lifting Index greater than 1. This means that for the manual lifting task under consideration the load weight was higher than the Recommended Weight Limit of the NIOSH equation, a well accepted international standard and one that is considered by the Ministry of Social Affairs and Employment. We also considered other standards: 1.5 and 2 times the recommended weight limit, and simply 25 kg and 40 kg. Moreover, the Ministry wanted to know the existence (or prevalence) of risky manual lifting per industry and per job category. Furthermore, we needed to know more about the relationship between physical complaints, specifically Low Back Pain, and manual lifting at work.

Restrictions

Many restrictions applied to our research, and this fact has definite influence on the results and the interpretation of them. Firstly, the research was not directed towards a social benefit cost analysis. Costs of health care, macro-economic costs, employment effects were not taken into consideration, although employment effects were analysed in a follow-up study. The results of that study, however, will not be presented in this paper, because the Ministry of Social Affairs and Employment has not yet made them public.

Secondly, the Occupational Safety and Health (OSH) measures considered are those that can be taken by the *individual* enterprise. Investments by an industry as a whole were not considered. Thirdly, from all possible diseases and injuries only those related to lower back pain were considered relevant. Fourthly, the study was explorative, simply because there was up till then no generally accepted framework for a benefit cost analysis of OSH regulations. Lastly, the study investigated the impact on salaried employees only.

Focus of this presentation: the methodology

In this paper, I will focus on the methodology applied more than on the results of the study. In my opinion it is of more interest for this conference to discuss about the choices that we have made, than about the results which are by and large specific for the Dutch economic and working environment. So, firstly, I will discuss the research design, the relation between manual lifting at work and lower back pain, our concepts of benefits and of costs. At the end, I will discuss the results of the study, not only the "central projection", but also different results in the case of alternative assumptions.

Following the research design

Analytically 2 building blocks: Prevention/Correction costs and Discounted Cash Flow

Theoretically, the level of working conditions can be seen as determined by the balance between marginal prevention and correction costs. Prevention costs comprise all those costs related to measures, investments and so on to improve working conditions. Specific OSH investments are of course an example, as well as training and education and Occupational Health Care. Correction (or curative) costs are all costs due to correct (or cure) the effects of “bad” working conditions, “bad” being a relative concept. Costs of sickness absence, but also workers’ compensation claims fall into this category. Moreover, many costs, as costs of Health Care are not borne by the actor who caused these costs to appear, the enterprise; these costs are external to the enterprise. One way a government can deal with this is to try to internalise these external costs (in several other fields, the Dutch government does try to internalise these costs). However, in the case of manual lifting, this is not the case. This means we have only looked into the direct costs borne by the enterprise.

One of the major difficulties was to look at the regulation of manual lifting from the point of view of an individual enterprise and subsequently to estimate the costs and benefits for *all* enterprises. Basically, it is quite simple: you calculate the costs which emerge from the investments by the enterprise on the one hand, you calculate the potential benefits which emerge from the investments on the other hand, and you subtract. However, the time dimension is also important. What we did was to use an approach which is common for investment projects: to calculate the investments needed for the project and the cash flows during the lifetime of the project in order to arrive at indicators as the net present value. The trick to arrive at costs and benefits for all enterprises, was to calculate the investments and operational outlays not per enterprise, but per worker with risky manual lifting tasks. This combined very well with the other parts of the research, and moreover, it helped us to aggregate the costs over industries and the economy as a whole.

Manual lifting can lead to lower back pain

One of the major links between manual lifting and the benefits to be gained is the relationship between manual lifting and bodily injury, leading in turn to sickness absence and occupational disability. In order to arrive at quantifiable figures we narrowed the definition of bodily injury to low back pain (LBP), which is also in line with the recommendations of the Health Council of the Netherlands. However, in its risk assessment the Council stipulates that it is not possible to quantify lifting-related injury¹. Indeed, this proved one of the more difficult problems in the research. We have not completely overcome this, but have used as much information as possible. We did this by splitting the question in two parts: 1 the relationship between manual lifting and low back pain, and 2 the relationship between low back pain and work. For this, we relied fully on literature.

There was only one source that answered the question which percentage of the set of problems (complaints, sickness absence, medical costs) related to low back pain can be attributed to manual lifting at work, and it estimated it at 14%². All other sources do not give the answer directly. Other sources comprise injury statistics, social security statistics,

questionnaire research with employees and epidemiological studies. Part of the low back pain related problems are not work-related; estimates vary greatly - between one third and two thirds. Most sources estimate it at one third, the percentage we have used in our study. From the available information we have also a large range of percentages of manual lifting as the source of (predominantly work-related) complaints of low back pain, with 33% as the best representation of the available data. A conservative estimate of the percentage of low back pain complaints that is due to manual lifting at work would be then 10%. We used in the study 15% as the central assumption, with 10 and 20% as alternatives.

How to measure: survey under employees

Before this research it was unknown how many employees have manual lifting activities. We wanted to use data that could be related to a reliable source. In our case this was the Survey Working Population carried out by the Dutch Central Bureau of Statistics. The CBS interviews face-to-face people with questions about their occupation. We asked the CBS to approach around 7,500 people with a question about manual lifting (do you have to lift manually several times a day loads of more than 3 kg?). Subsequently, in a telephone survey around 1,800 people were approached with a questionnaire, of which almost 1,500 people answered the questionnaire. One of the largest benefits of this approach was that from the regular CBS survey we could use many other interesting characteristics of the work force, as the industry in which the people were working and their occupation.

Main purpose: an estimate of the NIOSH equation

The main purpose of the telephone survey was to arrive at an estimate of the recommended weight limit for each lifting situation. Much effort has gone into the development, testing and validation of the questionnaire, which is really a combined effort of TNO Prevention and Health, the CBS and NEI. The questionnaire was validated by TNO Prevention and Health. The outcome was that employees overestimate the loads they are lifting with 33%. In our study this led to the use of a correction factor.

Expert opinions on manual lifting tasks

Having the data on employees with risky manual lifting tasks was not enough. We asked 14 experts on occupational safety and health to find solutions for in 67 cases of lifting of loads with a weight above the recommended weight limit of the NIOSH equation. Each expert was send around 6 cases and was asked to provide 3 different solutions per case, as well as a cost estimate. This was not an easy task for the experts, since the cases were anonymous and not all the information needed was available. Moreover, the experts were asked to how many workers their solution applied. In case it was not possible for them to give an estimate, we made up an estimate, using the available information on the kind of the solution (e.g. activity bound or company wide), the duration of the lifting activities, and the size of the company. The measures were classified as follows:

- organisational;
- use of lifting devices;
- modification of the working place;
- modification of the load;
- instruction and training.

Check with industry experts

About half of the solutions of the OSH experts were presented to and discussed with 26 industry experts, in order to arrive at a second opinion. Finally, we had 227 solutions for the cases. From this a picture emerged which is useful, but only indicative. The solutions given are of course strongly dependent on the manual lifting situations presented to the OSH experts. The results of this exercise were linked with the results of the employees survey, so that we could analyse results at the industry and macro level.

Costs: higher prevention costs

Of the costs to implement the solutions for manual lifting activities, we only looked at the additional costs of investments. This applies in our study only to workplace modifications, as these can be expected to be carried out within a larger investment plan.

Costs are further divided between operational and investment costs. The latter being all outlays at the beginning of the “project” and the former all outlays during the lifetime of the “project”. As mentioned before, we considered a timespan of 15 years. It turned out that the lifetime of the investments in this study averaged around 10 years, which means that we calculated a replacement investment after that period and a rest value of the equipment at the end of the 15 years.

Our costs estimate was, without discounting, ECU 310 per employee with manual lifting tasks with a Lifting Index larger than 1. These costs differed between industries, size of enterprises and types of solution. Mining, oil and chemical industries turned out to be quite expensive as regards solutions, as well as wholesale trade and agriculture. Solutions for the construction industry were not so expensive, mainly because the solutions applied to several employees having the same lifting activities. The costs differed markedly between different sizes of enterprises, with the small (less than 10 employees) companies bearing the largest burden (costs per employee can easily be twice or thrice as large than for companies with 100 employees or more). Finally, the costs for organizational solutions were the highest, primarily because these involve the use of more labour.

Benefits: lower correction / curative costs

As for the benefits, we discerned three types of benefits:

- 1 reduction of sickness absence;
- 2 reduction of disability due to occupational injuries and diseases;
- 3 gain in productivity due to measures taken.

We did not take into account, as mentioned before, lower social costs, e.g. lower costs of health care. The data used for the calculation came from administrative and statistical databases of social security organizations. For the productivity gains we relied on literature, and assumed that 25% of the investment amount was an usable approximation for productivity gains due to e.g. less rejected products as a result of better quality. For items 1 and 2 we combined two studies one with a model for calculation of those costs for individual companies, the other with estimates for some sectors/industries of the economy based on a survey with enterprises.

We estimated the benefits accruing from reduction of sickness absence and disability at a maximum of ECU 490 on average per worker with manual lifting tasks with a Lifting Index > 1 . However, it remains to be seen how much of the low back pain problems can be prevented by implementing the solutions. In other words: how effective are the investments? One of the other findings of the employee questionnaire was that more than 50% of the employees with regular lifting activities has also other heavy physical activities. This violates one of the conditions of the NIOSH equation. Given the scarce literature on the subject of effectiveness of lifting solutions, we used an effectiveness of 33%. When the lifting standard is relaxed (from NIOSH to e.g. 25 kg) we assumed that the effectiveness becomes lower³. So effectively, the benefits per employee with risky manual lifting tasks is estimated at ECU 175.

Results

25% of the employees with manual lifting tasks that go beyond the NIOSH standard

At first sight, one of the most striking findings is that one quarter of the working population have *regularly* manual lifting tasks with weights above the recommended weight limit from the NIOSH equation. In the Dutch situation, this means about 1.3 million workers. The differences between industries are large: whereas in government, defence and education only 7% of the employees have risky manual lifting tasks, in agriculture and fishing 59% of the employees fall into that category. Also between occupations there are large differences. Not surprisingly among jobs with a required higher educational level only 7% have regularly risky manual lifting tasks; of the lower medical personnel 88% perform regularly risky manual lifting tasks. The differences between companies of different size are not very large, although the companies with 100 employees or more do have a smaller percentage (19%) of their workforce that have risky manual lifting tasks than smaller companies (25%). In the appendix several tables are presented with all these figures in detail.

One of the advantages of the benefit cost analysis is that we could account for different timings. Investments were spread over several years, the benefits accrued only after a couple of years. In using the flow of receipts and outlays we used a discount rate of 9%. Finally, it should be kept in mind, that we performed a rentability analysis, not a financial Benefit Cost analysis (in which also the funding is taken into account).

Benefits and costs per year - discounted - ECU 180 million and - ECU 280 million

The benefits are the reduction in costs for the enterprise related to sickness absence and disability, but also some productivity gains are included. We have estimated them for a period of 15 years after the introduction of a lifting standard, in this case based on the NIOSH equation, and discounted them to the present year. The benefits then are ECU 180 million per year on average. The costs are those that have to be made for investments and measures to prevent risky manual lifting. The solutions taken could be organizational, or simply the use of a lifting device. The average discounted costs per year total ECU 280 million.

Net Present Value - ECU 100 million per year, Benefit/Cost ratio 0.65

So the difference between discounted benefits and costs, or net present value, leave a net cost of ECU 100 million; expressed as a ratio, the benefit/cost ratio, 65% of the costs are

recovered. The differences between industries are large, as could be expected, given the results of the employee survey on manual lifting activities. Some industries have positive results: Transport and communication, government, defence and education, and banking and insurance are industries with larger benefits than costs. Benefits and costs in the metal- and equipment industries are roughly equal as in the food, drink and tobacco industry; all other industries have larger costs than benefits, with the mining and chemical industry at the lower end.

Different assumptions NPV varies from - ECU 350 to + ECU 70

Depending on the assumptions made, the outcome of the benefit cost analysis can vary a great amount, between minus ECU 350 million a year to plus ECU 70 million a year. The first outcome is the result of combining the double figure for cost estimates per "lifting solution" or investment and a low effectiveness of the measures in practice; the other figure is the mirror image of those assumptions. But these are not the only relevant assumptions that can be varied. For instance, the assumed percentage share of sickness absence related to lower back pain that can be attributed to manual lifting at work is 15; varying this from 10 to 20% resulted in a range of benefit cost ratios of 0.50 to 0.79. And, of course, one of the most interesting assumptions is the standard used, the recommended weight limit from the NIOSH equation. In relaxing this assumption, the difference between costs and benefits narrows, but never turns into a net benefit. Moreover, the benefit/cost ratio actually worsens, reflecting the assumption of a lower effectiveness than with a more strict standard, notwithstanding the fact that lesser employees have to be protected and the standard is not as strict as the NIOSH equation.

Concluding remarks

The balance between benefits and costs of measures against risky manual lifting at work is negative for enterprises in the Netherlands. This remains so, even with the less strict standard of 40 kg. However, depending on the solutions chosen and the assumptions made, the balance can be much more negative, but also a bit positive. Finally, the research also showed that use of efficient solutions can bear financial fruit for the individual company.

Appendix

Table A1 Number of employees with manual lifting activities for which the lifting index > 1 at different standards (x1.000)

1 x NIOSH	1,338
1.5 x NIOSH	838
2 x NIOSH	539
25 kg	622
40 kg	266

Source: NEI/CBS/TNO-PG

Table A2 Yearly costs and benefits per industry

Industry	% employees with lifting activities above the NIOSH standard ^{a)}	Number employees with lifting activities above the NIOSH standard (x1.000) ^{a)}	Benefit Cost Ratio	Average per year Hfl million (discounted over 15 years)		
				benefits	costs	balance
Agriculture, fishing, forestry	59%	61	0.44	24	55	-31
Mining, oil, chemicals	20%	27	0.31	22	70	-48
Metal- and equipment	32%	111	1.04	39	38	1
Food, drink, clothing, textiles	37%	75	1.00	17	17	0
Wood, furniture, paper, graphical	23%	60	0.61	15	26	-10
Utilities	-	-	0.59	2	4	-2
Construction	51%	200	0.92	64	69	-6
Wholesale trade	28%	102	0.35	41	120	-78
Retail	19%	78	0.63	40	64	-24
Hotels, restaurants, repair	10%	67	0.86	7	9	-1
Transport and communication	30%	116	2.29	17	7	9
Banking and insurance	-	-	6.81	6	1	6
Business services	14%	69	0.61	25	41	-16
Government, defence, education	9%	79	4.36	23	5	18
Health care	35%	267	0.59	53	89	-36
Other	9%	15	0.90	2	2	0
Total	25%	1.338	0.65	398	617	-219

a) Source: NEI/CBS/TNO.

- = Too little observations; additional estimates.

Because of rounding, totals can deviate from calculated sums.

Source: NEI.

Table A3 Sensitivity for assumptions

Assumption		Net present value (x Hfl 1 million, average per year)	Benefit/cost ratio
a) Share of low back pain due to manual lifting at work	10%	- 306	0.50
	15%	- 219	0.65
	20%	- 131	0.79
b) Impact of measure in practice of a company	25%	- 282	0.54
	33%	- 219	0.65
	50%	- 84	0.86
c) Non diagnosed sickness absence	exclusive	- 265	0.57
	inclusive	- 219	0.65
d) Productivity gains; add factor on investment amount	20%	- 246	0.60
	25%	- 219	0.65
	30%	- 191	0.69
e) Costs of lifting - measures	high	- 699	0.43
	average	- 219	0.65
	low	22	1.07
f) Standard for manual lifting	1xNIOSH	- 219	0.65
	1.5xNIOSH	- 119	0.65
	2xNIOSH	- 87	0.64
	25 kg	- 89	0.63
	40 kg	- 37	0.60

Source: NEI.

Notes

1. Health Council of The Netherlands: Committee on Risk Assessment Manual Lifting (1995), *Risk assessment of manual lifting*, The Hague: Health Council of The Netherlands, publication no. 1995/02, pp. 67-68.
2. Walsh, K. N. Varnes, C. Osmond, et al. (1989), "Occupational causes of low-back pain", *Scand J Work Environ Health*, 15: pp.54-59.
3. Using data from: Waters, Thomas R., Vern Putz-Anderson, Arun Garg and Lawrence J. Fine (1993), "Revised NIOSH equation for the design and evaluation of manual lifting tasks", *Ergonomics* vol. 36 no. 7, pp. 749-776.

3 National policies on occupational safety and health

Introduction

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In the European Union, national policies on occupational safety and health vary widely, and with that, the approach to the costs and benefits issues varies also. Prins pointed out that the sources of regulations are different, OSH-instruments and provisions vary and that there is a number of different incentive systems. The related occupational safety and health systems or services are also different from country to country.

Most of the existing systems do not seem to provide effective incentives (typically less than 0.1% of the payroll). It must be appreciated that in order to provide incentives in regulations, collective or public insurance systems have to be modified. Also with respect to insurance systems, there is a great variety and each country seems to be much in favour of their own system. Furthermore, an international comparison between systems and the effectiveness is very difficult. Nevertheless, an international comparison of insurance systems, and especially the strong and weak points will be worthwhile.

Frans van Waarden, (University of Utrecht) analysed different national styles of worker protection focusing on the nature of regulation, the style of implementation and enforcement, and public versus private involvement. He found that there are marked differences between the systems in e.g. Sweden, Germany, The Netherlands, United Kingdom, Belgium, France, USA and Japan. Differences which are in most cases strongly embedded in the national institutions and culture. Globalization will to his opinion therefor not create a race to the bottom, or to a convergence of national regulatory styles. Full imitation of the system of an other country is normally impossible. However mutual learning is possible. We can learn from other countries what effects financial incentives can produce, what effects commercial occupational safety and health services can have, what might be the costs and benefits of strict enforcement, and what role civil liability can and cannot play in the improvement of working conditions.

For a comparison of the effectiveness of the different national policies it is needed to calculate the total sum and the ratio of preventive and corrective costs for each country. Many data are still lacking for real reliable conclusions. Beatson and Coleman also come to this conclusion. Based on an analysis of the cost components that are included, they conclude that extreme caution is required. None of the current estimates includes all costs, as a result of which estimations are likely to err on the side of conservatism.

In the improvement of occupational safety and health, the enforcement and the role of the Labour Inspection remain important. Von Richthofen observes that the role of labour inspection tends to be undervalued, which opinion is underlined by the number of accidents. Even countries that have a culture of internal control (such as Norway) accident rates are high. In the majority of ILO member states, labour inspection is one of the most important instruments in developing a sustainable preventative culture in companies. In current cost-benefit estimates the effects of enforcement are not always clearly visible, yet the costs of non-prevention are high.

The goal is achieving a comprehensive compliance with preventative objectives. With regard to the future strategy, Von Richthofen concludes that thematically comprehensive, interdisciplinary research is required, focusing on costs and benefit aspects that are relevant to labour inspection..

A cost effective model for inspection is suggested by Sten et al. It is observed by the authors that there is a gap between the desirable and possible activities with regard to inspection. Therefore inspection will concentrate on the risks and its value, enterprises with low motivation and those enterprises where employees will benefit most. In the evaluation of the risk, the value is estimated based on lost man hours, welfare losses, societal costs and value of losses defined by experts and insurance. At the moment, data is missing to draw up accurate risk assessments. Co-operation, better reporting and better use of available data should lead to feasible risk evaluations.

The issue of prevention and the role of national policy, in relation to social security, is addressed also by Coenen and Meffert. Four promising strategies in prevention are presented: specific concepts for small companies, focus on sectors with high accident rates, focus on operational activities and instruction to companies with high accident rates.

In Europe at least four different types of accident insurance are used: self-administered or independent systems, government controlled systems, private systems, and coverage by health insurance. It is stressed that insurance systems can be effective in prevention, in particular the positive aspects of the self administered system, as used in Germany) are emphasised. Bjurström analyses the economic aspects of working conditions and the way policy development is affected at two levels: the national economy and the corporate economy. Bjurström notices that improvement of working conditions can be both profitable or non-profitable to companies, also when effects on quality and productivity are taken into account. Furthermore there are differences between the various kinds of investments: ergonomic investments tend to be profitable whereas other improvements can be costly. National policy should best be adapted to the profitability of working conditions improvement. Where investments are profitable for companies, no obligations are needed and the is common interest. Information and knowledge dissemination are important. Where investment are not profitable to companies but are at the macro level, legislation, enforcement and the creation of incentives are policy options. If improving the working conditions is economically non-profitable, ethical aspects become important.

The experience of Grondsma with regard to national policies to stimulate preventive action is also that a mixture of policy instruments is likely to give the best results. In her paper self-regulation, covenants and subsidies and information are examined. If self regulation is not effective extra enforcement may be needed, but the costs of this policy is rather high.

Grondsma concludes that strategies that appeal to the responsibility of each individual firm, supported by subsidies and information will be effective and worth its costs.

The situation in France, in particular with regard to occupational medicine, is described by Chaabane. The costs of occupational medicine seem to be high, but due to lack of transparency of the system, it is hard to get a good insight in the cost effectiveness. The French system is in discussion, but a breakthrough in the rigid legal framework is required to introduce more liberalism and competition into the situation.

Krajcovic reflects on the development of a system that includes economic motivation for prevention of occupational accidents in Slovakia. It is made clear that the costs of accidents should be born by the companies (in a comparable way as environmental pollution). Economic incentives should be included, the creation of good working conditions must be made attractive. In this, social security also plays a role.

Incentives can be an effective way to stimulate preventive action. Most European social security systems and regulations or enforcement systems, however, have no or very little incentives built in. A model for a system with an economic incentive is developed by the European Foundation for the Improvement of Living and Working Conditions, in co-operation with an extensive international work group. In international comparison was the basis. From this comparison it resulted that existing systems usually work within an industrial context. Furthermore companies are generally not encouraged to report accidents or injuries. A new incentive model, based on a premium graduation that is both retrospective and proactive may overcome the drawbacks of existing systems. This model has been tested in France. It was concluded that the model could well be applied in practice.

Findings and conclusions

It can be concluded that in the European Union, there is a general consensus about the contents of policies (what are the important risks now and in the future). Policies should have a holistic nature and should be closely related to social security, employment and industrial relations. Further requirements are that policies should be specific on risks and sectors.

Despite the consensus on policies there are great differences in views on the organisation of institutions, the role of the government, the importance of private initiatives and the role of social insurance. Future policy development can make more use of international comparisons and international benchmarking, for which of course quantitative targets and studies are required. Scenario studies also offer opportunities for improvement of policy development. However quantitative predictions are beyond the possibilities of the current methods and instruments. It remains important to develop more understanding of the economic impact of prevention, vocational rehabilitation and the preventive aspects of social security.

Occupational safety and health has a major economic impact, both at the company level and at the level of national output. Incentive systems as a means of cost internalisation offer good opportunities to improve occupational safety and health. Important conditions are an adequate size of the incentives, a direct link to any improvement in the work situation, effective targeting, moderate administrative costs and it should be applicable to small and medium sized companies also.

Although there is number of studies on national costs of occupational safety and health available, so far no research project covered all relevant costs. Also the national studies reported take different cost components into account. Differences in definitions, for instance in the notification of accidents, occupational diseases and work related illnesses are a further complication. Under reporting of accidents and illnesses is known to give an underestimation of the national costs.

National Styles of Worker Protection

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Introduction

Countries have different traditions of state-business relations and regulation of the economy. They differ a.o. in the intensity of regulation, the strictness of implementation, and the dominant agents or principles of regulation. In the US the market and civil law (liability) litigation is especially important. In France, the state does much of the regulating. In Germany, Austria and the Netherlands, private interest associations such as trade associations and unions, play a role in regulating business, and in some even large private firm hierarchies do their part. Countries differ also in their preference for policy instruments (the carrot, the stick, or the sermon), in their preference for detail of regulation, and in their strictness of policy implementation. Such differences can also be found in occupational health and safety regulation and implementation.

Over the last years, quite a number of comparative policy studies on the regulation of occupational safety and health (OSH) have appeared. Just to mention a few: Wokutch 1990 and 1992, Kelman 1981, Badaracco 1985, Wilson 1985. More recently, the Dutch Ministry of Social Affairs and Employment, the organizer of this conference, commissioned a comparative study of occupational safety and health policies in eight countries (Prins, Koster, van Polanen Petel, and Zandvliet 1997). Using the findings of these different studies, I will now try to characterize the styles of OSH-regulation in these various countries.

Different OHS-regulatory styles

To that end, I will first distinguish a number of dimensions on which to compare regulatory styles. These are:

A- Regarding the Nature of Regulations

- 1- Level of protection
- 2- Degree of detail
- 3- Coverage of workers
- 4- Broadness
 - a- also non-classical risks (stress)?
 - b- link to other social policies
- 5- Engineering versus behavioral orientation

B- Re: The Style of Implementation and Enforcement

- 6- Adversarialism versus consensualism
 - a- Punitive enforcement versus administrative guidance and advice
 - b- Rigidity of enforcement and punishment

C- Re: Public versus Private Involvement

7- Involvement of Interest Associations in Rule Formulation and Implementation

8- Workplace Level Committees

8- Involvement of Private Business (e.g. Insurance)

9- Involvement of the Courts. Role of Liability Law

Elaboration

1 Level of protection.

Do the regulations provide for high or low standards of worker protection? What is the amount and intensity of demands put on employers? This variable probably does not differentiate so much any more among industrialized capitalist nations. However it will differ in relation to the developing countries in Asia and Africa, where on the whole worker protection regulations are much less developed. Child lab or is still common in countries like India and Indonesia, working days are long, and physical burdens due to heat, noise, exposure to dangerous chemicals is still high.

2 Degree of detail.

Are the rules highly detailed and operationalized, or are they formulated in a more general manner, providing only broad protection, which is to be operationalized in court?

3 Coverage of regulations.

What is the percentage of workers and firms covered by the regulations, both OSH standards and requirements as to the provision of OSH-care facilities? Are also small companies affected? And what are small companies? With less than 10 or less than 5 employees? Is occupational health care compulsory, and how great is its coverage?

4 Broadness of regulations.

Do the regulations only protect workers from the classical risks, the physical dangers? Or do they also try to protect workers from psychological risks, such as high stress levels? Furthermore, are OSH regulations also linked or backed up by other flanking regulations, that try to offset externalizing strategies of firms? Firms can try to externalize OSH-costs to society at large, e.g. through outsourcing of dangerous work, hiring less protected contingent workers, or by hiring and firing practices that leave only stress-resistant workers in the firm. The costs of such policies show up in high (long-term) unemployment rates, or an increase in unprotected foreign workers or contingent workers. Such externalization strategies could be offset by legislation raising the legal rights of contingent workers, or raising the costs to employers of selective hiring, of firing elderly workers, and of outsourcing.

5 Engineering versus behavioral orientation.

Is regulation in particular concerned with the technicalities of the workplace, the physical working environment. Or does it concern also or more the behavior of workers and in particular also the firm management? Does it put demands to the structure of the organization (safety committees, expert advice) or require certain procedures (safety plan)?

6 Adversarialism versus consensualism.

Are regulations implemented and enforced in an adversarial style, one of distance and conflict between the enforcement agency and industry, or are relations more of a cooperative and consensual nature? An adversarial relation assumes distrust between government and industry. Emphasis is on punitive enforcement and the imposition of sanctions, rather than on administrative guidance and advice. Furthermore, regulations are strictly and rigidly enforced, inspections are frequent, fines and other penalties are often imposed, exemptions are rarely given, and there is little room for negotiations about (temporarily) underachieving the standards. A consensual implementation style on the other hand presupposes (and reinforces) mutual trust between government and industry. Agencies do not only or so much control compliance, but place great emphasis on advising and helping companies in achieving safer and healthier work environments. They have greater discretionary authority, and use this to enter into negotiations with industry about satisfying the standards.

7 Involvement of interest associations in setting regulatory standards, operationalizing them, and/or enforcing them.

Trade unions and employers' associations may be involved in special rule setting agencies or implementation bodies, or may provide for self-regulation or OSH-care facilities. E.g. additional rules may be introduced in collective wage agreements.

8 Do the regulations provide for involvement of workers or their organizations in workplace bargaining and control of OSH?

9 Do commercial organizations, such as insurance companies, set (additional) rules and standards? And does state regulation provide for, allow, or support this?

10 How important is civil liability litigation in controlling OSH behavior of firms?

Usually, the different styles - different positions on these dimensions - are found in any country, however, some are more frequently found in one country, i.e. can be considered to typify that country. Thus e.g. the US has on the whole a rigid implementation style, even though it does give exemptions to large companies such as Chrysler and AT&T which have shown to be able to selfregulate OSH and which have been given VPP-status, implying that the OSHA does not control their plants any more. Furthermore, OSHA has also tried to introduce a more consensual implementation style, but in the end this failed because of unwillingness of industry to cooperate (Wokutch 1992: 225)

In the following table, OSH-regulation styles of different countries are characterized by these dimensions. As information on different countries was only available to a limited extent some of the studies mentioned before are comparisons of two countries, e.g. Japan and the US or the US and the UK, or the UK and Sweden, only some countries are listed in each box, more by way of example to show the diversity of styles, than to provide a comprehensive overview.

Tabel 1 Overview of styles

Dimension	High/Yes	Medium	Low/No
A-Nature of Rules			
Level of protection	most industrial countries		developing countries
Detail	USA	NL, S	UK, J
Coverage	S, NL	DK, J, B, D	USA
Breadness: also non-classical risks	S, NL, B		UK, USA
Engineering/Behavioral approach	Behavioral J,		Engineering USA
Summ.: Breadness	S, NL	J, B, DK	USA, UK
B-Enforcement			
Importance of Administrative Guidance in rel.to Enforcement	S, DK, B, J	NL	USA, D
Strict Enforcement	USA, UK, DK, D		S
Summary: Adversarial Enforcement	USA, D,	DK, UK	J, NL, S, B
C-Private Parties Involved			
Interest Associations Involved	D, B	NL, J	USA, S
Commercial Insurance	B, DK, USA		
Workplace labor relations involved	UK, DK		
Tort Litigation	USA	UK	J, NL, S, B, D
Summ: Degree of State Involvement	Etatism J, S (F?)	Market, Civil Society: USA	Corporatism: D, B

Rootedness of Styles in National Institutions and Cultures

These national regulatory styles have not come about accidentally, but are the product of long term historical processes, whereby the emergence or creation of certain institutions in the past have influenced the development of subsequent institutions, a process called

historical path dependency. In this process, developments may have gone in different directions. Because of this genesis, regulatory styles are often closely rooted in other legal and political institutions, and in societal, political and legal cultures. Examples are: general administrative traditions, training, recruitment of civil servants, the degree of centralization and codification of law, presence of jury's in court, or citizen's trust in the state; or historical events such as early or late industrialization.

Some examples:

1- Punitive enforcement and adversarialism high in the US.

- Distrust of citizen's, including business, of the state. Prevalence, but at the same time, illegitimacy of partiality, favoritism, nepotism. Importance of universalism. This makes civil servants very careful in relations to business, not much given to flexible rule application and negotiation with individual firms over observation of rules and standards. And these values have also provided for much institutional control and oversight, from superiors, Congress, the courts, over civil servants, limiting their discretionary power.

2- High incidence of civil liability cases in US, due to, a.o.

- weakly developed welfare state, reflecting a great distrust of citizens in the state, and reflecting individualism as a dominant value, rather than collectivism and solidarity. In the absence of a high benefits workers have a greater incentive to sue their employer for diseases and injuries acquired at or because of work
- legal system offers greater chances of success: decentralized structure, jury's in civil law cases, unpredictability of jury decisions, activist lawyers, always ready to try to find loophole, contingency fees of lawyers; high lawyer density,; and as a result of these, over time: tradition of high tort payments

3- Emphasis in Japan on administrative guidance:

Rooted also in culture. It is relatively easier to rely on administrative guidance and advice in a culture which is more collectivist, and which stresses corporate responsibility. Where honor and responsibility to one's group are more important values than short-term individual profits. And where harmony is valued, and open conflict anathema. Where the interests of workers and the national interests predominate over the interests of other corporate stake holders, such as the stockholders, consumers, creditors, suppliers, and the surrounding community. (Wokutch 1992)

4- Corporatism in Germany (and Holland)

- ... Rooted in age-old tradition of self-organization of civil society (guilds in medieval merchant cities; never destroyed by French Revolution) and of delegation of state tasks and state authority to private associations.

Costs and Benefits of Different Regulatory Styles

These differences in regulatory styles between countries could produce pressures on each other to adjust to each other, to adopt and imitate elements of regulation found elsewhere, resulting in a process of convergence.

That is of course dependent on the effectiveness and efficiency of the different regulatory styles. More effective ones will be considered 'Best Practice', and may be copied by other countries. Furthermore, the different styles may impose different cost-levels on business and other interested parties, such as workers and the state. That should also influence their popularity with parties in other countries.

A complicating factor is, however, that it is not so easy to determine the effectiveness and costs of different regulatory styles as compared to one another. First of all, it is already difficult to determine in one particular country, what the costs and benefits of a particular style are: a- high prevention costs, backed up by strict regulation, require investments, i.e. are costs; but they lead also to higher productivity, less standstill of expensive machinery due to accidents and injuries, higher motivation of workers, etc. This is more than just wishful thinking. Wokutch (1992: 225), deriving conclusions from his study of Japan: 'The research (in Japan) also suggests that safety and health, product quality, and productivity can be positively related in practice in much the way safety and health rhetoric in the United States claims they are.' b- Are high standards, strictly and universally enforced, more costly? They also reduce uncertainty, provide stability and predictability, facilitating long-term investments. Such benefits are benefits one is often not aware of, and are extremely difficult to measure. c- Is rigid punitive enforcement more costly than flexible implementation and administrative guidance? It could be, because it often involves extended administrative and legal procedures, with business appealing decisions, leading to high lawyering and litigation costs. But the evidence is far from conclusive.

Furthermore, the costs or benefits of a particular style will be dependent on the institutional and cultural environment. Styles that are effective within one country do not have to be so in another national context. Administrative guidance may be effective in Japan, but it will be less effective in an overall climate and tradition of adversarial government-industry relations, as in the US. Generally formulated principles may be efficient in countries where such standards are supported in legal and business culture, and have a generally accepted meaning, as is sometimes the case in Britain or the Netherlands. However, in the US such general standards would immediately generate extensive litigation in order to define such standards precisely, with all its attendant lawyering costs.

Mutual Learning or Policy Competition?

Nevertheless, political and economic actors will look to other countries, and may exert pressure in their own countries for imitating what they perceive as desirable examples, either for their strict and effective standards, or for their relatively lower costs on business, on the state, or on society at large.

One should distinguish here between forced and voluntary imitation. As OSH regulation usually adds to the costs of business, business could threaten to relocate to other countries where regulations are less strict and costly. Politicians could try to preempt such events by lowering their standards, a process called policy competition. This could be considered a forced imitation, leading to a so-called 'race-to-the bottom'. However, countries could also voluntarily imitate each other, trying to adopt what is being considered 'best practice' in regulation.

So far, such pressures have apparently not been so strong yet. They have not prevented the differences identified above to evolve and to persist in the past. However, it could very well

be that the increasing economic integration brings about change. It could increase policy competition. Should this necessarily lead to a race-to-the-bottom, to social dumping? Or is a convergence at a high level of protection also possible? There are some factors that work against a race-to-the-bottom.

The California Effect

Many recent studies indicate that the degree of policy competition is limited and that there is certainly in many policy fields no 'race-to-the-bottom'. Large states can and do set standards, high standards. Vogel (1995) has challenged the conventional wisdom that trade liberalization and agreements to promote free trade invariably undermine national health, safety, and environmental standards. He demonstrates on the contrary that liberal trade policies often produce the opposite effect, that of strengthening regulatory standards. Large states in world markets can and do set standards, high standards. And any other national industry that wants to export to such a country has to satisfy those standards. Thus the norms of such large countries become international norms. Vogel has called this the 'California effect', after the largest American state, that has stiff product quality, health and safety, and environmental standards. These standards tend to become the norm also elsewhere in the US, for those industries that want to sell also in California.

An example: "The California effect can be seen literally in the history of American automobile emission standards. The 1970 Clean Air Act Amendments specifically permitted California the option of enacting stricter emission standards than those requires for the rest of the US, an option which California chose. Consequently, its standards remained stricter than those of any other state. In 1990, Congress brought national emission standards up to California's and once again permitted California to impose stricter standards. It also gave other states the option of choosing either national or California standards. In 1994 twelve eastern states requested that the federal government permit them to adopt California's new standards. These standards in turn are likely to become the basis for the next round of minimum federal requirements. California has now had America's strictest automotive pollution control standards for more than three decades. Thus, instead of states with laxer standards undermining those with stricter ones, in the case of automobile emissions precisely the opposite has occurred: California has helped make American mobile emissions standards stronger". (1995: 259).

He then explains how it works: "The California effect connotes a much broader phenomenon. The general pattern, the ratcheting upward of regulatory standards in competing political jurisdictions, applies to many national regulations as well. This pattern has three components: two relate to market forces, and the third has to do with politics. First, to the extent that stricter regulations represent a source of competitive advantage for domestic firms, the latter may be more likely to support them. Second, rich nations which have enacted greener product standards force foreign producers to adjust to them in order to continue to enjoy market access, thus helping in turn to raise foreign product standards. Third, agreements to reduce trade barriers can provide richer and more powerful greener nations with the opportunity to pressure other nations into adopting stricter product and production standards." (1995: 260).

In Europe Vogel perceives Germany to play the role of California. It has a tradition of stiff product quality, health and safety, and environmental standards. German industry derives

often competitive advantages from these rules, and hence in general tends to support them. And Germany is, with 81 million wealthy inhabitants, a major market that no exporter in and to Europe can afford to neglect. Thus the country has the willingness and the power producer to force its standards upon its trading partners. Recent studies of harmonization of European standards in the European standardization bodies CEN and CENELEC also show that these new European standards often tend to lie at high levels (cf. Voelzkow and Eichener 1992 and 1993, Eichener 1995). They are much higher than the 'lowest common denominator' in Europe. As far as protective standards are concerned, this is because of the political importance attached to high standards by such powerful countries as Germany. Given the various arguments and evidence, we do not on the whole expect a significant 'race-to-the-bottom' in occupational health and safety regulation. Instead, a gradual diffusion of relatively strict standards is to be expected, with major players such as Germany, the US, Canada, the ILO, and the EU supporting such a development.

Other Channels for 'Regulating-Up'

Three other channels can still be distinguished for facilitating the diffusion of high standards:

- 1- private hierarchies: MNOs as channels for transferring practices from one country to another (research Kagan). Ongoing research at the UC Berkeley shows that strict regulation in the US forces firms there to invest and to develop innovations in workplace organizations. Once large multinational companies have developed such innovations can be introduced at considerably lower costs in other countries, allowing such multinationals to brush up their public image, and their image with regulators. Furthermore, such large companies are highly visible and hence more sensitive to their public image and may fear a buyers boycott, as Shell actually experienced around the plans for sinking oil tanks in the sea. It has lead the Shell leadership to recently formulate its principles of 'corporate responsibility', as being 'respect for the human individual'. Other companies have already promised to buy only goods produced without child lab or, and have instituted their own inspection facilities.
- 2- public hierarchies, state: supra-national regulation. Increasingly, supra- or international organizations are becoming involved in the formulation of international OSH-standards. Not only the obvious case of the EU, but also the WTO, NAFTA, or the ILO. As international trade is liberalized further, and as it threatens to affect national protective regulations, for workers, consumers, or the environment, pressures for new international regulations is going to increase. We can presently observe this development. Thus the US has attempted with some success to introduce environmental standards in the NAFTA Treaty, e.g. those pertaining to the Dolphin-Tuna case. Scandals, such as those over child lab or in third world countries being used for the manufacturing of products sold in the west, do and will continue to force countries sensitive to public opinion and with a moralistic tradition in their foreign policy, such as the US (cf. Seymour Martin Lipset 1996: 64-67), to push for such regulations at the WTO level and other trade agreements, just as they did before in the famous Tuna-Dolphin case.

- 3- fashion. Regulators look to each other. Learn from each other's experiences, in part. regarding the style of implementation. Thus lately, a broader approach to regulation, and emphasis on guidance and advice rather than command and control have increased in popularity and are diffusing to those countries, where the institutional environment is conducive to such an approach.

Conclusion

Increasing international competition does not automatically and necessarily produce pressures for divergence 'at-the-bottom'. This is not unavoidable or even inevitable. There is still much room for policy choice, also by national governments, either pertaining to their own regulatory style, or to their input in negotiations over international standards. There is room for manoeuvre, for policy choice, for conscious learning and mutual adaptation, for copying of good practice elsewhere, even if that would increase the costs to business.

There may be limits to imitation. But these are more likely to derive from the incompatibility of certain national regulatory styles to the institutional and cultural environment in the imitating nation. The example of the American OSHA trying to adopt a more cooperative and less adversarial implementation style, when its legitimacy was threatened under Reagan, is a case in point. It failed, because of the lukewarm reception by business. Business was not used to such an approach and distrusted the state. (Wokutch 1990) Even if many firms would cooperate, one needs only a few firms who resist choose the adversarial route via the courts, to break up this approach. And the decentralized and unpredictable American legal system provides such uncooperating firms with many chances to gain greater short-term benefit.

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Costs, Benefits and Prevention Strategies: Some notes for discussion of future Strategies

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Introduction

The background paper to this Conference, and indeed the orientations of presentations and sessions appear to me to not give sufficient consideration to the role and contribution of one key player--besides, of course, employers, workers, their organizations, the different actors of the social security systems, private consultants, etc.--namely the Government side, notably the state labour inspection systems and their services. Perhaps they are "taken for granted"; perhaps they are not seen as key players, at least in the Western European context, as a driving force in the process of introducing OSH cost/benefit concepts and considerations to the enterprise level, or of contributing in a significant way to the discussion and development of such new concepts; perhaps there are other reasons. But governments' role should not be, and in fact mostly is not limited to setting broad policy guidelines, or putting in place a legal "enabling" framework and then letting the other players get on with the job. Perhaps it is a truism, but even the best, most apt legislation cannot do without consistent and coherent enforcement, which in turn needs policies, structures and services reaching out to the workplaces. This is not a job which the other players effectively can or should do themselves. No self-inspection regime, no system of "internal control", no supervision services organized by social security, however, well established, can or, in my view, should do that job, and certainly not alone; quite apart from the fact that only very few countries world-wide have such systems to date. International preoccupations seem to concentrate on either the upstream ride of discussions or the downstream, but not, or at least not as intensively, on the necessary transmission mechanisms in between.

The question in my mind is not whether labour inspection has a key role to play in the development and promotion of concepts regarding costs and benefits which, in terms of occupational safety and health, is always also a discussion on prevention; but rather, what should be the specific content and context of that role, its policy foundations, its operational parameters, its relations with other key players, etc.

Before taking a closer look at some of these issues, I wish to refer to selected random data to illustrate different aspects of the costs of non-prevention. While much of this data is well-known, and of course focuses on the macro-economic level, it does, in my view, illustrate the problem better than mere GNP percentage figures.

Some data underlining the need for new strategies

Society's vision of good working conditions is one in which work, if properly organised, itself promotes good health, and where no one is killed, involved in accidents or becomes ill from the working environment. The reality of working life is quite another.

Of the roughly 115 million workers in the European Union, over ten million are victims each year of occupational accidents or diseases. Of these, more than 8,000 die each year as a result of occupational accidents alone. The number of fatal occupational diseases is estimated to be many times higher, possibly by a factor of 10 or more. Quite apart from the human aspects, the economic (and indeed social) consequences of non-prevention are enormous: in the EU alone, the money paid out each year as a direct request of work accidents and illnesses is estimated to be higher than 26 billion ECU.

Conclusive studies show that the indirect costs of workplace accidents, incidents and diseases are again many times higher (possibly by a factor of 10 up to 40) than the amount of compensation and insurance benefits actually paid. UK figures indicate that the real costs declared, hidden, and on-costs - of non-prevention in that country alone are in excess of 25 billion £St. per year.

In the USA, the costs of non-prevention merely in the manufacturing industry have recently been given by the Department of Labour to be around 190 billion US\$ annually. Similar cost estimates for the German economy give total annual losses due to non-prevention of work accidents and diseases at around 52 billion DM. In the Russian Federation, while cost-estimates are not available, recent data gives the number of reported occupational accidents at over 300,000 per year, of which over 7,000 are fatal, and some 13,000 result in permanent serious injury and consequent invalidity. One can only speculate what the percentage of non-reported accidents in that country -- and other European countries in transition -- is likely to be.

Occupational diseases are also at a very high level in these Central and Eastern European countries, but are hardly repertorized at all, an unfortunate inheritance from the former system. By way of example, Slovakia in 1995 registered altogether only around 950 cases of occupational diseases for the whole country - with around 5 million inhabitants and a very low level of labour protection. By comparison, the same figure for Denmark, also with around 5 million inhabitants, and with a very high level of OSH, is between 16,000 and 17,000 per year.

Even in "advanced" countries like, for instance, the UK, the total annual number of fatal occupational diseases (4,000) as a result of exposure to one hazardous substance alone, (asbestos), is estimated to surpass very soon that of all fatal traffic accidents in the country (presently around 3,500). In Germany, asbestos-induced fatal occupational diseases, which account for more than 80% of all fatal work-related illnesses, are calculated to be in excess of 1 million DM in direct costs (treatment, compensation, etc..) for each single case.

In Norway, a relatively small country, with again a very high level of labour protection, 2,500 cases of occupational diseases are reported every year; 25,000 occupational injuries are reported every year; and roughly 250,000 persons have a permanent health problem due to poor working environment. Yet, the Norwegian labour inspectorate estimates that only one out of four occupational injuries is actually reported even in that country. Considerable human suffering and economic losses lie behind these statistics. Norwegian studies show that the social costs of non-prevention in that country amount to an estimated NOK40 billion per year, or approximately 550 million US\$.

UK studies have repeatedly shown that work accidents and diseases are often associated with poor management practices. Even well-managed companies may, however, be paying a price, and losing up to one third of their annual profits through accidents; other figures given are losses of between five and ten per cent of running costs. In Western Europe, construction companies find that accidents costs may make up 10% and more of their tender price. And many companies are surprised and concerned by the amounts they are losing as a result of minor incidents (property damage, halts in production, etc.).

Latest figures from that country, provided from a study by the Industrial Society on absenteeism due to ill health in UK workplaces, suggests a conservative estimate of \$13 billion (approx. ECU18.5 billion) in wasted salary bills. This figure does not include falls in productivity, the cost of temporary staff, overtime bills, damage to morale of colleagues, and loss of customers.

The problem with these figures (with which most of you are, of course, familiar) and the underlying consequences for policies, strategies and actions which they imply is that of "internalization". How does one translate the overwhelming and inevitable conclusions from the macro- to the micro-level, to the shop floor? There is a comparison to speeding or smoking. We all know the statistics of fatal accidents and diseases as a result of these bad habits, but as individuals many of us, indeed too many, tend to ignore them. Is it because the evidence is still not sufficiently conclusive? Or what other factors stand in the way of a rational approach to these issues?

Still, a significant trend change has been noted and appears to be gaining ground. Good loss control, or total loss management, is increasingly seen as a key to effective business management. Total loss management has at its core a prevention-oriented approach. It involves learning from both accidents and incidents to achieve effective control, reduce costs and increase profits. Investment in the reduction of loss contributes directly to profits and is cost-effective, particularly at times of high competition when it may yield a better return than a similar investment, for instance, to improve sales or market shares.

A widely accepted axiom is that all accidents can be prevented (as can no doubt the large majority of occupational diseases). However, in many countries, occupational accidents and diseases are today still on the rise, and even where accidents are being brought down, occupational illnesses often continue to be dramatically on the increase. And what is certainly rising exponentially is the cost of non-prevention to the economies and individual companies in virtually all countries around the globe, and only a small proportion of these costs can be covered by insurance. Studies indicate that average uninsured, and increasingly uninsurable costs can run up to between 8 and 36 times those actually covered. All these and many other factors underline the need and quest for new prevention strategies.

Some paradigms regarding prevention

Institutions serving the field of labour and social policy such as labour inspection, concerned with the function of prevention, are today undergoing profound and rapid changes the world over. These changes have a deep impact on their respective role, scope and functions, their relationships with each other and with their principal clients. It is therefore necessary to understand and analyse the nature of these changes, the way they affect the capacity,

performance, impact and relationships of the principal actors and the social reality in which they operate¹.

Since the adoption of labour inspection standards dealing with matters of prevention (of which in particular ILO Convention No. 81 on Labour Inspection in Commerce and Industry has acquired universal character through its ratification by almost 120 member States), the very concept of "prevention" has changed substantially. To speak of prevention implies first of all a determined effort to avoid incidents, accidents, diseases, disputes, individual and collective conflicts, etc. However, what has occurred and has been the subject of intervention and sanctions is much more readily documented, measured and valorized than what has been avoided. How does one measure the number and consequences of accidents and occupational illnesses or indeed of industrial disputes that did not take place? And how does one show evidence of effectiveness and efficiency as a result, and as proof of achievement of labour inspection's mission.

Today, preventive orientation and the development of a culture of prevention as a social and labour policy paradigm aims at the broad goal of enabling individuals to lead a long, productive and healthy life, and thereby also to reduce the exponentially growing costs for the different elements of social security to individuals, to enterprises, and to society at large. Prevention in the world of work is identified more and more, not only by short-term advantages, but as promoting, supporting and sustaining working capacity, productivity and quality, security of employment, etc. It is therefore increasingly seen as a decisive prerequisite for an individual to lead a dignified life in society. Prevention thus defined is a holistic, "open" or pluralistic concept which aims at avoiding a multiplicity of social, technical, medical, psychological, economic, etc. risks which produce costs, and whose effectiveness depends increasingly on the recognition, analysis and consideration of "early" indicators which will produce benefits.

ILO experience in technical cooperation with its world-wide constituency over the last decade shows that the shift from a relatively rigid concept of reactive control, to one of "anticipatory" prevention invariably leads to substantial progress in labour protection and in results obtained. But this body of experience has also shown the difficulties in achieving this indispensable - evolution and in maintaining its orientation against a host of impeding factors.

Any policy of prevention, to be effective, requires the participation of all parties and individuals directly concerned. It must therefore first of all pass through the involvement of organized social partner representatives and their commitment to any such initiatives. The pursued prevention objectives must, additionally, be fully integrated into the system of objectives of the enterprises concerned. This in turn includes the active participation, indeed leadership of concerned management. Such conditions are far from being met worldwide, or indeed even in the most industrially advanced market economies.

Added to that, the budgetary constraints now weighing on governments everywhere (in developing and developed countries alike), and in particular on the means available to labour inspection, risk jeopardizing or weakening any such policy (re-)orientation as they tend to be, at least initially, costly in time and resources and difficult to measure and therefore to justify in quantitative terms. Nevertheless, it is by analysing and explaining the economics of prevention, by presenting quantitative arguments that one can most rapidly and most often engage the interest and commitment of the parties concerned.

As already indicated, in industrialized countries at least, the economic and social costs of non-prevention are everywhere growing out of hand, to financially unaffordable and politically unacceptable levels. To this trend must be added the growing recognition of the general insufficiency of corrective *ex-post-factum* intervention. This has led to the inevitable conclusion that the preventive elements of any system of labour protection have to be reinforced as a matter of priority. In consequence, we find ourselves in the middle of a discussion, at national and international levels, with a view to developing valid, practical effective new concepts for comprehensive preventive action cost-reducing, benefits-producing, in which labour inspection, but not it alone, is called upon to play a crucial part.

Labour protection is a social function in which all actors have equal responsibility, and only the correct sharing of this responsibility can produce optimal results in terms of productivity and quality of working life. Such an approach requires the active engagement of the social partners, as well as the clear will of the different public authorities concerned to enter into a productive partnership. Even if this will is manifest, one must still find the tools for dialogue and work methods that will allow all actors, and notably those who are most affected by the consequences of non-prevention, to have active responsibilities within any such prevention policy.

Government must enable and promote such a sharing of responsibility and provide the impulse necessary for any relevant initiative, whether within enterprises or within different sectors of economy. At the same time, the state must maintain its role of guaranteeing the protection of workers. For a long time, and in many countries, labour inspection policies were placed in a rigid framework of state control aiming mainly at conformity with prescriptive standards of conditions of work without, however, fulfilling this role in an effective manner. Prevention aims at other aspects, notably an anticipatory and guiding role of labour administration combined with a higher degree of confidence in the actors directly involved in preventive action. Such action on behalf of labour inspection requires a new system of relations between inspectors on the one hand, and employers and workers' representatives on the other. Inspectors must, in particular, follow closely, and enhance all preventive action developed in the enterprises. To this end, rather than merely limiting their intervention to a strict supervision of the correct application of standards, labour inspectors must be attentive that their action is complementary and supportive of initiatives taken at enterprise levels.

If the notion of prevention is already common currency in most members States of the European Union, other countries have only recently begun to embark on this course. But our observation of activities in this domain confirms that when employers, workers representatives and public authorities act in concert in implementing comprehensive prevention policies, real change can be brought about in the effectiveness of labour protection.

Some labour inspection parameters

The increasingly rapid pace of change and innovation in all aspects of the world of work - social relations, work organisation, production technology, conditions of employment, informatics, new hazards, etc. - creates a mounting challenge for labour inspectors.

Inspectors must not only keep abreast of developments in more and more complex, divergent and increasingly specialized fields necessary for their competence. In fact, they must anticipate trends and developments and be able to rapidly identify and understand the consequences in terms of labour protection, and thus to develop and implement new prevention strategies

In the large majority of ILO member States, labour inspection is one of the most (if not the most) important instruments of state presence and intervention to design, stimulate, and contribute to, the development of prevention culture in all aspects under its purview: general conditions of work, occupational safety and health, social security. For inspectors to successfully accomplish this primary task, they must reorient their policies, influence reform of legislation, of methods, relations, etc. towards developing a preventative capacity, internally and externally. This concerns both the policies and methods, etc. which the inspection authority must adopt, as well as the methods of inspection of workplaces to be pursued by inspectors.

Major determining factors in this context are the challenges and pressures on labour inspection from the economic, political and administrative context. These concepts tend in practice to make the work of labour inspection more difficult and complex, although they may also provide a driving force for innovation. They regularly, however, tend to exacerbate the usually chronic resource deficiencies. Labour protection therefore also must look for creative and viable alternatives to resource the development of its own contribution to prevention. The larger aim is to develop a comprehensive, sustainable prevention culture in workplaces (and society), taking into account the dynamics of change in social relations within the enterprises, the challenges to traditional notions of authority and legitimacy which arise from changes in attitudes, in work organization, etc., the generally higher (and still rising) levels of training and education among both employers and workers, new forms of participation which create an enabling environment, etc. All these require new forms of cooperation of the labour inspectorate with employers and workers and other institutions, notably the actors in the social security systems not only as regards enforcement of standards and regulations, but with a view to achieving comprehensive compliance with the preventative objectives of new protective social and labour policy and legislation.

Some "strategy" considerations

The above parameters have led us to conclude on the usefulness of, and need for a major international research and action initiative, organized in a thematically comprehensive, interdisciplinary manner, focusing on specific labour inspection-relevant aspects of costs and benefits of prevention, in close collaboration with interested international institutions and leading practitioners from a number of representative inspection systems. Its main methodological elements are: research and adaptation of the available body of information; analysis and presentation of national experiences; synthesis and dissemination of innovative forms of action and preventative support by labour inspection at different levels; and (in a second phase) development and testing of prevention-relevant instruments and strategies in selected member States. The presently ongoing research project is pursuing two tasks: to enlarge and enrich the knowledge-base concerning legal, organizational, social, technical, etc. requirements with regards to new prevention concepts and processes; and to develop generally valid and transferable conclusions and recommendations for effective application

in the practice of labour inspection and transfer to the enterprise level in a significant number of countries.

This programme concentrates on a set of issues, such as strategic changes to develop or reinforce preventive action; methodological aspects of the costs and benefits of prevention; development of (new) strategic partnerships for prevention; implementation strategies, etc. The quest for, and development of such partnerships will focus mainly on the relationship between labour inspection and social insurance, which if often not defined, often problematic, competitive, without always adding value (equivalent to the cost of maintain, the status quo) to the task of prevention. But there are also examples of a structured relationship between these two key players that produce genuine synergy, optimize resources and emphasize responsibility for those tasks which each actor by definition can do best. In Switzerland, for example, the national accident and disease insurance body, SUVA/CNA, reimburses the cantonal labour inspectors, which have a broad labour protection mandate covering not only OSH but also general conditions of work, employment and industrial relation issues, for that part of their time spent in enterprises on OSH, or contributing to prevention work. The rate at present is approximately CHF120.- (US\$100.-) per hour pro rata; preparation and follow-up time is also calculated, and this system appears to be running very smoothly, has Ed on a trust relationship with little or no conflictual waste.

Another interesting example comes from Australia. In New South Wales, the Workmen's Compensation Fund finances the State Labour Inspectorate - Work Cover - with around 250 inspectors, who are state civil servants under the authority of the state minister for labour. Their role in prevention is recognized by the social partners, and because this is in fact the primary responsibility of one group of the population, employers, the general public is not a financial contributor. This seems to be a good case of what we consider a strategic partnership which avoids duality and overlap and optimizes functions and resources. The ongoing research and action programme will endeavour to internationalize such examples of best practice in a number of countries.

In closing, I wish to mention three other ILO initiatives which have a bearing on the subject of this conference. They are part of our programme for 1998/99. The first concerns the launching of a new Global Programme on OSH and Environment, which will develop a new structure to pool resources more effective for more effective global action (along the lines of the ILO's International Programme for the Elimination of Child Labour, IPEC). The activities of this new programme will be based on three axes: prevention, protection and promotion. It will take on a multi-donor approach, targeting in the main Second and Third World countries.

Another activity concerns the development of a "prevention culture". This approach links quality of service and productivity with occupational safety and health. Emphasis is placed on sound managerial systems and voluntary action. The objective of this action programme is to increase awareness among managers and workers of the benefits of a prevention culture, with a view to its more widespread adoption. A multidisciplinary approach is required and in an increasing number of cases a safety culture has now been recognized as an integral part of industry strategies to enhance competitiveness, credibility and occupational safety and health performance. A critical review will be carried out of experience in the development of workplace prevention and its value in promoting occupational safety and health principles.

It will also define the unifying concepts of prevention, protection and promotion, and identify the technical, economic and ethical conditions that influence the implementation of an effective prevention culture. The finding of this review will be included in a report, which will examine the concept of working cultures, including safety culture, labour protection culture and corporate culture, and will highlight examples of good practices by enterprises, with emphasis on the importance of a participatory approach and the integration of occupational safety and health into management practices. A practical guide will then be developed to encourage a commitment by managers and workers to the implementation of occupational safety and health fundamentals and of an occupational safety and health management system in the enterprise. This guide will be used in workshops and seminars at different levels.

Lastly, I wish to refer to a programme (aptly) called WISE (Work Improvement in Small Enterprises). This approach has proved effective in generating solutions of simple and low-cost improvements that link productivity with a safer and better workplace. Its application has shown that improvement measures, including training, are effective when they focus on (i) a multifaceted approach building on local practice; (ii) positive achievements and feasible solutions which are locally attainable including low-cost solutions; and (iii) learning-by-doing which directly involves managers through group work. A typical programme consists of a checklist exercise, group discussions of low-cost examples collected from participants' enterprises, group work on proposing and implementing, within the programme period, simple improvements, and final group presentations of planned achievements. Many practical results were accomplished in WISE training courses in CEEC's and developing countries. The methodology is being applied in ILO and other technical cooperation projects the world over. By providing real workplace opportunities, it is adaptable and effective in varying local conditions, and a high degree of acceptance has been achieved. Moreover, WISE is another example of an approach where the basic message - that a good working environment is also good business - can be successfully transmitted by different actors, including the labour inspectorate, to the workplace level. And that, after all, is what the discussion on costs and benefits of OSH is all about.

Notes

1. "Prevention" in the context of labour protection, and the role of labour inspection in this regard, is referred to in numerous International Labour standards (e.g. ILO Conventions Nos. 81, 129, 155, 174 and others). However, the special instruments on labour inspection (Conventions Nos. 81 and 129, and Recommendations Nos. 81, 82 and 133), while generally conducive to, and promoting principles of prevention, specifically address the issue only at the pre-workplace stage (cf. paragraphs 1-3 of ILR No. 81 and paragraph 11 of ILR No. 133).

International comparisons of the economic costs of work accidents and work-related ill-health

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This paper provides a brief review of recent studies that have attempted to estimate the economic and social costs of work accidents and/or work-related ill health. Differences in methodology are considered in addition to the results of these studies.

Studies covered

A study conducted by economists in the HSE and the Danish Working Environment Service, on behalf of the European Commission¹, reviewed a number of estimates of the costs of work accidents and work-related ill health, covering Denmark, Finland, Great Britain, Norway and Sweden. This paper builds on that work. It reviews a more recent study produced in Australia, as well as the latest costings produced by the Dutch authorities.

Results

Key findings from each of these studies are summarised in Table 1. The data suggests that costs - either as a proportion of output or per person employed - were in most countries in a range between 1 and 4 per cent of national output. Costs relative to output were estimated to be lowest in Britain, with the highest cost estimates arising in Norway and Sweden.

Methodology

A report reviewing European research into the economic costs of road accidents (COST 313)² developed a thorough and comprehensive classification of all the relevant economic and social costs involved in road traffic accidents. This framework would appear to be equally applicable to accidents and ill health at the workplace.

Its comprehensiveness means that it is also an ambitious framework. Table 2 presents an assessment of how far the coverage in each national study matches the COST 313 framework. Table 2 reveals numerous differences in the broad cost categories included in national studies. The figures prepared for the Nordic countries follow a similar methodology, but comparisons with the British and Australian studies reveal wider differences. The Australian study, for example, is the only one to explicitly cost calls on the emergency services. Both British and Australian studies, in contrast to the Nordic countries, attempt to place money values on the pain and suffering to victims. Only the 1992 Danish study attempts to provide an illustrative estimate of the lost domestic output. Finally, the recent Dutch cost estimates adopt an even wider perspective by estimating the cost of preventive services and legal enforcement.

These differences in methodology are magnified when differences in the way costs are measured are taken into account. For example, the British study estimated the total number of cases of work-related ill health from the results of a population survey, which relied on

people's own assessment of their medical condition and whether it was caused, or made worse by, work. In contrast, the Nordic country studies take existing estimates of the incidence of ill health as a whole and then estimate the proportion of ill health that is work-related using the scientific information available.

To give another example, the Dutch study measures the effects of accidents and ill health on lost output through their impact on social security payments. This will be an imperfect measure, to the extent that disability benefits do not fully capture productive potential. A more common approach has been to measure lost output through earnings loss. A German study (not reported here) used yet another approach, based on macroeconomic model results.

Conclusions

These differences in methodology are sufficient to make cost estimates of this kind very difficult to compare. While all of the studies attempt to quantify many of the main economic impacts, such as production losses and healthcare costs, the treatment of non-marketed effects, such as the impact of pain and suffering on victims' lives or the effect on their ability to carry out unpaid work in the home, is less comprehensive. Extreme caution must be exercised in making comparisons.

It is worth noting that none of the cost estimates reported in this paper cover all the relevant costs. To that extent all are likely to err on the side of conservatism.

Table 1 Comparisons of estimates of the economic and social costs of work accidents and work-related ill health

Country/study	Base year	Cost as percentage of national output (base year)
Great Britain ^a	1990	1.4-1.5
Denmark ^b	1991	3.8
Finland ^b	1991	3.1
Norway ^b	1991	6
Sweden ^b	1991	8.3
Denmark	1992	4.3
Finland	1992	5.5
Australia	1992/93	4.1 ^c
Netherlands ^d	1995	2.7

^a Excluding costs arising from accidents which did not cause injury.

^b Estimates prepared for the Nordic Council of Ministers, using a similar methodology.

^c The figure here is based on an estimated cost of A\$15 billion. The report indicated, however, that costs could be as high as A\$37 billion.

^d The figure here is a best estimate of Fl 16.8 billion. The range of cost estimates is Fl 12.9-22.8 billion.

Note that all estimates of costs expressed as percentages of national output are approximate, being based on OECD data on national output and exchange rates.

Table 2 Costs elements included in national studies of the costs of work accidents and work-related ill health

Cost element	GB (1990)	Nordic coun- tries^a (1991)	Australia (92/93)	Denmark (1992)	Finland (1992)	Nether- lands (1995)
Medical costs:						
<i>First aid ambulance</i>	X	?	✓	?	?	?
<i>Accident and emergency</i>	X	?	✓	?	?	?
<i>In-patient treatment</i>	✓	✓	✓	✓	✓	✓
<i>Out-patient treatment</i>	✓	✓	✓	✓	✓	✓
<i>Non hospital treatment</i>	✓	✓	✓	✓	✓	✓
<i>Aids and appliances</i>	X	?	?	?	?	?
Non-medical rehabilitation:						
<i>House conversions for the disabled</i>	X	X	?	X	X	X
<i>Occupational rehabilitation</i>	X	X	X	X	X	X
Loss productive capacity (gross or net):						
<i>Lost output of employed persons</i>	✓	✓	?	✓	✓	✓
<i>Lost non-market production (i.e. domestic, voluntary work)</i>	X	X	?	✓ (illustra- tive)	X	X
<i>Future or potential loss of production</i>	✓	?	X	?	?	✓
Other economic costs:						
<i>- time spent visiting the sick</i>	X X	X X	✓ X	X X	X X	X X
<i>- lost production of other household members</i>						

Cost element	GB (1990)	Nordic coun- tries ^a (1991)	Australia (92/93)	Denmark (1992)	Finland (1992)	Nether- lands (1995)
Human costs:						
<i>Loss of life expectancy of deceased victims</i>	✓	✓	?	?	?	X
<i>Physical and mental suffer- ing of their victim</i>	✓	X	✓	X	X	X
<i>Mental suffering of friends and relatives</i>	X	X	✓	X	X	X
Damage to property/equipment	✓	X	?	X	X	✓
Administration costs	✓	X	?	X	X	✓
Police costs	X	X	?	X	X	X
Fire service costs	X	X	?	X	X	X
Health insurance administration costs	✓	X	?	X	X	✓
Non-health insurance administration costs	✓	X	?	X	X	✓
Legal costs	✓	X	✓	X	X	✓

a The four country studies for the Nordic Council of Ministers were based on the same methodology.

Key: ✓ = covered by the study; X = not covered by the study; ? = insufficient information.

Sources: Classification from COST 313; entries in columns are judgements based on the information available from country studies. For some of the studies, this information is limited.

Notes

1. N Davies, N Marshall, P McCrea, M Beatson and P Lunde Jensen, 'The Economic Appraisal of European Union Health and Safety at Work Legislation', unpublished report to the European Commission, December 1995.
2. J-L Alfaro, M Chapuis, F Fabre (eds), 'Socio-Economic Cost of Road Accidents', COST 313, Commission of the European Communities, 1994.

The economic aspect of working conditions changes policy and practice

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Economic aspects have not earlier been used purposefully in the working environment policy. In the last few years our knowledge about the economic importance of working conditions has increased. Attitudes have also changed. Changes in the working environment policy and in the prevention work on company level can clearly be seen.

In Finland an important target for the working environment authorities has been to reduce losses to the national economy due to bad working conditions. According to calculations the cost of work-related diseases and accidents is almost 4% of the GNP.

Measures to improve working conditions can be either profitable or non-profitable to the company. Profitability depends on the working environment sector under consideration or for instance on the appraisal interval. Nowadays it is very common to emphasize the positive effects of good working conditions on productivity and quality.

There has been a lot of development work concerning analysing and calculation models for the economic impact of working conditions. This gives new tools for the workplaces as well as for the authorities. At the same time the content of the working environment policy and the prevention work changes.

Introduction

Individuals, households and enterprises and other organizations try to attain well-being, and they are expected to act in a sensible way for reaching that goal. This is presumably part of a generally accepted economic theory, for example according to the American Gary Becker, the winner of the Nobel Prize in 1992 for economics. Becker thinks that economic thinking directs all our decisions and behaviour.

What about the sector of working environment development? Do we take economic aspects into account when developing the working conditions and the personnel's well-being at a company level and on the other hand at the social level? It is justified to argue that the occupational safety and health policy or the practical safety work has hardly been based on systematic consideration of financial aspects at least in Finland or in the other Nordic countries. On the contrary, a common opinion has often been that economic thinking must not be connected to questions concerning people's health and safety. However, it is reason to ask if utilization of economic thinking and comprehensive objectives aiming at overall well-being would not be the right way towards a more effective occupational safety policy. In this respect we seem to be in the middle of an extensive process of change. We must, however, avoid superficial economic considerations where ethical and economic views may clash.

There are some signs of change in respect of the economic aspect of the occupational safety policy in Finland in the 1990's. The following are worth mentioning:

- 1) The working conditions committee set by the Government had wide discussions about economic aspects and it proposed in its report (1991) a number of developmental measures.
- 2) In 1992 a separate development programme for working environment economics was confirmed for the occupational safety and health administration.
- 3) In the state budget of 1993 reduction of losses from the working environment to the national economy was set as one of the objectives.
- 4) At the proposal of a tripartite working group, the Ministry of Labour carried out a comprehensive development project in 1944-96. It was based on the needs of workplaces to investigate the economic effects of the working environment.

The viewpoint of national economy

The aim of the Ministry of Social Affairs and Health is to reduce the losses bad working environments cause to national economy. It is reason to investigate the national economic importance of working conditions in order to support a reasonable and efficient occupational safety policy. Such macroeconomic calculations involve many theoretical and practical problems, and the figures presented in public differ clearly from each other. According to a calculation made by the Ministry of Labour in 1994, the costs of work-related diseases and occupational accidents were FIM 18.3 milliard, which was nearly 4% of the GNP (Table 1). Half of the losses are caused by reduced productional input resulting from disability.

Table 1 Costs of work-related diseases and accidents in Finland in 1992

Sickness category	Work-related	Work-related	COSTS
	%	No. of cases	FIM million
Tumors	4 %	700	600
Mental disorder	5 %	1 800	1 200
Nervous system and sense organs	20 %	3 000	1 400
Circulatory system	10 %	3 400	3 000
Respiratory organs	25 %	7 800	1 600
Skin diseases	45 %	4 200	500
Musculo-skeletal complaints	33 %	47 000	7 500
Accidents at work	100 %	85 000	2 600
Total		152 900	18 300

The calculation shows the potential savings which would have been created in national economy if there had not been any work-related diseases or accidents. So the calculation does not answer the question if the inputs have been adequate from the viewpoint of national economy or well-being. It nevertheless helps us to proportion the importance of working conditions into other features of society. The calculation also gives us a practical tool for assessing the significance of the different sectors of occupational safety and health. Ergonomics seem to be the most important target for development in the light of this calculation. On the other hand, the importance of mental well-being is then not included in the calculations.

In many countries analyses of economic effects are made in connection with reforms of the working environment laws. It is difficult to make good analyses, and their quality is indeed varied. Their meaning in decision making varies and is also unclear to some extent. However, analyses are an important tool which tends to raise the level of legislative preparation work. Within the European Union the evaluation of the economic effects of working environment directives is part of the preparation process.

The viewpoint of corporate economy

National-economic calculations may well remain on a rather theoretical level and one cannot expect companies and workplaces to act in the way optimal to national economy. The business economic viewpoint, which is based on the circumstances of each company, may be the most important incentive for the development of working conditions today. The personnel's well-being and working conditions in a broad sense are significant for the productivity, profit and competitiveness of any company. In the development of working conditions in companies and other organizations, the input-output approach has become a useful point of view. Outputs and inputs can be looked at by means of figure 1.

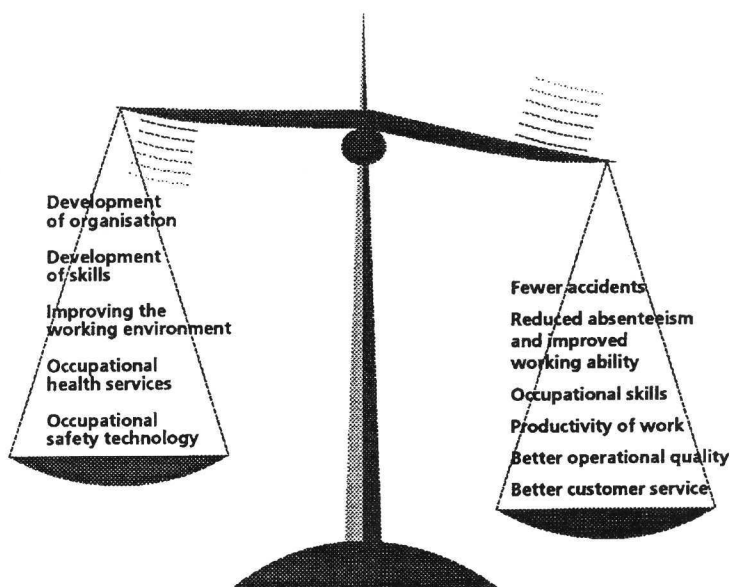


Figure 1 Inputs and outputs of workplace development

In order to find out the ratio between the inputs and outputs of working conditions we need analysing and calculation models. These can be investment calculations, separate cost or follow-up calculations for occupational safety or personnel economic calculations. Usually companies follow their costs and benefits associated with working conditions quite

occasionally. It is obvious that the economic importance of working conditions is usually estimated as a result of inadequate monitoring or internal audit.

The large project carried out by the Ministry of Labour in 1994-96 (the Project on Working Environment Economics) sought to find out the economic importance of the different sectors of the working environment and to present different kinds of models for analysis and calculation. The project produced knowledge of the following subjects (there is a special publication on each sector):

- workers' well-being and productivity
- working environment in the service sector
- model for profitability assessment
- costs of sickness absenteeism
- costs of disability pensions and staff turnover
- work climate and customer service
- working environment and productivity in industry
- human resource reporting.

It is clear that not all investments in the working environment are financially profitable. When the physical working environment is on a high level, as it often is in Finland, it may be difficult to prove that investments in the physical working environment are profitable to a company. However, it is not up to working environment economics to prove the profitability of the measures. Often they must be taken irrespective of profitability and the necessary inputs are part of productional costs.

If the standard of working conditions is low - there are for instance heavy routines and many risks of accident - investing in the working environment may be profitable. Studies often show that investments in ergonomics are very profitable. It is clear that financial profitability depends on several factors, such as the status of the company, the problem in question, time span and the company's proficiency. Therefore it is reason to avoid generalizations about the profitability of occupational safety. The following conclusion is perhaps still justified: The wider concept of working environment we use, the more definitely we can say that investment in the working environment is profitable. Figure 2 illustrates this argument.

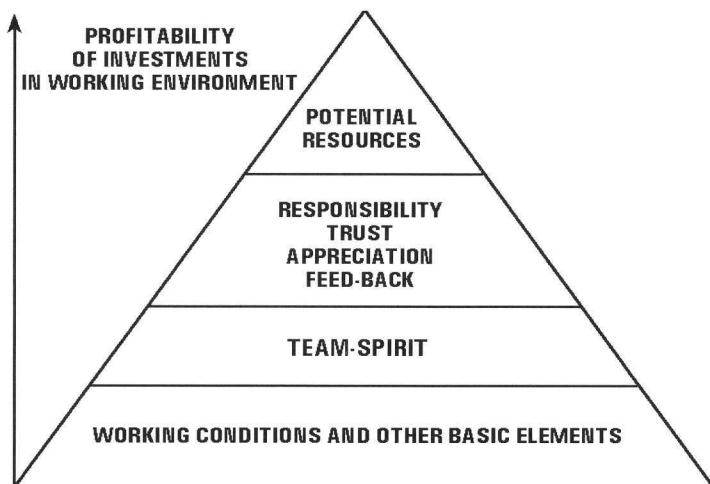


Figure 2 The well-being of the employee and productivity

Conclusions

The economic effects of working conditions are comprehensive and often difficult to find out. Therefore this paper only tries to throw light on certain central aspects of the matter. In order to be able to make systematic use of economic thinking in the occupational safety policy, we must try to look at things objectively without exaggerating or understating their importance. In Finland we have found it sensible to divide the effects of the development of working conditions from the economic aspect in the following way (programme for the development of working environment economics within the occupational safety and health administration):

- 1) Development of the working environment which is profitable to corporate economies
 - in common interest
 - no obligations needed
 - a question of information and knowledge
- 2) Development of the working environment which is profitable to national economy but not to corporate economies
 - public authority influences through legislation and supervision
 - development of new economic incentives
- 3) Development of the working environment which is economically non-profitable
 - public authority influences through legislation and supervision
 - ethical aspects
 - must be carried out as economically as possible.

In enterprises and other organizations the needs and expectations are related with the question what the economic meaning of the concerned problem is. Similarly, it is reason to suppose that economic factors have their influence on the way authorities act. Figure 3 illustrates the different roles of a safety inspector depending on whether the question is one of working environment development profitable to corporate economies or not and, on the other hand, whether the minimum requirements of the law have been fulfilled or not.

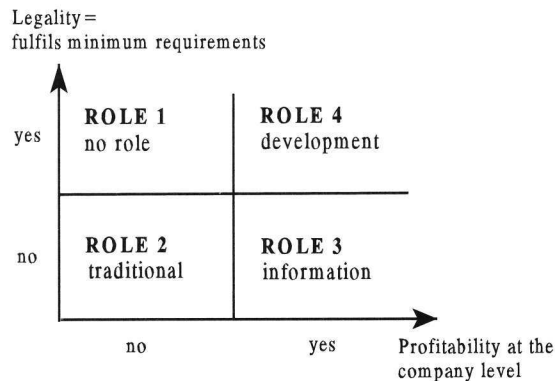


Figure 3 Different roles of the authorities

In Finland some occupational safety inspectors have started consciously to develop their modes of action so as to make use of economic thinking in their inspection activities. The Ministry of Social Affairs and Health has in 1997 in cooperation with the occupational safety inspectors launched a separate development project in this sense.

Economic thinking has in recent years become an ever more important aspect in the occupational safety policy and practical safety work. At least in Finland this has come up as new kind of interest in questions concerning the working environment. At the same time the concept of working environment has been extended and matters related to it have approached the different sectors of management. Economic thinking inevitably forces us to look at many modes of action with criticism and to search for new methods. However, this requires better follow-up and assessment of the economic significance of working conditions both at the social level and at the workplace level.

However, economy is not an end in itself but it should serve the systematic development of working conditions based on the objective of well-being in broad sense.

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Case Study of Self-Administered Systems in Occupational Safety and Health

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Introduction

Although occupational safety and health have been improved considerably in all countries of the European Union over the past decade, there is no reason to be satisfied with the position that has been achieved. European statistics (1) indicate that a total of 4.8 million occupational accidents occurred in 1993, of which around 6,000 resulted in fatalities. What these statistics fail to communicate is the suffering endured by the victims and their loved ones.

The central question is how safety and health conditions in the workplace can be further improved in an efficient manner. With this objective in mind, the following questions arise:

- Which means are available to generate a further reduction of the accident rate?
- Where to begin?
- What are the most appropriate prevention strategies?

The inclusion of efficiency considerations in prevention measures is indispensable. The significantly scarcer financial resources in practically every European country are one reason why. In addition, the relatively slight drop in the frequency of occupational accidents over the past years also raises the issue of the efficiency and marginal utility of prevention measures.

One method for estimating the existing potential for improvement of occupational safety and health is to take a closer look at the size of firms in proportion to the specific frequency of severe occupational accidents (figure1).

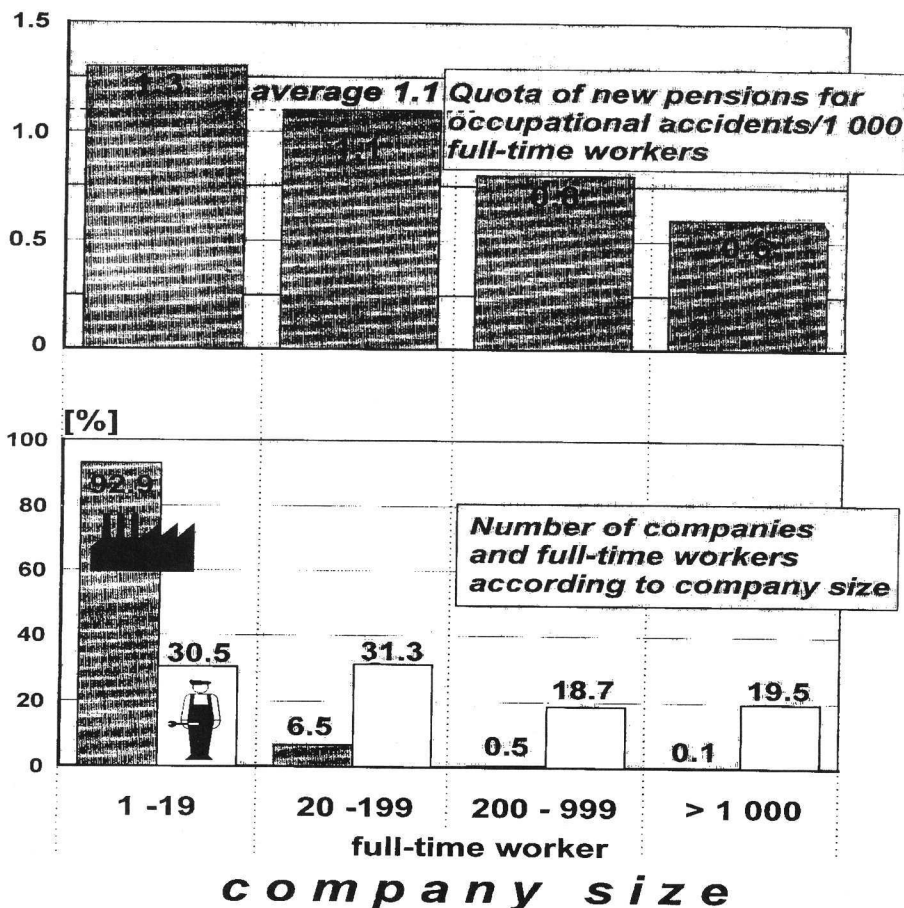


Figure 1 Number of firms and employees as well as the rates of new occupational accident pensions according to company size.

In 1995, smaller companies with less than 200 employees, which comprise 99.4% of all enterprises in Germany, employed almost 62% of the national workforce. As the upper part of the illustration shows, the rate of severe accidents for which pensions are paid is, on average, greater in small and medium-sized companies than in larger firms. This is partly attributable to the fact that many small companies are active in relatively high-risk branches, such as the building trade. If the frequency of severe accidents in these small and medium-sized firms could be reduced to the level of that in large companies with more than 200 employees (i.e. to around 0.7 accident pensions per 1000 full-time employees), the annual number of new pensions would drop by more than 10,000, or 30%. Experiences of the past ten years reveal that such a percentage drop in new occupational accident pensions is accompanied by a fall in the total number of reportable accidents by at least half this percentage. Annual savings in terms of rehabilitation costs and pensions would then be in

the order of DM 700 million. Cost savings related to lost production would even be many times higher. Considering the fact that the reduction in occupational accidents accomplished in Germany during the past ten years has been of the same magnitude, this savings potential is definitely realizable.(2)

The following promising prevention strategies will be discussed below:

- On the one hand, the development and introduction of specific prevention concepts for small companies. The reason why the above-mentioned situation in large companies is better than in small ones (which is probably the same in all European countries) is that most large companies have their own Occupational Safety and Health Departments, which are often effectively integrated into their business operations. To attempt to transfer this model to small and medium-sized companies is not possible due to the great variety of business structures. The notion of including occupational safety and health in a (de facto) third-party certified management system - a suggestion that is currently being discussed on both the European and international levels - is less desirable for small and medium-sized firms (3). Small and medium-sized firms usually do not have their own occupational safety and health experts and should, therefore, be supported through other means. Here lies a task for the supervisory institutions: federal authorities, accident and health insurers, as well as private service providers. The so-called Entrepreneurial Model, a prevention concept developed by accident insurers and specifically geared to small companies, will be discussed toward the conclusion of this article.
- Efficiency also ensures that prevention is focused on those branches known to have high accident rates. Certainly not confined to Germany, an above-average number of reportable occupational accidents occur in such industries as building, lumber, quarries, etc. (2) (figure 2). The development of accident rates in the construction industry is an indication that this priority strategy can indeed be successfully implemented. The rate of severe occupational accidents leading to pensions has decreased by almost 42% from 1985 to 1995, which is clearly higher than the average drop in all other industrial branches (32.5%).
- Yet another effective focus on prevention can be found if the accident rates are viewed in connection with operational activities. Figure 3 shows the main points regarding reportable accidents and severe accidents resulting in pensions (4). Clearly higher than the other figures is the rate of accidents that occurred in connection with operation of machinery and tools, internal transport, or in connection with stumbling, slipping and falling. These three types of accidents accounted for around 2/3 of the 1.5 million total number of accidents which occurred in 1993. Stumbling, slipping and falling, and more specifically, falls from a height and falling from ladders, are also the main causes of severe accidents, of which every fifth to tenth occurrence is so severe that they result in pensions.
- The demonstrated focus on prevention can still be further strengthened when accident insurers select from the great diversity of member companies those companies that because of their accident record were obliged to pay the highest premium possible over the past five years. These companies are then given specific advice and instructions with a view to reducing the risk of accidents. The result: Already after one year, the

frequency of accidents was clearly down by 40-50% and, in one case, even by 80%. There now are many such integral management consultation models, all of which are producing positive results, also from an economic perspective (5,6).

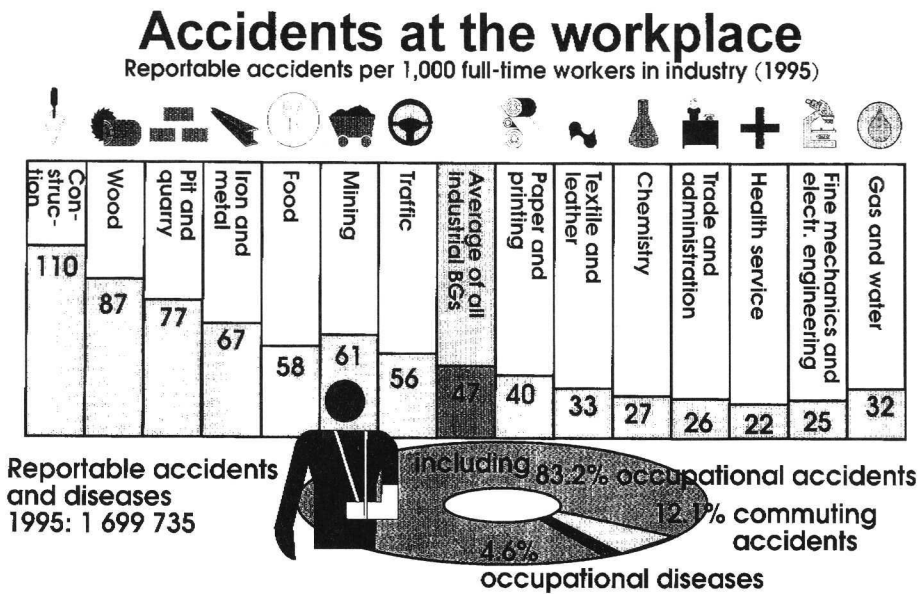


Figure 2 Frequency of reported occupational accidents in various industries.

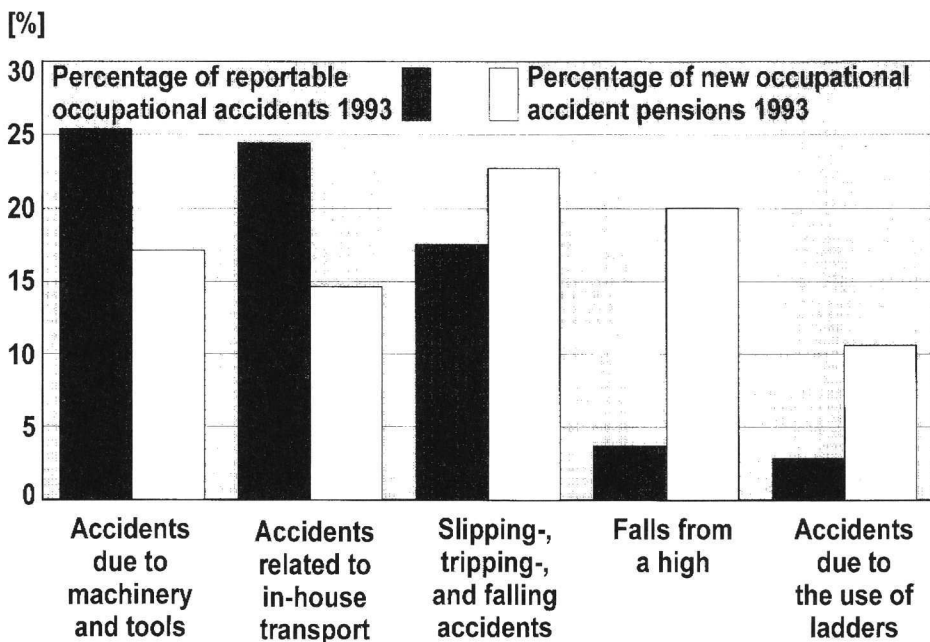


Figure 3 Frequency of reported occupational accidents and new occupational accident pensions in various areas.

The highlighted approaches to prevention serve as examples that could be further extended. They show that accident insurers, through their experiences and statistics, can make a worthwhile contribution to the improvement of occupational safety and health.

Occupational Accident Insurance in Europe

This section discusses the role accident insurers play in European occupational safety and health in general terms, without going into too much detail. Focus is on systems with a high level of administrative autonomy, that is, those providing for a higher degree of autonomy and flexibility in occupational safety and health for those who are principally afflicted: employees and employers. To begin with, it is practical to take a close look at the obvious similarities among the systems, while also investigating the differences between industrial accident and occupational disease insurance systems in Europe.

In each and every European Union member state, people who work for someone else are insured against occupational accidents and occupational diseases on the basis of legal regulations. There are, however, great differences in the structure of accident insurance schemes, their legal status, and their relationships with other social security domains and state-operated services. The spectrum spans from self-administered or independent systems (Germany, France, Italy, Luxembourg, Austria) to state-controlled systems (Great Britain, Ireland), and those with partial private status (Belgium, Denmark, Finland, Portugal, Spain). In some countries (Greece, Ireland, the Netherlands), accident insurance rehabilitation

benefits are covered by health insurance or state-operated health services (Great Britain, Ireland, Portugal, Spain), while other countries have an independent, unique system (Germany, Luxembourg, Austria).

All employees, along with the self-employed, school children, students and other groups, are insured, either under a national or under a private scheme. In addition to being insured against occupational accidents, most people are also insured while travelling to and from work. This is not the case in Great Britain, Denmark and, in part, Italy. Regulations on payment of benefits in the form of services and cash benefits, as well as on the taxation of insurance payments differ so much that only the relevant literature can be referred to here (7,8).

Setting aside the extensive, tax-financed solution applied in Great Britain and Ireland, accident insurance is financed primarily through employer premiums. In some countries (Denmark, Germany, Finland, France, Italy, Luxembourg, Portugal, Spain), these premiums are based on the level of risk or the risk classification. Other countries (Belgium, Greece, Ireland, Austria, Sweden) have a more or less flat-rate premium volume based solely on the total volume of wages and salaries. State subsidies only exist in legally arranged exceptions (Greece, Luxembourg), or in special areas such as agriculture (Germany, Finland) (7).

The social partners, as the ones specifying the content of self-administered systems, are often represented in the decision making bodies of the accident insurance industry, though with very distinct responsibilities, degrees of influence and opportunities to specify the content of the systems. In many countries, accident insurance includes far-reaching prevention obligations in regard to industrial accidents and occupational diseases (for example, Germany, France, Luxembourg, Austria). Denmark, on the other hand, does not have this obligation, while Spain and Italy only have it to a limited extent. Yet it is self-administration that can have a great influence on prevention in the realm of occupational safety and health.

It is not possible to investigate every commonality, difference or detail within the limited time allowed for this presentation. Therefore, please refer to the relevant literature (7-15). Special reference is made to the European Forum of Insurances against accidents at work and occupational diseases (8). It was founded in June 1992 by the occupational accidents and diseases insurers, and its objective is to promote the idea of a specific insurance against occupational accidents and occupational diseases. Insurance institutions from ten EU and EFTA nations now participate in this forum.

Principle and effect of self-administered systems in Occupational Safety and Health based on the German example

Self-administered insurance systems in occupational safety and health are, first and foremost, characterized by the effective, equality participation of those who are directly effected by occupational accidents and diseases. That includes, on the one hand, the employees, who, in the end, are the victims of inadequate safety and health in the workplace. On the other hand, there are the employers, who are not only fully responsible for occupational safety and health policy, but who must also carry the financial burden.

In Germany, as well as in some other European Union member states, this hundred-year-old principle of accident insurance has been successfully integrated into the modern social market economy system. In addition to self-administration by the social partners, the cornerstone of German accident insurance is the simultaneous responsibility for prevention, rehabilitation

and compensation (16-19). This implies that the primarily afflicted parties, i.e. employers and employees, have access to all the necessary instruments with which to have an efficient and effective influence on occupational accident and disease rates. Moreover, they have the opportunity to create and further develop such instruments.

The new legal structure of German accident insurance, which was introduced in 1996 (20,21), not only reconfirmed the tried and tested principle of shared responsibility, but also expanded it in terms of content. For example, the statutory prevention obligation has been expanded to encompass the prevention of work-related health risks (22,23). The compensation regulations have remained unchanged.

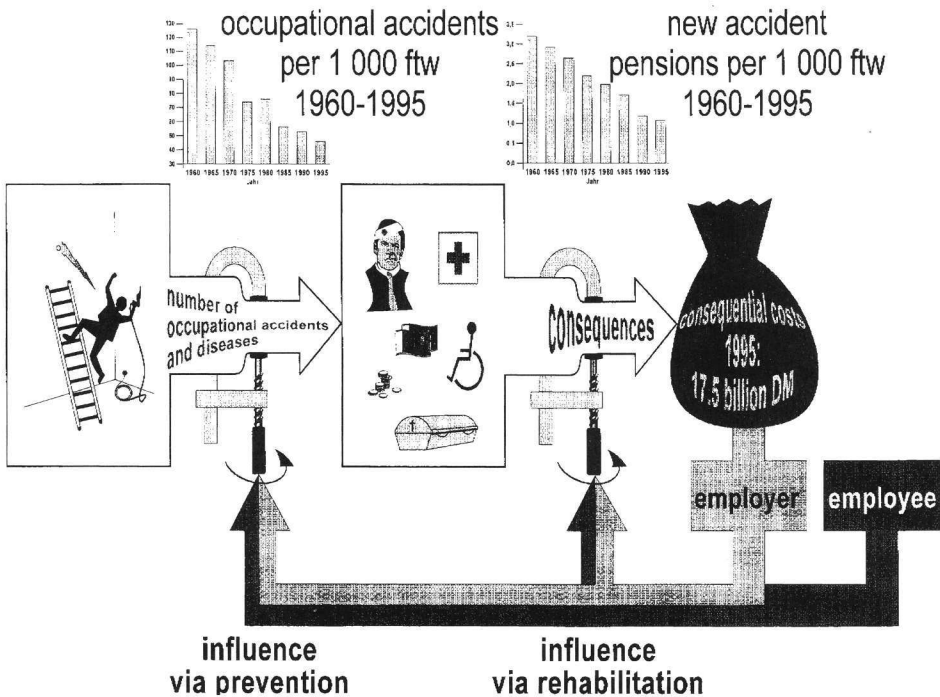


Figure 4 Schematic representation of the process of self-administration in accident insurance by the social partners.

Figure 4 is a schematic representation of the basic process of self-administration in accident insurance by the social partners. Employers and employees have an effective influence on the system as a whole. First of all, they have the power to influence accident and occupational disease rates through many and diverse prevention measures. They can furthermore regulate treatment and occupational re-integration into the workforce by means of medical and social rehabilitation measures. The histogram in the upper half of the illustration represents the result, the so-called "humanitarian balance". The frequency of all degrees of occupational accidents and, in particular, severe accidents has clearly declined by 63-65% over the past 35 years (1960-1995). Fatal accidents have even fallen by around 77% (2).

This considerable humanitarian balance is accompanied by a positive economic balance. Although cost increases for premium and rehabilitation measures affect accident insurance as much as other social securities, the average rate of accident insurance is lower today than 35 years ago. This rate stood at 1.46% in 1995, compared with 1.51% in 1960. Furthermore, the accident insurance contribution to the social budget has dropped from 2.2.% to 1.5% in this period, while the 3.58% share in all social security premiums is clearly lower than the 5.83% in 1960. These are important criteria for the economic assessment of the accident insurance system.

An estimation of Germany's industrial economy in 1993 revealed the following: If the accident rate remained the same as in 1960, the rising annual premiums to be paid by companies would be DM 8 billion higher, that is some 50% (24). This positive economic balance of prevention is not only applicable to the German model of accident insurance. At the "Third International Congress on legal-medical aspects of work injuries", held in Munich in March of this year, it was established that where organizations are simultaneously responsible for prevention, rehabilitation and compensation, premiums for accident insurance amount to 1.3-1.5%. Other systems that only offer compensation have an average premium volume of 3-4% (25).

The effects of self-administered, independent occupational safety and health systems have been described in detail in (16-18). A few points should be highlighted here:

- they relieve the government from obligations regarding accident insurance as a whole, as well as regarding many other monitoring and regulating measures needed to improve occupational safety.
- they comply almost exactly with the subsidiary precept.
- stabilizing the business climate, they are socially tolerable and promote acceptance because the equal representation of the social partners institutionalizes a balance of interests.
- they have a supportive effect for employers and employees in their prevention efforts.
- they are business-oriented through the branch-specific division of the accident insurance industry.
- they comprise regulation mechanisms affecting the number of accidents and occupational diseases and the costs.
- they enable and secure cost and expenditure transparency.
- they help identify causal relations of injuries and their origins.
- they provide financial prevention incentives, e.g. through risk-specific premium graduation and a system of rebates and supplements. Here, too, the aforementioned International Congress in March of this year ascertained that target-oriented incentive systems function best when prevention and insurance are the responsibility of one single party (25).

Prevention Instruments

Accident insurers in Germany have developed a multi-faceted set of instruments for regulating and supporting prevention in businesses (24). These instruments have differing approaches and are aimed at a variety of target groups. It is important to regularly gauge their effectiveness and efficiency, and to adjust them to the changing legal and corporate conditions. The legal foundation for German accident insurance that was newly created in

the autumn of 1996 (20/21) - the Accident Insurance Classification Act - has reconfirmed that the accident insurer is responsible for prevention and has expanded its content. This and other current developments are discussed below.

- **Extension of the prevention obligation of accident insurers**
The EU framework directive for occupational safety and health came into effect in Germany in 1996 through the Occupational Safety Act (26). It extended the prevention obligation for employers, who are now required to take occupational safety and health measures to prevent occupational accidents and work-related health risks, and to design a humane workplace. The concretization of occupational safety and health measures to be taken is based on an assessment of existing and potential dangers in the work environment. Accordingly, the prevention obligation of accident insurers, which up till now only comprised the prevention of occupational accidents and occupational diseases, has been extended to include the prevention of work-related health risks (20, 21). This meant that accident insurers have had to modify their prevention measures (22, 23). The rules and regulations of accident insurance in particular have to pay attention to work-related risks for life and health. Also, this extended obligation will govern all future consultation and monitoring of companies, training and in-service training, the content of occupational medical prevention, testing and certification of products, as well as research by accident insurers. Of special importance in regard to occupational safety measures, in which the accident insurance institutions advise and monitor companies, is the implementation of corporate risk assessments and of all measures intended to counteract imperfections in organization, qualification, information, and cooperation.
- **Cooperation of the supervisory institutions concerned with occupational safety and health**
The new legislation has also redefined the obligations of the supervisory institutions responsible for occupational safety and health. This includes the obligation for the federal supervising authorities and the inspectorates of the accident insurance institutions to cooperate and the obligation of the health insurers to cooperate with accident insurers in the prevention of work-related health risks. The concrete implementation of this cooperation is well on its way and is supported through a series of mutual projects (29). In consideration of the scarcer resources for occupational safety and health, the significance of cooperation now emerges as even more important.
- **Occupational safety and health in small and medium-sized companies**
With the national implementation of the European framework directive for occupational safety and health, a new, promising foundation for improvement of occupational safety and health in small companies has been developed by the German *berufsgenossenschaften*: the so-called Entrepreneurial Model. Special training for small businesses, which in some branches will be offered and utilized quite extensively, is intended to inform and motivate decision-makers in business and to enable them to take control of and implement occupational safety and health in their companies. The strongly branch-specific orientation of this relatively new measure has gone down well in small companies. Experience gained so far indicates that the Entrepreneurial Model is a highly effective and efficient means of elevating occupational safety and health in small companies to a higher level (30).

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A model for establishing a risk based inspection program

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Abstract

The paper presents a project with the objective to provide a basis for development of a risk based inspection strategy for the Norwegian Labour Inspectorate. A model that applies risk management concepts and risk theory within the area of occupational health and safety is described. A risk based inspection strategy implies that analyses and decisions concerning inspection plans must be made both at the national and at the regional inspectorate level. An overview of the distribution of risk for the country as a whole and between branches is needed. In addition, the local knowledge of regional inspectorates is a necessary element of the strategy. Data needs in order to implement a risk based inspection strategy are described.

Background

The Norwegian Occupational Health and Safety Inspection System is based on the Internal Control concept. The main principle of Internal Control is that enterprises themselves are obliged to establish a Management System for occupational health and safety based on general quality management principles. This implies that inspections must to a larger extent be carried out as System Audits. This is a rather challenging concept which requires careful planning of inspection activities.

The authorities are faced with austere requirements concerning cost effective use of resources. There is a considerable gap between what is desirable and what is possible with respect to available resources for occupational health and safety inspections. At present the Norwegian Labour Inspectorate has resources to visit only about 10 percent of the country's enterprises annually.

The idea of Risk Based Inspection is suggested as a means to satisfy the need for more cost effective use of inspection resources and implies that inspections are planned according to the level of occupational health and safety risks in the enterprises. Such a Risk Based Strategy implies three challenges to the Labour Inspectorate:

1. Survey of the Labour Inspectorate's area of responsibility in order to identify where the largest occupational risks are occurring.
2. Concentration of inspections to enterprises with low motivation for systematic occupational health and safety work.
3. Concentration of the inspection efforts on enterprises and occupational health and safety problems where employees will benefit the most from improvements.

Working environment is characterised by many different kinds of risks (injury and sickness). In order to develop a risk based inspection strategy, the various risks must be compared and weighed in relation to each other. Elaboration of the use of the risk concept within the domain of occupational health and safety is therefore required.

Assisted by SINTEF Industrial Management, the Norwegian Labour Inspectorate has suggested a model for preparation of inspection strategies based on general principles of Risk Management. The feasibility of the model is presently being examined.

The model implies four steps of analysis and decision making, see figure 1.

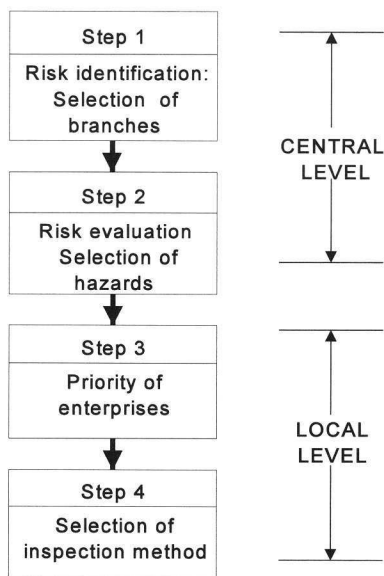


Figure 1 A Risk Based inspection strategy, Yates, F (ed): *Risk-taking behavior*. Chisester, Wiley, 1992.

STEP 1: Risk identification

Reports of injuries and diseases caused by working environment are of course already being collected on a national basis. To obtain a more complete overview of occupational risks, data from mandatory reporting to the Labour Inspectorate will be supplemented with information held by the Norwegian Social Security Agency on occupational diseases /injuries and other relevant sources (e.g Norwegian hospital data base).

On this basis an overall evaluation of occupational risk in the country will be compiled in a risk criticality grid. This involves stipulation of the frequency of different categories of losses (injuries and diseases) and measurement or stipulation of the magnitude of losses (e.g in loss classes).

In order to clarify the use of the risk concept in connection with Occupational health and safety, the project has adapted the following definition of risk (Yates , 1992):

$$Risk_i = P(Loss)_i \oplus V(Loss)_i$$

where: $P(Loss)$ = The probability of a loss (i.e. injury or sickness)
 $V(Loss)$ = The value of the loss, and \oplus signifies the mathematical operation (not initially defined, addition, multiplication e.l).

Estimator for Probability of loss: Frequency of cases pr. category of loss divided by exposure (total man-years or man-hours)

Possible estimator for the Value of loss is presently under consideration and could be one or more of the following:

1. Man hours/ man-years lost as a consequence of occupational injuries and diseases
2. Loss of welfare caused by occupational injury and diseases
3. Societal costs (medical and care) of occupational injury/disease
4. Predfined loss classes established by expert evaluation
5. A loss classification system similar to those used in insurance

In order to identify branch specific risk profiles, the risk criticality grid for the country as a whole is broken down into separate branch grids - figure 2.

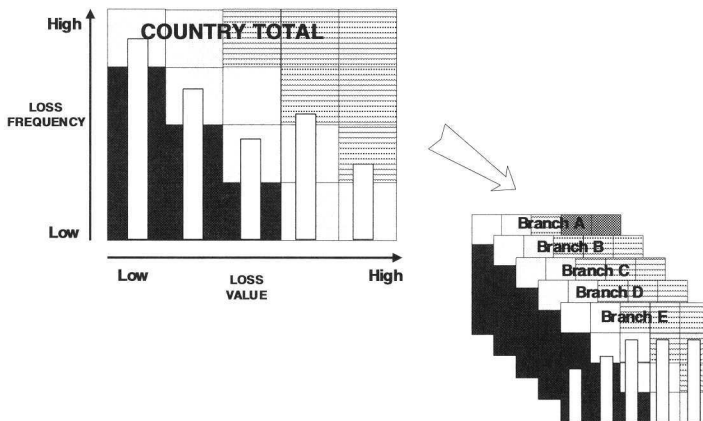


Figure 2 Risk criticality grids at country level and branch level

Branches and categories of occupational risk with high frequency will be prioritised for further study. This priorities are made based on comparison between branches .

- a) Some occupational health and safety risks may defy risk evaluations. The suggested model assumes risks estimates may be based on reported injuries and diseases. This approach might overlook some important occupational health and safety risks, e.g where the causes of the damages are difficult to evaluate, or the consequences of exposure

are not fully known yet. In such cases expert evaluations may be applied. Relevant areas are:

- b) Diseases and damages to health caused by unfavourable psycho-social working environment
- c) Possible diseases following from bad indoor climate
- d) Diseases with long period of latency from exposure to outburst e.g some types of cancer

STEP 2: Risk evaluation

In order to identify what risk factors should be focused in the annual work inspection plan, a Working Environment Risk Model is applied - figure 3. The model classifies potential work environment risks into four categories, physical-, chemical-, organisational-, and psycho-social risks. The first task in the evaluation is to identify what is known about the extent of each type of risk in a given branch. The next task is analysis of the assumed efficiency of the system-barriers which should prevent the potential risks from resulting in unwanted exposure to hazards. In Norway the primary system barrier within the enterprise is the Internal Control System which consists of the preventive means and the emergency preparedness. The analysis of the efficiency of the Internal Control will be based on search in stored knowledge from earlier inspections and from research.

The next task is to evaluate the importance of each occupational risk problem identified in the analysis, by comparing to what is known about unwanted exposure to hazards from earlier inspections. Following this, the risk problems in question are evaluated by comparing the findings to what is known about unwanted consequences in the form of injuries and diseases. To complete the analysis of consequences, information about the seriousness of the final losses for individuals (e.g. permanent handicaps) and the society (hospital and care costs) are sought out.

Based on the results from these analyses, recommendation will be made to the local inspectorates with respect to:

- * Prioritisation of branches
- * Selection of occupational risks and risk factors to be focused

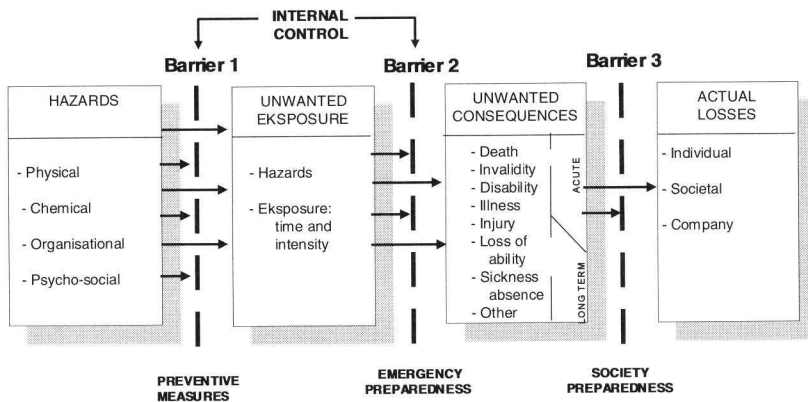


Figure 3 Working environment Risk Model

STEP 3: Priority of enterprises

Local annual inspection plans will be prepared based on the centrally issued directives. The local inspectorates' knowledge of and experience with enterprises within their district should be used in implementation of the general inspection strategy.

STEP 4: Selection of inspection and sanction forms

Inspection method and if necessary sanctions, should be selected according to the enterprises' competence and motivation for occupational health and safety work - figure 4. The main inspection methods are System Audits and Verification.

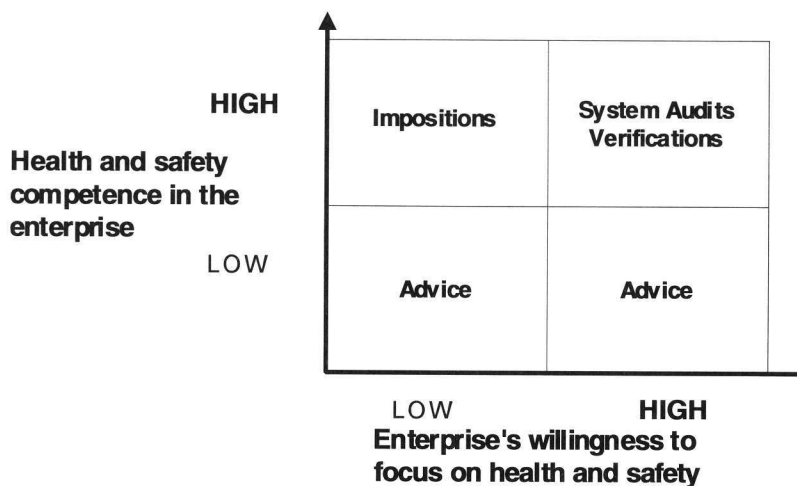


Figure 4 Inspection modes adapted to the enterprise's occupational health and safety situation

Data needs

The data required to establish a complete system for Risk Based Inspection can be separated into three main data bases, data on the extent of health and safety problems, knowledge of health and safety risk factors and inspection experience - figure 5. In order to enable the Risk Based Inspection System to have learning abilities, new knowledge and experience from inspections will continuously be added to the existing data bases.

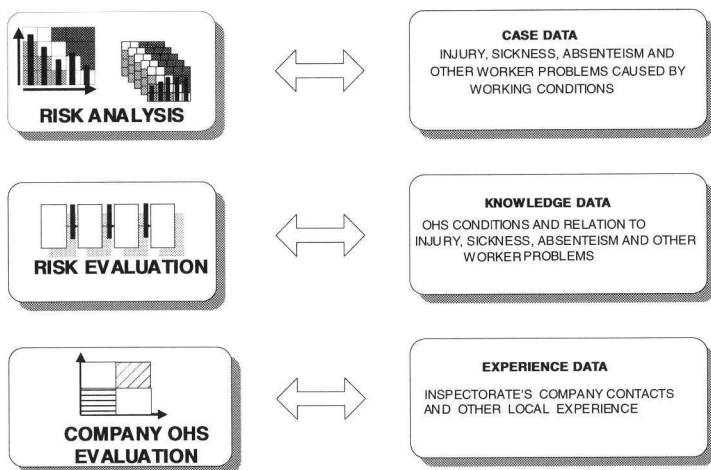


Figure 5 Data bases required in a Risk Based Inspection Strategy

Conclusion

The idea of *Risk Based Inspection* is suggested as a means to satisfy the need for more cost effective use of inspection resources and implies that inspections are planned according to the level of occupational health and safety risks in the enterprises. The present study has demonstrated that in spite of the area's many incommensurable kinds of risks, Risk Management can in principle be applied to the area of occupational safety and health. The challenge ahead is to obtain the necessary data to make risk evaluations feasible. This is primarily a question of the quality of health and safety reporting, better use of available information, and of cooperation between the parties in working life.

A Cost Effective Way to Improve Working Conditions in the Construction Industry

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Summary

In many Western European countries the operative system of regulation on 'safety and health at work' (OSH, Occupational Safety and Health) is one of self-regulation. However, this system does not display the expected effect on the improvement of OSH. Supplementary policy instruments are required, especially in a sector like the construction industry, a sector with subcontracting and relatively many small and medium-sized enterprises (SME's).

This paper argues for the covenant as a policy means. The covenant is a written and signed 'gentleman's agreement', to be agreed on not only between the government and the construction industry, but also between the industry and its firms.

However, covenants alone will not be sufficient. Externalities are the main reason for not incorporating OSH-improvements in the economic calculations of enterprises. First of all SME's should be compensated for extra OSH-efforts. Furthermore information campaigns should be set up. These policy means together may provide an effective mixture of policy instruments, being worth their costs.

Introduction

Since the seventies most Western European countries have enacted law on 'safety and health at work' (OSH, occupational safety and health), i.e. the United Kingdom since 1974, Norway since 1977, the Netherlands since 1980. This law is intended to change the behaviour of employers and employees to provide safer and more healthy working conditions and production processes.

In spite of the legislation the situation on health and safety in most countries does not show much progress. In the United Kingdom for example, there was a decline in fatal and serious accidents up until 1980, but this trend has not continued into the 1980s (Dawson *et.al.* 1988: 42). Even in the Scandinavian country Norway, which has a long tradition of realizing work reforms through legal-administrative strategies, figures about workplace accidents and ill-health absenteeism demonstrate nearly progress, which is the reason for the introduction in 1992 of a new regulation (Saksvik, 1997).

This paper advocates a mixture of policy instruments, which could improve the OSH-situation in the construction industry in a cost effective way. The covenant is the most important instrument in this mixture.

Self-regulation in Safety and Health

In the United Kingdom, as in the Netherlands and Denmark, 'safety and health policies' are based on the doctrine of self-regulation. In this doctrine the law provides "a regulatory framework within which those in industry could themselves undertake responsibility for

safety at work" (Dawson *et.al.* 1988: 3). As a consequence national governments leave actions on safety and health for the main part to the individual firms, i.e. to the local or micro level.

Dawson *et.al.* report about case studies in three industrial sectors: the chemical, the construction and the retail sector. They conclude that the essential elements for effective self-regulation are, besides awareness of the problem and knowledge about it, the willingness to act and the capacity to act. However, being able and willing to act often don't go hand in hand: "there may be a problem of the *capacity* of those involved to pursue policies rather than their *willingness* to do so" (1988: 176). The OSH-actors within enterprises are mostly safety officers and/or safety representatives. They are "weak players in capitalist enterprises" (Cutler & James 1996: 763), normally not in a position to decide about company goals and means. The motivation of senior executives and line managers seems to be a more important ingredient in the OSH-policy of firms; line management has to be responsible (Dawson *et.al.* 1998: 176).

According to this conclusion the Dawson case studies indicate that industrial structure is a major variable. The chemical industrial sector is a sector of large enterprises, which are fixed on location and have a hierarchical internal structure. In such situations, OSH-issues will be relatively easy embodied in company policy. The other sectors show a different industrial structure, which in the next paragraph will be demonstrated for the construction industry, a relatively risky sector with a high proportion of SME's.

The Construction Industry

According to a recent study the percentage of absenteeism in the Dutch construction industry shows a decline since 1990, but it is still considerable higher than the average (Korbijn 1996: 159): the construction industry is 'unhealthy'.

As Dawson *et.al.* stress (1988: 176-179) two out of four cases in which self-regulation is not effective, are common in the construction industry:

- In small firms effective safety management may be inhibited,
- Subcontracting and self-employment weaken management control systems.

The issue of the safety caps provides a well-known example. Difficulties are experienced when convincing the workforce to wear their safety caps on construction sites or motivating them to carry out other preventive actions. More generally, it is hard to control the implementation of safety rules.

The OSH-problem in the construction industry is related to the organization of the building process (Korbijn 1996: 157-158). Many SME's participate in this process, while functions are strictly separated, and firms meet each other on construction sites in changing combinations. Hence, stable coalitions between firms are nearly formed and responsibilities remain separated, even if there is the will to do a safe and healthy job. And due to subcontracting there is no effective hierarchy on construction sites. This is seen especially on small and medium-sized sites: there is a positive relationship between size of site and obeying the safety helmet rule (Dawson *et.al.* 1988: 127).

The question now is: What can be done to improve the safety and health situation on construction sites? How can we cope with the construction industry's high number of firms, of which the majority is relatively small? In the next paragraph I argue for the covenant as a supplementary policy instrument.

Covenants as Policy Instrument

According to Dawson *et.al.* (1988: 268), if the limits of self-regulation are manifest, (more) enforcement will be needed to bring about the desired effect. But in my opinion a different policy instrument could be used: the *covenant* (Grondsma 1997). A covenant is a written and signed agreement between two agencies A and B, stating that agency B promises to bring about a specified policy goal on which both reached agreement, within a specified period of time. So, agency A does not dictate the behaviour of B, but appeals to B's own responsibility to do as promised.

Normally, covenants will be signed between central government and an industrial branch (Van der Ent, 1996). However, it will be impossible to determine a OSH-covenant between central government and all enterprises in the construction industry, given the characteristics of the industry. The best way to cope with this problem may be to make a 'two step covenant ladder': government and branch organizations in the construction industry make up the top step, and branch organization and (groups of) construction firms make up the lower one. At the top step there are covenants between government and branch organizations, at the lower step between branch organization and (groups of) construction firms. Thus, branch organizations in the construction industry have to play an important intermediating role (see also Wilthagen 1996), given the impossibility to take the OSH-stair 'two at a time'.

In the period 1989-1995 the Dutch government concluded covenants on OSH-matters in some industrial branches, under which the construction industry. Due to disappointing results, the recent trend is to put more bets on the horse of financial incentives to activate OSH-responsibilities. However, the path of the covenants will not be abandoned entirely (Van der Ent 1996: 520). The legal quality of the covenant is improved and new experiments can be carried out in the Netherlands.

Subsidies and Information

The Dawson case study indicated a significant relationship between the activities of CONIAC (the Construction Industry Advisory Committee, established 1978, Dawson *et.al.* 1988: 192-193) and the activities and policies of larger construction firms. It also showed that many smaller firms were more or less untouched (1988: 206). In line with this conclusion one can have serious doubt if a system of covenants alone, also in its best legal form, will be conclusive enough to improve the OSH-situation in the construction industry. Financial support may be necessary, especially to SME's.

We can distinguish two types of costs in OSH-matters: those of a 'hardware' kind and those of a 'software' kind. 'Hardware' costs, on the one hand, are costs made for special tools or robots. In other branches of industry hardware of this kind is a normal feature. In the construction industry such innovations nowadays are extending, because of its positive effect not only on safety and health but also on productivity. 'Software' investments, on the other hand, are (for instance) investments in communication, consultation and personnel training. They seem to generate no direct output, but research shows that the effect/cost-ratio for these costs can be bigger than one, depending on the way *immeasurable* effects are quantified. Most firms are unaware of this fact and they may be very surprised if indicated to it, as a Finnish project shows (Ahonen 1997).

But even if employers are aware of the positive effects to their firm, there still is a problem: the free market of Adam Smith does not work well in OSH-matters. Many improvements

have positive *external* effects: they not only have positive (financial) effects for the employer and for (the well-being of) his employees, but have also positive effects on people outside the firm. Therefore, the benefits of many OSH-improvements will not be fully incorporated in the economic calculation of the employer, as was stressed also on the European Conference on Costs and Benefits of Occupational Safety and Health 1997, Scheveningen, and investments of (above all) a software type will be much too low from a social welfare point of view (De Koning *et.al.* 1996: 71-74: Van den Doel and Van Velthoven 1993: 34-36, 90-91).

Financial compensation can be a good way to cope with this problem. This holds especially for SME's, because in these enterprises improvement costs are relatively high compared to overall production costs. A promising example of such financial compensation is the Dutch plan to fiscally stimulate SME's if they make investments to reduce noise pollution and to improve operating with toxic materials (Opening Speech by the Secretary of State of Social Affairs and Employment, F.H.G. de Grave, on the Conference, May 28, 1997, Scheveningen/The Hague). Instruments like this bring micro-costs, the cost on firm level, nearer to macro-benefits, the benefits for society as a whole.

As the Finnish project shows, it is important to give enough information about the benefits of OSH-improvements. The Construction Chart Book of the USA Centre for Protect Workers' Rights (CPWR 1997) is an interesting example, for employers *and* for employees. For, employees are often not aware of the dangers they are exposed to (De Jong, 1996).

Conclusions

If self-regulation does not work well, government has a couple of choices. On the one hand it can strengthen the regulation and sharpen the control mechanism. However, the 'regulation costs' of such a system to society are high. On the other hand it can appeal more to the responsibility of private firms by a system as advocated in this paper, which is a combination of de-regulation and self-binding, supported by subsidies and information campaigns. This option will be cheaper than the first one. Therefore, it is an effective governmental strategy, being worth its costs.

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Costs and Benefits The French point of view through Occupational Medicine

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Introduction

Scope of the problem

During the last election campaign (1997) in France, Former Prime Minister Edward Balladur said: "France has the second highest expenditure on health protection in the world., yet it is far to be in the second position in so far as health and well being of the population are concerned"; "there is a problem of efficiency". He added. Cost/Efficiency in the management of the public institutions has been of the major theme of the campaign.

It is not the purpose of this paper to deal with this rather broad issue. But the same problematic affects the field occupational health and safety (OHS) This paper addresses the roots of the problem from the side of occupational medicine. It looks at the opportunities for change under the European legislation influence. It draws on literature on the debate following the implementation of the European Framework Directive (E.C, 1989) and on a survey on the subject conducted via the Préventique-Sécurité review.

A number of institutions and groups with strong legal, historical and institutional backing are involved in the field of OHS: the Labour Inspectorate (LI), the Social Security Funds (SSF), the Occupational Medicine (OM) and the Health and Safety and Working Conditions Committees. (HSWCC) In-house OHS departments and the appointment of OHS specialists is left at the discretion of the employer. But most large and medium sized companies do have such structures in one form or another.

However, OM is regarded as the keystone of the French OHS framework. Any change may only be envisaged from this particular side.

It is inevitable to look at the problem from the European perspective, but there are some important observations which need to be expressed before indulging in such an exercise.

Background elements

Harmonization in Europe has now been a subject of debate for more than ten years. But talks and discussions on comparisons of management models in the various dimensions of the social and economic spheres are still going on. The main management models related to OHS under discussion are the Anglo Saxon, the German and the French. None of them has achieved miracles in the prevention of occupational accidents and diseases and therefore none can claim supremacy over the others.

It is true that harmonization cannot be forced overnight upon any country as there are more urgent local economic and social problems to be solved. Nevertheless, the ingredients of it are already present: greater freedom of movement of goods, people and information

together with ease and speed of communication. These ingredients are pushing countries to review their management policies in every single sector both for compatibility and running costs purposes. The deeper, in the political, cultural and organisational structure of the country, the model has its roots, the greater the pressure needed to envisage any modification, be it improvement.

- The French model of prevention of occupational accidents and diseases has been developed on the basis of the social model of the late 19 th. century. It is still very much influenced by individualism as reflected by the employer's duty and the functioning of OM together with the compensation framework, for examples (Seillan 1981).
- Compared to Germany and Britain, France is a very regulated country (Kessler 1995). The roles and missions of institutions and bodies are specified in Law. This is the important characteristic of the French administration and civil service.
- The employers' duties in connexion with OHS are a sum of heterogeneous statutory provisions lacking principles (Seillan op.cit). These provisions place the worker in a situation of an object rather than an actor and at the same time remained non effective in terms of dissuasion until lately.
- The workers' participation and role are peripheral, even after the CHSCT (HSWCC) Law of 1982 (Chaabane 1985).
- Institutions of experts like occupational medicine and the regional arms of the SSF, have been, since their creation in the late 1940ies, functioning rather remote from the decision centres and the workplace. They have not envisaged their role in the sense of cost-advantage. (Chaabane op.cit.).
- The whole framework is under the supervision and control of the L. I. But there again, lack of efficiency has characterised their role mainly because the functioning of the institution is more administrative and individualistic. (Chaabane op.cit).

The role of OM in France

Legal Framework

Occupational medicine was introduced and regulated by the Law of 11 October 1946. Subsequent legislation on OM was concerned with its extension to cover all types of professional activities and by 1952, it became compulsory to provide a service in all industrial and commercial activities. Transport activities were included in 1955. Collieries and Quarries in 1959, agriculture in 1966, domestic work such as janitor of public building, warders and house keepers in 1971 and part time labour in 1972.

Provisions of the Law of 1946 have been modified by the Law of 20th. March 1979, but only with some change in the role of the occupational physician. Both Laws are codified in the current Code of Labour. In the first Law 25 articles out of 31 (80%) are devoted to the organisational and administrative issues of OM structure and services and in the second,

40 out of 58 (70%). Between the two and up to now there are official Memoranda issued from the Ministry of Labour and are mainly explanations and recommendation related to points in the laws.

One of these Memoranda (13 June 1969) recommended the OP to spend one third of his on prevention and on activities on the workplace. It specified the content of the activity in the following way: "a study of the workplace" and "analysis of dangers relevant to the activity of the undertaking he is in charge of". This recommendation became statutory through in the Law of 1979.

It is legitimate to say that the OP is theoretically required to be involved with all aspects of occupational accidents and occupational diseases and welfare. He is therefore not only required to deal with the clinical aspects but also with all the aspects of the workplace. The training of the OP incorporates occupational hygiene to such an extent that no independent professional group exists under that name.

The points made so far indicate that the OP is very strongly entrenched in the HS field and give indication as to why the OM is regarded as the keystone of OHS system in France.

Organisation of occupational medicine

The organisation of OM is a complicated system as reflected by the number of articles devoted to it in the legislation as mentioned above. This section is only meant to give an idea with some emphasis on the input, the OP may have on the undertaking. An idea on this input will help to assess effectiveness.

The form of the OM service is a function of the time that any undertaking can employ an OP and is set out according to a specified rule (Art. R241.32 of Code of Labour):

"The time allowed for a physician to accomplish his mission is fixed at 1 hr./month for:
- *every 20 employees (office work etc. . .)*
- *every 15 shop floor workers*
- *every 10 workers who are under special medical supervision because of their working conditions"*

The law specifies that beyond 173 hrs/month, the undertaking must establish its own OM service, called autonomous OM service. When the workload is less than 20 hrs/month, the undertaking must join an inter undertaking OM service. Between the two limits, the employer can choose between the two forms.

There are 1435 occupational services, 422 are inter-undertaking services and 1013 are autonomous. However, the total number of employees is 12 464 485 and 91% of them are covered by the inter-undertaking OM services. Every OP is in charge of 300 to 400 undertakings in which he is in charge of up to 2772 employees (Travail & sécurité 1996). Large companies have several plants sited in various places and therefore an autonomous OM service is in reality an inter-plant OM service with the difference that it is run by the company

and the OP is an employee of the company. This form has some negative implications; they are beyond this scope.

We have analysed elsewhere (Chaabane 1984) the tasks allocated to the OP, notably an annual routine medical examination of all employees and the resources available to him in terms of time, training, competence and manpower and we have demonstrated that it is physically impossible to meet the demands. We suggested that the "tiers temps" is most frequently subordinated to the more familiar role of medical examination.

The figures mentioned above confirm the conclusions we arrived at then. They even show a worse situation as the total number of employees has increased from 10.000.000 in 1975 to 12464 485 in 1995. At the same time OM services have decreased from 2908 to 1435 and the proportion of the inter-undertaking services increases each year. Greater ones absorb smaller ones which have financial functioning difficulties. The undertakings are grouped in geographical sectors to reduce travelling time and expenses and not according to the nature of the activities therefore the OM service and the OPs cannot afford to specialise in one particular activity in order to offer package solutions to similar problems although this can only be partial because of undertaking specificity in terms of proper policy and organisation.

The actual input of the OP and hence that of the OM service towards the undertaking can only be limited.

Cost effectiveness

In this section we look at the problem from the financial input of the undertaking towards the OM service. In France, the rate of the wage costs is 45% including overheads which is too high compared to 10.2% in UK for example.

The contributions which go towards financing OM services are calculated either on a flat basis or as a percentage of the total salaries paid by the undertaking. In both cases the rate varies from one geographical region to another as a function of the running costs of inter-undertaking OM services. They are also specified through the Ministry of Labour Memorandum of the 20th June 1966. The memorandum specifies that the rate is meant to cover the expenses and provide resources sufficient to meet the statutory mission of the OM service. The expenditure will include the OPs salaries, that of the medical and related services manpower and general maintenance services. Clearly the specifications in this memorandum are based on the statutory role of the OP and the statutory organisation of the OM. Lack of transparency on this issue (see coming sections) makes it difficult to give exact figures on this point. A rough idea may be gained from Rochaix (1989). He gives a figure of the equivalent of 150 to 300 \$/employee/month. Complementary medical examinations, when needed, are paid for in extra.

This situation supports the idea that the OM services have a uniform relationship with undertakings irrespective of the nature of the activity of the undertaking and its size. A more or less similar situation has been pointed to in connection with the role of the LI, the SSF and the HSWCC (see chaabane 1985 op.cit).

To date no proposal has been made on estimating the effectiveness of these institutions and bodies in in-plant OHS. The only criteria used are still the accident frequency and severity rates (an injury serious enough to allow more than 24 hrs lost time, or some permanent disablement or death), derived from the SSFs definitions. Furthermore, the question as to whose contribution (OM; LI; SSF; HSWCC or private consultancies) would a reduction in one of these rates be attributable still remains put.

The performance of the O M services seems to be appreciated through the comparison of the resources available with the activities carried out in terms of statistics on items such as the number of medical examinations and visits to the undertakings. The implications go in the sense that both defenders and critics of the OM agree that this system has no measurable impact on injuries and illnesses in the work place. This is, in no way, to deny the efforts and progress achieved by OM in the field of OHS as a whole. But undertakings would need to be convinced that the financial contributions they make are allocated in the most effective way. The question is how much effort is needed to improve the system in this direction.

The futur of OM

This part of the paper reports on a study in Préventique-Sécurité Review.

First, it is apposite to indicate that France transposed the Directive by the Law of 31st December 1991, but the law remained silent on the question of occupational medicine. The government believes that the French legislation on this topic satisfied the requirements of the Directive. This position was admitted by the EU Commission at the time, but it soon became subject to major critics. The French government expects the different partners to come up with an agreed platform on which to base its further intervention (Seillan 1995). The situation is still under debate.

Preliminary observations from the survey:

- The survey was a simple call for papers addressed to the main bodies concerned with OHS, with the object to contribute to the debate on the futur role of the OP and the organisation of the OM in the light of the European legislation. The only unifying rule was that the contribution should be within the context of the requirement of Article 7 of the European Directive (E.C.1989).
- Contributions came from all the partners in the field of OHS, either as representatives of institutions or bodies. OPs expressed their views as individuals and on behalf of the OM they belong to. A distinction will be made accordingly and justified when possible. The respondents are presented under the French abbreviation with English translation.
 - **NPF:** The National Council of the French Employers
 - **The Trade Unions:** **FO** Work Force **CFTC** French Confederation of Christian Workers
CFDT French Confederation Of Workers
CGT Genral Confederation of Workers

GIT Association of Occupational Nurses
MTI Occup.Phys. in Inter-Undert.Service
MTA Occup.Phys. in Autonomous Service

- Key issues and key expressions are systematically recorded from the texts. The issues are presented and a selection of statements is translated and reported in the text according to the arguments flow.

There is a common agreement on a list of issues which were regarded as important in connexion with the subject and on which the contributions were structured and views expressed often backed up with evidence. These are given below: The abbreviations are merely introduced to be referred to in the remains text.

Role of OM within European Framework (EF)
 Need of Coordination (NC)
 Cost-Effectiveness (CE)
 Need for Change (NFC)
 Role of OM in Small & Medium sized Undertakings (SMU)
 Training and Competence (TC)
 Tiers Temps (TT)
 Deficit in Manpower (DM).

The list is not in any ranking order or priority. Although the way we put it would reflect two separate levels, an institutional and organisational level to analyse EF, NC, CE, and an internal level looking inside the functioning of the OM and at the role of the OP. NFC would concern both levels. Accordingly, each level would require a proper approach. We will only extract information from each level and concentrate on the principle ideas sticking to the spirit of the paper as set out and highlighting major agreements and differences in positions and views of the respondents.

- TT, TC and DM, are issues we have referred to in the previous section. The same critics as the conclusions we mentioned earlier are addressed to OM on this ground from all the respondents. There is no need to pursue the analysis further. The TT formula seems to offer a solution to the Directive requirement (see coming section); Partners stick to the lengthy training of OPs with no major modifications in its content. The DM is evaluated to be 600 OPs. The general practitioner role and that of the OP remain in excessive compartmentalisation. SMU represent 93% of the undertakings in France with 91% of the work force covered by inter-undertaking OM services and where the issues (TT, TC, DM) are most deficient.
- EF and OE are issues which are evoked simultaneously to justify NFC. A typical observation from the OPs themselves reads like this: "The originality of the French system within Europe puts us in an awkward position and its efficiency with regard to the costs it engenders is often criticized".

Attitudes to change

All the partners recognised the issues at stake in connection with Europe. It is interesting to note the fact some expressions on this point show a definite will to change. More important is that these positions are held by the OPs themselves. Examples of these positions are: "Any institution which does not change, and does not accept reforms is in danger" wrote Pr. Pujol Head of the Regional Institute for Occupational Health. Trela (OP) wrote his contribution under the title "The Inter-undertaking OM: Realities, Stakes and Perspectives".

It is interesting to note that the expression "Santé au Travail" is being introduced in the OHS terminology in France. It is now used in the academic world. The CNPF and the OPs used the expression in their articles at one time or another referring to it as a new approach. A situation which may be interpreted as a relative preparedness to change. The expression is the exact literal translation of Occupational Health. As to the meaning of the concept and its translation in practice, except for the academic world, it is subject to prevarication. An OP from an autonomous OM service of a large national company wrote: "The question of the policy of health in the undertaking must be analysed, discussed and specified" The CNPF wrote "The French system of occupational health relies nearly exclusively on the OPs. Without being incompatible with the Directive, this organisation very specifically French might not fit perfectly the technical provisions of the European legislation." The trade unions did not use the expression "Santé au Travail", although their demands fit in the concept.

- The trade unions expressed a feeling of fear from harmonization to such an extent that they make an apparent tacit coalition reflecting a rather similar position. They all placed themselves as defenders of the French OM system and of the OPs demanding more resources for the OPs. The following expression from CGT speaks for itself "If the French OM system is not for sale, if it does not need to be exported, it gains to be known" CGT adds "the recent necessary harmonization is an excuse to reform it". The CFDT said: "It would be a pity that the implementation of the EU Directive leads to devaluing the OM in France" This situation makes the CNPF in a rather comfortable position. The overall impression is that of **calling** Occupational Medicine occupational health, maintaining its principles and introducing improvements at its organisational and functioning level.

The ideas put forward so far seem to fit in a general problematic which links back with the elements set out at the beginning of this paper and which Edward Balladur summarised in the following question "Can we be a greater nation from the point of view of Economics and at the same time save our social model to which we are attached". The problem with OM is that the evidence and figures given in the first section do not reflect the spirit of the social model except from the fact that it is statutory and theoretically covers all the work force with no exception.

Multidisciplinary and need for coordination

Multidisciplinary and coordination between actors are well respected principles in OHS. Multidisciplinary as a concept is known in the trainings of OHS experts in Universities since their inception in 1972 (Dog Santos et al., 1995). The fact that it is mentioned and

associated with coordination in the professional domain is a further sign of the interpretation of the concept of occupational health.

However the CNPF gives it yet another meaning with the object of futur organisation of OM and the role of the OP. In its evidence to the High Concil of Occupational Risks Prevention (CSPRP), the CNPF came up with a proposal based on the principle of "improving the system without further costs" (CNPF 1995). The elements of the proposal are

- A. The OPs may be assisted in their tasks on the work place by what the CNPF called Work Place Health Assistants (Assistant de Santé en Milieu d u Travail ASMT).
- B. The time for the workload of the ASMTs is taken off the statutory time allocated to the OP, precisely from the TT. Suggesting that the principle of t h e TT as described earlier will remain but reduced in time according to the needs of the ASMTs In principle the time of the TT can be reduced from 1 / 3 to 1/4 and not any further.
- C. The decision to call in one or several ASMTs remains within the employer's competence according to the Op's advice.
- D. The OPs on the other hand will be required to take in charge more employees to compensate for the time allocated to the ASMT.
- E. The ASMTs will work under the control and supervision of the OP.

Considering the critics addressed to OM, the OPs seem to hung onto this frame. Some of inter-undertaking services (in Toulouse for example) have recruited OHS professionals In Toulouse a Regional Institute for Occupational Health (a sort of a network) was also created and is adopting the multidisciplinary approach. It looks as if it is taking the lead and several other OPs have referred to it in their contributions. Nonetheless Pujol (op.cit) from Toulouse remains radically opposite to the idea of taking the time of ASMT off the TT. He said: "It is the very type of ideas which are falsely dangerous. It is an unrealistic solution based on an error in jugement a n d which will go against the goal it seeks to achieve".

Surprisingly enough, the trade unions seem to look at the the proposal from a rather positive side. Their only fear is the posibility of transfer of OHS responsibility from the employer onto the OP; a situation which is legally impossible. The fear comes from a misinterpretation of Article 7 of the Directive. FO said clearly : " the OP cannot be designated by the employe to look after the problems of safety of the employees in the establishment a s defined by Article 7 of the Directive".

The reason we did not ention the GIT so far, is that they only expressed themselves on this particular point. In fact they reacted vigourously to the idea of the CNPF looking for ASMTs in the domains of "noise, industrial hygiene, epidemiology, physical and chemical work place environmment monitoring, without due consideration of the occupational nurses. They dug out articles R241.35 and R 241.36 of the Code of Labour to remind everybody of their statute arguinf that the role of the ASMT is, no more no less, theirs as may be gathered from the following expression: " the GIT whishes to express its astonishment and concern. It draws

the attention to the fact that there already exists, and by law, an assistant of the OP in all his activities in the undertaking: this is the occupational nurse".

Discussion & Conclusion

The situation is still in progress, the implementation of the CNPF proposal is at the beginning of its implementation and therefore no definite conclusion could be made. Single issues have been discussed as the text progressed. We will recall the main ideas and point to some factors which may accelerate the process hopefully in parallel directions.

The description and analysis conducted through this paper highlights signs of progress in the approach of OHS and in the breadth of its scope. The need for coordination, an issue pointed out by all the parties concerned, gives further indication in this sense. Every party seems to realise that the picture of super abundance of specialist manpower and institutions in this field is only a n apparent one and none of the actors, even the OPs, has the right expertise, time and influence to make more than superficial contribution to prevention. The context of rivalry in which Chaabane (op. cit) conducted his study ten years ago has somewhat disappeared.

We will deliberately call the proposal of the CNPF a technical solution as in its present state, it is influenced by immediate financial factors and lacks strategy. The details description of the allocation of time to the ASMT is an example which gives it the image of digging the same whole (OM) deeper. Although lack of financial resources limited investment in parallel directions, other factors will, in future, improve the tool (the approach) and suggest other areas excavation.

- The list of scientific backgrounds from which the ASMT may be chosen demonstrates the breadth of the field. Some respondents extended to other domains and others cut down. This is yet another sign of prevarication on the types of professional needed. Coordination between actors on one hand and coordination the ASMT and the OP will raise fundamental questions which will need further definitions and specifications from the legislator as it is the tradition in France.
- Through these issues, the partners will come to realise that not because the OP is statutorily well established in the undertaking that he can easily become an OHS expert from the point of view of occupational health as opposed to occupational medicine.
- The boundaries between occupational health, health in general and well being tend to disappear and the general practitioners will soon have a more important role to play in connection with work place.
- The work place itself has changing shape and conditions because of automation, telematics, distance work, contract work, and part-time work. In addition collective risks are much more important than individual risks. The concept of OM itself is bound to change under these conditions.

The French OM system is under the microscope for efficiency and costs diagnosis. First medicines are being administered but these are only first-aid. Much more care is needed for a better state of OHS.

The situation is in such an evolution that it will break through the rigidity of the legal frame to face reality. The reality there is a tendency to move towards liberalism even more and competitiveness will penetrate the restricted domain of OM under the influence of other European models. The field of OM expertise can, in future, be invested by OPs as well as equivalent experts from other European countries. The French OPs are well aware of this danger as expressed here: "Our speciality develops and will develop under the influence of the international legislation (especially the European) and also under the pressure, on the market of occupational, of actors probably more aggressive than the OPs". The paper leaves the question of costs more or less open. However voices are expressed from different bodies and in rather vigorous terms. Examples of which are: "in order to create a climate of confidence between the social partners, the CFDT calls for an operation of truth on the financial situation of the OM services".

Interest on this issue is also shown at the European level, similar comments and observations to those made in the cost-effectiveness section above appear in Cartier et al (1996). This report of the European Foundation highlights weaknesses of the French OHS finance scheme and suggests a pilot incentive model. The model is under test and does not seem to occupy literature so far.

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Economic motivation for the prevention of industrial accidents, work-related diseases and environmental damage

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When making cost/benefit analyses for occupational safety and health, regardless of whether they are based on the costs of accidents and work-related diseases or, inversely, on the costs of uninterrupted working hours, a question that always recurs is which costs are to be allocated to occupational safety and health and which costs to other items, e.g. environmental protection.

For some items, this is quite clear. Occupational safety and health costs include the costs of safety and health department personnel, such as safety experts, safety engineers, company doctors and external safety experts, participation in intercompany industrial medicine services, etc. They also include the employer's liability insurance premiums (the contribution to industrial accident insurance), the costs of personal protection equipment and various types of costs and losses that directly or indirectly ensue from industrial accidents and occupational diseases.

Cost allocation is not as easy with respect to technical and other occupational safety and health measures. Sometimes there is no problem, sometimes the situation is more complicated. For instance:

- Air polluted by dust or chemical pollutants must be extracted from the workplace, which is an occupational safety and health measure. The subsequent purification of the air, however, is an environmental protection measure. In this case, cost allocation is still relatively unequivocal.
- An outdated system or machine is replaced by a new, modern one to increase production capacity. Working conditions with the new system or machine are better - a welcome additional effect. Should part of the purchase costs be charged to occupational health and safety? If so, how much?
- Directive 82/501/EEC/SEVESO and similar directives and international agreements stipulate a number of measures to prevent large-scale industrial disasters. These measures involve occupational safety and health, but are also to a large extent related to protection of the company's environment and the environment as a whole. Where do we draw the line?

In some concrete calculations an answer is relatively easy to find. We could assume, for instance, that the costs of occupational safety and health only include items regarding which there are no doubts, although it should be accepted that this conclusion will not be entirely correct.

In many cases, it will be possible to add up the costs of occupational safety and health and those of environmental protection. But that does not solve the problem either.

So much for those questions, and now back to the main subject of this lecture. The costs incurred by a company due to accidents, occupational diseases and environmental damage should encourage measures to prevent them, even if only for economic reasons.

The State also exerts a certain economic pressure where occupational safety and health and environmental protection are concerned. But the State's duties in this respect are so complex - the State being, above all, legislator and inspector - that they cannot be discussed in detail in this lecture.

The State cannot and should not do everything. Systems of economic motivation that do not directly depend on the State should also be used to good effect.

In order to be effective, economic incentives should meet the following requirements:

- those who produce must take responsibility for the foreseeable consequences (the "polluter pays principle").
- the creation of proper working conditions and the implementation of environmental protection measures should, financially speaking, be more beneficial - at least in the long term - than compensation of the results in the event of neglect.
- the main emphasis of motivation should be on prevention.

Conclusion

Proper working conditions and sound environmental protection should be more beneficial to companies and other economic partners than neglect and omissions that may lead to damage in the workplace or in the environment. Economic incentives should ensure that the general public does not suffer from the actions of a handful of inconsiderate polluters.

Implementation of the - basically correct - idea of linking the system for occupational safety and health with that of environmental protection is, unfortunately, not as easy as it might seem. There are only a few overlaps and these are most likely to be found in measures for keeping the air clean and in the prevention of industrial disasters. This not only refers to world-famous incidents like Seveso, Bhopal and Chernobyl, but also incidents with only a local effect.

Our institute has formulated a number of proposals for economic incentives for occupational safety and health and environmental protection. One of these proposals concerns accident insurance.

Accident insurance with graduated premiums as it exists in many countries - which covers costs ensuing from accidents and occupational diseases - should be extended with an additional element. The amount of the premium should also be affected by the number, i.e. the percentage, of employees who have to work under conditions that do not meet hygienic standards. Here, too, the premiums should be graduated according to the type of risk factors, the extent to which the standards are exceeded, etc.

We realize that this is not a panacea. Only quantifiable factors such as noise, dust, pollutants, temperature, radiation, etc., can affect the amount of the premium. Non-quantifiable factors such as job-related stress, poor work climate, etc., which no doubt also have a negative effect, cannot be included in this system.

The company responsible for the damage should not only bear the costs resulting from accidents, occupational diseases and working conditions that do not meet hygiene standards, but also the costs for removal of soil and water pollution. If remediation is not possible, the company should pay a multiple of the lost economic benefit, e.g. a multiple of the value

of the year's crop. This is the basis for the second proposal: statutory risk insurance or, in other words, environmental insurance. This insurance should be graduated in accordance with the extent of environmental risk. For production with a high environmental impact or high risks for the environment, this might mean that the insurance premium would be so high that closure of the production site is preferred, or that such a plant is not built at all. Of course, such companies could move their production to countries with less strict conditions, e.g. developing countries, where the wage level will also be lower, but it is just a matter of time; sooner or later, all countries will have to adopt international conditions and requirements.

Another possibility is to impose levies and taxes for pollution of air, water and soil. This option is already implemented in a number of countries, although the amounts are usually not commensurate with the extent of the damage. These levies should increase progressively when standards are transgressed, not only with respect to the degree of pollution, but also with respect to the duration of the harmful effect. Environmental protection should be comprehensive; concentration on isolated elements cannot yield optimal results. The above-mentioned levies should lead to "dirty" technologies being replaced by "clean" ones.

The systems of accident insurance and "environmental insurance" should, in the future, be interconnected. This will certainly not be an easy task, for accident insurance is based on structures that have a history of over one hundred years in some countries (Germany, Austria). It is, however, not an inconceivable task either.

I would like to make one final remark. This entire concept also has a social-ethical element. As mentioned before, those who produce must take responsibility for the foreseeable consequences, both in occupational safety and health and in environmental protection. But companies often act with intentional neglect of measures with a view to making the highest possible profit. So people can either listen to their conscience or deliberately ignore it. But everyone must ultimately account for their decision - towards themselves, their environment and even God.

Summary

The workplace can be considered as part of the environment as a whole. The State plays an important role as legislator and inspector for occupational safety and health in the prevention of accidents and work-related diseases, and for environmental protection in the prevention of diseases related to air, water and soil pollution.

The State cannot and should not do everything. Systems of economic motivation that do not directly depend on the State should also be used to good effect.

In order to be effective, economic incentives should meet the following requirements:

- those who produce must take responsibility for the foreseeable consequences (the "polluter pays principle").
- the creation of proper working conditions and the implementation of environmental protection measures should, financially speaking, be more beneficial - at least in the long term - than compensation of the results in the event of neglect.
- the main emphasis of motivation should be on prevention.

In this respect, the Bratislava Institute has prepared some proposals on, for instance, accident insurance.

The entire concept also has an important social-ethical element.

Economic Incentives for the Improvement of the Working Environment in Europe -A Multi-Media Presentation on CD-ROM

H. Litske

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The project was presented by the team of authors:

Kirsten Jørgensen Head of Department, Danish Working Environment Service.

Christian Koch, Assistant Professor, Technical University of Denmark.

Prof. Dr Wolfgang Krüger, Dean of the Faculty of Safety Engineering at the University of Wuppertal, Germany.

Henrik Litske, Economist and Research Manager at the European Foundation for the Improvement of Living and Working Conditions, Dublin, Ireland.

Steve Bailey, Occupational Health Consultant, United Kingdom.

Dominique Le Page, Engineer, Eurogip, Paris, France.

The views and comments at the Coordination Group were also presented.

Mr. R Waeyaert NCMV, De Organisatie voor Zelfstandige Ondernemers, Belgium

Mr. M Sapir, European Trade Union Bureau for Health and Safety, Belgium

Mr. M. Heselmans, Ministerie van Tewerkstelling en Arbeid, Belgium

Prof. D. Koradecka, Central Institute of Labour Protection, Poland,

Also,

Jens Svensson of OSHA, U.S.A., made a presentation on the topic, as well as Kari Häkkinen of Industrial Insurance in Finland.

After three years of development, the European Foundation for the Improvement of Living and Working Conditions has come forward with a new way to support and encourage employers to invest in Health and Safety. This new approach, involving economic incentives, has recently been tested successfully in France. A multimedia CD-ROM format was presented. It provides an insight into the proposed methodology and makes various suggestions as to how it might be used, for the consideration of governmental bodies and social partners, and insurance bodies.

Background

The direct costs of occupational accidents and diseases in the EU were for the year 1992 estimated at ECU 27 billion. However, this figure represents only the tip of the iceberg. The indirect costs are much higher. Many of the costs are paid by the public sector and employees rather than the companies. Past preventive measures have included legislation, control, information and training. Such preventive tools are both useful and can be further developed and improved in the future. However, if a real visible reduction in the injury rates

is to be achieved, it is necessary to develop new instruments which can support the companies planning and design processes in a positive way. "Economic incentives" is such a tool.

International working group

Against this background the European Foundation for the Improvement of Living and Working Conditions (the Foundation) established a multi-disciplinary working group in 1993 with the aim of preparing the ground for the development of new innovative economic incentive schemes to operate within the Framework of compulsory industrial injury insurance. The work was guided by a Steering Group of government, employer and trade union representatives and the European Commission.

International comparison

The first report was an extensive catalogue of the major economic incentive systems in operation internationally (see Reference 1). Advantages and disadvantages of these different systems were analyzed and discussed and the conclusions summarized in a booklet (Reference 2). Knowledge and experience were extended further through a seminar with Eastern Europe in October 1994 held in Warsaw. Interesting new models are being developed there (Reference 3).

Most of the existing economic incentive systems typically work within industrial injury insurance. If companies reduce their accident rates they are being rewarded through a reduction in the premiums. Most of the existing systems are based on history rather than the actual working conditions. Therefore the preventive achievements can be questionable.

There is also a potential problem in that some of these existing systems may encourage companies not to report accidents and diseases and so undermine the national monitoring systems. This type of premium graduation (called "experience rating") uses incentives which often work only in relation to accidents: many categories of occupational disease develop over years and it is not possible to identify which workplace environment caused the disease. Small and medium sized enterprises are often disadvantaged by experience rating: for them, statistical fluctuations in the rates of accidents and the severity can be very costly.

It is for these reasons that a new, forward looking approach is needed. The Foundation recently published a report which proposes incentive mechanisms which have none of the disadvantages described above. The report, "An Innovative Economic Incentive Model for Improvement of the Working Environment in Europe", has been written by Stephen Bailey, Kirsten Jørgensen, Christian Koch, Wolfgang Krüger and Henrik Litske (Reference 4).

Premium graduation

In the new approach, the premium graduation is based on the calculation of both existing and future risks. In other words, it is proactive in nature. The basic idea would be to assign each enterprise a gross premium and then offer possibilities of a premium reduction or bonus. The premium could be composed of three elements to reflect base, sector and work function aspects of the working environment.

The highest level - the gross premium - would be assigned to enterprises operating close to the minimum requirements of health and safety legislation. Bonuses are then awarded to enterprises operating to higher standards.

The bonus system could comprise three sub-bonuses: general, specified and individual sub-bonuses. A general sub-bonus would be given to enterprises when they have improved health and safety, and would be awarded by the responsible organisation without a special application by the enterprise. Specified bonuses would be centrally designed to address recognised health and safety problems in a sector and would be awarded upon application. Individual bonuses would be given upon application to enterprises with individual problems, who co-operate to develop novel solutions.

A major consideration behind this proposal is the diversity of enterprises. It is necessary to consider differences between sectors and sizes of enterprises, differences in technology and in the corporate culture of the organisations. In part, the sub-bonus system addresses these different needs. Additionally, a special programme is proposed for small and medium-sized enterprises.

Documentation and evaluation routines necessary for the operation of the new incentive approach are detailed in the report. Information on causes of known and future risks must be collated from several sources. Information on the consequences of accidents or exposures, the workforce, the enterprises and the actual work are all necessary components.

Options for the organisation of the body responsible for the incentives are described. A monopoly organisation is a pre-condition. It could be public, semi-public, private or a mixture of the three. Key criteria are the effectiveness of administration, including how visits are prioritized and the procedures for complaints and appeals.

Throughout the report, the necessary flexibility across national systems is emphasized. The incentives could be implemented in a number of different ways and embedded in different organisations.

In the final chapter, practical issues concerning the implementation of the proposals are discussed.

Testing

No idea can be deemed successful until tested. To do this, the Foundation established a close co-operation with the French social security system, CNAMTS, in order to compare the new approach with the French system.

It is intended to use the feed-back from the French testing to further improve and fine tune the approach.

The experiences from the testing, which could be useful to those in the process of establishing or improving economic incentive schemes have been published (Reference 5).

At the workshop Dominique Le Page of Eurogip presented the conclusions:

"The Model proposed by the Foundation is in certain ways similar to the French system. It can be concluded that, although this is a model which could be considered as ideal, it could also be applied in practice. The Model is sufficiently open and flexible, because it is described in terms of objectives and not by a closed system in which everything has already been planned. This should enable various scenarios.

Creating a new system:

In a start-up stage, the Foundation Model provides the groundwork for a system in which prevention and efforts are the foundation for pricing.

Improving an existing system:

When a system already exists, with its history and hence its past and its shortcomings, areas for development or modification may be found.

The main problem posed for a system which already has a certain history is the financial burden of the past. In a country such as France, this burden accounts for 60% of expenditures in a year, and it must therefore be paid by enterprises today applying coefficients which enable the burden to be spread universally."

Implementation

The Foundation's aim is to provide guidelines for those wishing to improve the working environment. The ideas need to be adapted to national traditions and structures before they can be implemented.

Some of the ideas are technical. To help understand, the Foundation is therefore experimenting with a multi-media presentation on CD-ROM.

The Future

The Foundation would like to encourage policy makers and insurance bodies to consider these proposals or to test the ideas as was done in France. The Foundation would also welcome feedback from organisations who consider the proposed approach.

The Foundation is continuing its work on economic incentives. The focus will be on the development and promotion of more holistic and better co-ordinated approaches to the uses of economic and fiscal instruments aimed at improving the working environment as well as the external environment.

The CD ROM

The CD ROM makes it possible to gain insight into the Foundation's work on Economic Incentives in an interactive way in sound, graphic illustrations, moving and still pictures and text.

From the main menu you can choose a video-based "Introduction" to the topic.

Under the heading "Foundation Profile" you can retrieve information about the role of the Foundation and advice on how to obtain specific information.

In the category "Project Design" a summary of the project and its various stages is given. "Background" in the menu provides information on the need for economic incentives. Statistics on Accidents and Diseases in Europe is provided as well as data on Work-related health problems in Europe. "Existing Systems": contains a catalogue with a description of economic incentives' schemes in operation in Europe and elsewhere. "Foundation Proposal": - This is the key part of the CD ROM. A new forward looking approach to the issue of economic incentives is provided. "Testing": The approach has been tested in the French social security system.

“Debate”: The suggestions have been discussed at various conferences. Some of the views expressed are reported here. “Steering Group and Authors”: Through the video you will get to know the authors and the views of the social partners and governments.

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- 2 Economic Incentives to Improve the Working Environment - Summary and conclusions of an international study, European Foundation for the Improvement of Living and Working Conditions, Dublin 1994. ISBN 92-826-7685-4. Available in all official European languages of the European Union.
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All Foundation publications can be obtained through the national outlets of the Office of Official Publications of the European Union, 2 rue Mercier, L-2985 Luxembourg, tel: +352-29 29-1, fax: +352-48 85 73.

4 Impact on business, the productivity of working conditions

Introduction

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The impact of improving safety and health at work on the competitive power of companies seems to be at the heart of many discussions. Both at the company level and at the national level the economic return of any action to improve safety and health at work gets much attention.

This chapter explores both the macro or (inter)national and the micro or company perspective. At the national level it is often argued that better working conditions requires extra effort and investments and will give rise to higher production costs. The point of view of many professionals is that good working conditions are an asset to individual companies. Better occupational safety and health are believed to increase the competitive power of companies. In this respect cost-benefit analysis also includes strategic indicators like innovation and flexibility.

It proves to be hard to get clear indications of the benefits. The benefits most often mentioned are improved health and less fatalities (resulting in less absenteeism or early retirements), less damages and production losses from accidents and increased productivity. Various studies at the national level, however, demonstrate that assessing the benefits of preventive action and regulations is difficult. Direct financial benefits, such as less hospitalisation or the value of output losses can generally be estimated. Quantification of value of (healthy) human life are often heavily disputed as various approaches give different results. Productivity gains are hard to quantify and are therefore estimated very roughly or left out of economic assessments. Studies and analyses at the company or sector level tend to be more precise in terms of defining productivity, but there are still many problems in accounting the benefit. This chapter offers a number of papers that give more insight in the relation between conditions at work on the one hand and productivity and competitiveness on the other.

Frick explores the issue of OSH profitability from different angles. One of the issues is that economic modelling has its risks and may give rise to misuse. Methodological problems are manifold. Furthermore, employers and employees are not strictly rational and economic thinking persons. Improving occupational safety and health is a social process and the use of economic influences this process. Profitability of OSH is often expressed in terms of reduced sick leave. Frick argues that, at least in Sweden, these costs do not give an accurate picture to the employer, for instance because their opinion may be that sick leave has no costs because of the insurance system. More important are the productivity effects of

improvements in the work place. Especially cheap investments may be very profitable and are likely to align the interests of both employers and employees. It should be noted that OSH and profits remain separate goals. Economic theory can give indications when improvements serves both OSH and profits.

The link between competitiveness and the national regulations and infrastructure is also discussed by Pornschlegel. His starting point is the question how the potential of good OSH can best be exploited and what should be done at the national context to optimise this potential. His analysis is based on the German situation, though most of the findings will apply to other countries as well.

Kuusela expanded on the traditional definition of productivity as the ratio between inputs and outputs: considered by type of cost, inputs consist notably of material inputs, human resources, and capital. At the corporate level, productivity is a measure of the company's ability to combine the various inputs in order to achieve maximum performance. The basic elements of productivity are the human input, well-being, the skills and know-how of the staff, the available technology and management's capabilities to supervise the system made up of these components. In the study of Kuusela the effect of ergonomics on productivity in a number of cases is evaluated. It is concluded that excellent work performance can only be achieved if the work itself, the working conditions and the employees are in good shape. A comparison between the costs of occupational safety and health and the costs of flexibility and innovation is made by Dhondt. In his contribution he argues that assessments of costs and benefits of occupational safety and health should include flexibility and innovation as well. Qualitative analysis indicates that the costs of flexibility are mainly carried by the flexible worker, and these workers seldom profit from better working conditions. Two arguments can persuade companies to invest in working conditions for all (not just the core workers):

- good working conditions can make flex-work more acceptable to all stakeholders;
- good occupational safety and health are a precondition to innovation, as case studies demonstrate that companies investing in better working conditions show improved innovation; the benefits outweigh the costs of OSH.

Further elaboration (in terms of hypotheses) on the effects of occupational safety and health as a competitive factor is made by Thiehoff. He concludes that attempts to calculate on a lost time basis have been unsuccessful as causal connections cannot mostly not be demonstrated and as most production processes have built in flexibility and buffers that compensate for the effects of for instance absenteeism. Thiehoff assumes that the benefits of occupational safety and health are a competitive factors. Direct effects are to be found in:

- uninterrupted production;
- improved productivity;
- better process and product quality;
- reduction of personnel and ancillary labour costs;

The limitations of conventional (strictly economic) cost-benefit analysis are also pointed out by Zwetsloot and Evers. In their contribution they emphasise that indicators like lost time, accidents and illnesses have drawbacks like poor predictive value, limited relevance and poor statistical unreliability in SMEs. The approach of Zwetsloot and Evers is therefore

to find the added value of occupational safety and health management in the language of managers. As a tool, a model for total health and safety management is used.

The best evidence of the positive economic effects of investment in occupational safety and health is given by Johansson. In an evaluation of 108 companies (selected at random) that participated in workplace programmes of the Swedish Work Life Fund he showed that the investments contributed to reductions in sick-leave and in productivity increases. The median pay-back time was estimated at 3 years. Johansson concludes that almost all of the organisations consider the investments successful. The calculation of pay back periods proved useful and the method was effective, despite the methodological problems that generally hamper this kind of economic evaluations.

Conclusions

From the various cases presented it appeared, on balance, that improved working conditions clearly had a beneficial effect on productivity - both directly and indirectly. From different research projects it appears that productive and innovative companies have better working conditions. It is in studies that professionals and policy makers try to find evidence that good safety and health contributes to good business.

The case against was made by those who pointed out that indicators of improved economic performance had emerged at the same time as the economic recession: workers had improved their productivity (absenteeism had been sharply reduced, waste had declined) but they had returned to work before they were fully recovered and were thus likely to further debilitate themselves and infect their fellow workers. Such malfunctioning is not, or cannot be, captured by broader surveys which strongly indicate that joint (with worker involvement) efforts to improve working conditions (especially to eliminate poor jobs) very clearly raise economic performance and productivity.

What approaches can business service organisations use to propagate the positive message that it is at least worthwhile to improve working conditions and economic performance at the same time?

There are no miracle solutions, but there are well-tested paths:

- Strategic research on overarching issues, such as the relationships between working conditions and working time and employment, certainly lead to change when they are in tune with, and timely for, national debates. But the path from knowledge to implementation is not usually straight forward. Often, it works through traditional educational and training processes.
- Action research commissioned by business is useful particularly where local networks are involved - peer influence and learning has more impact than expert training. Moreover, where the research concerns the development of physical products and/or tools, confidence can grow between the two groups (business service and business) and lead to further innovation.
- Holistic approaches are needed - uni-disciplinary approaches of ergonomists, economists, engineers, and the like have their shortcomings which can only be overcome by team-work. For different disciplines have partial views of corporate reality which can, in the end, only be resolved through trade-offs.

An emerging counter (or complementary) approach is that of trade-off analysis. This focuses on negotiation : effects of existing working conditions or their deterioration needs to be balanced against, say, more jobs or more income. This goes down better than cost-benefit analysis with those who refuse to value human life.

Overall, cost-benefit analysis (CBA) seems to be a worthwhile way of trying to assess, before the event, the advantages and disadvantages of introducing compulsory changes into existing national and corporate systems. It can be concluded that a wide range of positive effects of occupational safety and health on company competitiveness is suggested by various authors. Until now, it is not clear how the large number of relevant factors can be incorporated in easy to use models or tools for cost-benefit analysis in in-company decision making. One can even doubt if cost benefit analysis and having a good cost-benefit model results in more rational decision making in the field of occupational safety and health. Opinions still play an important role, but no manager can totally ignore economic reality. It is suggested that putting costs on absenteeism will result in adverse effects like selection and forcing people to work. With this respect, flexible workers are most at risk. As elsewhere, the workforce at the bottom of the pile usually gets the worse deal. Before an analysis is started there must be discussion (and if possible agreement between all the parties involved) on the basic hypotheses used. It is not a purely technocratic approach. The legal system can induce change: devolving responsibility (and costs) to the levels at which they are caused requires reviewing other systems and actions. The incorporation of better profitability due to improved OSH into macro-models gives many practical difficulties, and little experience exists in this field (which is also pointed out in chapter 3). Possible courses for future research include cumulating and evaluating of cost-benefit analyses, studying the use of economic modelling in decision making with regard to OSH (at both macro- and company level) and improvement of data sources.

The author wishes to thank A. Hubert and K. Frick for their valuable comments on the conference discussions on this theme.

The Role of Cost-benefit Analysis in occupational Safety and Health Regulation

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Abstract

The proper role of cost-benefit analysis in shaping occupational safety and health regulations will depend on theoretical applicabilities, technical possibilities, and policy considerations. In each of these areas, cost-benefit analysis offers promising contributions and also faces critical limitations. Due to a lack of consensus on methodological issues and the variety of ways cost-benefit analysis can be applied to the regulatory process, perceptions regarding the implications of using such analyses differ widely. At the extremes, some resist any role for cost-benefit analysis, while others advocate complete reliance on such analyses to optimize regulations. In practice, solutions for safety and health issues cannot be reduced to a formula. However, cost-benefit analysis provides a valuable tool for creating more efficient and effective regulation and for promoting public and private efforts to improve occupational safety and health. As the demands grow for justification of government action and for achieving maximum results from available resources, cost-benefit analysis should and will play an increasingly important role in advancing occupational safety and health protections. U.S. Occupational Safety and Health Administration (OSHA) conducts extensive and detailed analyses of the costs and of the benefits of all significant new and revised safety and health regulations. Such regulatory impact analyses are conducted by most federal government regulatory agencies as required by the President Clinton under Executive Order 12866 and by previous Presidents since at least 1981.

The expected benefits of OSHA regulations have always been far greater than the estimated costs. Even if no value is assigned to the lives saved or to the pain and suffering prevented, and if only the direct financial benefits of preventing injuries and fatalities are considered (including, for example, avoiding medical costs, lost wages and production time, hiring and training costs, etc.), OSHA regulations often result in large net benefits for employers as well as for employees and society as a whole.

However, the role that cost-benefit analysis should play in the process of developing occupational safety and health regulations remains controversial. Requirements for regulations to meet a cost-benefit test are on the one hand advocated as a sensible mechanism for ensuring good regulation, while on the other hand, the application of cost-benefit analysis is strongly resisted and feared as a means of weakening the regulatory program. The debate has become increasingly politicized as the U.S. Congress currently is considering legislation which would reform OSHA's regulatory authority.

To put the cost-benefit debate in the United States in context, a key difference between the American regulatory process and that of most other countries needs to be recognized. OSHA's authority to issue regulations is derived from legislation which also sets out certain conditions that must be met by the Agency. The conditions in the legislation, expounded

upon by various court interpretations over the years, address factors such as demonstrating the need for a regulation, defining acceptable risk levels, and establishing technological and economic feasibility, which each require substantial supporting documentation. If OSHA is successfully sued for failing to meet its obligations, the regulation is nullified by the court. Members of the public, industry, and unions routinely sue OSHA over every major new regulation, and OSHA must be able to prove in court that it has satisfied the specific legal requirements in issuing the regulation. Thus, the legislative language underlying OSHA's regulatory authority not only provides a mandate to protect workers but also critically defines the legal tests that must be met.

In contrast, the President's requirement to analyze the costs and benefits of regulations is not subject to litigation from the public and thus does not require as great a burden of proof. The President's requirement does not supersede the legislative mandate, and it functions primarily as a central review mechanism for the White House which regulations and accompanying analyses must pass through before being issued.

This paper explores the issues for determining the proper role for cost-benefit analysis in shaping occupational safety and health regulations. The potential contributions and implications of applying cost-benefit analysis in different ways are assessed from three perspectives: theoretical applicabilities, technical possibilities, and policy considerations. Scenarios for incorporating cost-benefit analysis into the regulatory process are then evaluated to identify roles that are most useful for effectively reducing occupational risks without hindering goals for improving and strengthening safety and health protections.

Theoretically, cost-benefit analysis should be the tool for policy-makers to apply in at least three different areas to identify optimal choices. First, in order to properly allocate agency resources among competing regulatory projects, preliminary cost-benefit analyses of potential regulations can be used to prioritize actions to determine how overall risk reduction goals can be achieved most efficiently. Second, cost-benefit analyses of draft regulatory requirements and their possible alternatives can enable regulations to be designed based on the most cost-effective approaches and solutions to address specific risk factors or hazards. Third, cost-benefit analyses can provide rigorous, documented evidence and support to explain and defend particular regulations and to promote the many positive effects associated with improvements in occupational safety and health generally.

But even at the theoretical level, objections can be raised to a reliance on the use of cost-benefit analysis as the sole determinant in making the best decisions. For example, if one were to blindly prioritize regulatory actions across the entire scope of government, occupational safety and health regulations may be pushed aside by increased highway safety initiatives. And yet it is generally accepted that government should not abandon its involvement in protecting the safety and health of workers just because of possible differences in the marginal cost-effectiveness of government spending. Objections to a reliance on cost-benefit analysis in making decisions have also been based on ethical arguments. Belief in a set of moral principles (for example, involving equity or fairness) makes certain actions or circumstances unacceptable, and thus the consideration of other factors (such as profits), in a manner that weighs against the value of adhering to those principles, can be perceived as morally wrong.

The debate on the theoretical usefulness of cost-benefit analysis can be reconciled by reaching a common conceptual understanding of the scope and applicability of such analyses. Theoretically, the definition of cost-benefit analysis can be stretched to incorporate subjective values and morals, and the results can be made to reflect any concerns desired; or, at least, cost-benefit analysis can be applied to an appropriate subset of factors with other considerations treated separately. However, proponents of cost-benefit analysis must also recognize that the conventional use of the methodology involves making comparisons between quantifiable values, usually expressed in monetary terms, and as such may not be ideally suited or acceptable for all purposes.

The debate on the role of cost-benefit analysis also reflects different perceptions regarding the practical and technical aspects of applying cost-benefit analysis. At one end of the spectrum, the research exercise of identifying sources of costs, benefits and other effects associated with regulatory impacts can in itself be seen as productive. A better understanding of regulatory impacts results in an increased awareness of the circumstances being addressed, generates further ideas and options, enables the relative importance of specific elements to be more clearly distinguished, and generally helps bring real-world input into the process. At the other end of the spectrum, a cost-benefit equation can be seen as the primary determinant of the appropriateness of a proposed action.

Regardless of the particular application, a cost-benefit analysis needs to be sufficiently rigorous and detailed to be useful. Advocating reliance on the results of cost-benefit analysis to determine optimal choices must be accompanied by a willingness to devote the resources necessary to ensure the credibility of the analysis. Moreover, the relationship between resources applied and usefulness is not always linear: where a thorough analysis can offer reliable guidance, a more limited analysis may provide uncertain or misleading conclusions. If industry-by-industry detail is required, then the specific definition used for "industry" critically affects the resource implications for the analysis. Technical limitations may hinder the ability of cost-benefit analysis to deliver definitive answers. For some applications, adequately detailed data may be unavailable, or analytical results may depend on estimates that involve subjective judgments. Useful descriptive conclusions do not necessarily constitute indisputable proofs. In short, the promising aspects of what cost-benefit analysis can deliver are in reality difficult to guarantee.

A few examples can provide an idea of the types of issues that cannot be easily resolved and yet can have large effects on the results of an analysis. What discount rate should be used for future benefits measured as lives saved, especially when a latency period is involved, such as with exposure to carcinogens? How can anecdotal evidence on productivity effects be generalized to the industry or national level, and what are the corresponding effects on employment and wages? To what extent should secondary and indirect effects be considered, such as effects of injuries on other family members or the chain of effects from compliance spending? How effective will requirements to provide training be in preventing accidents? A few years ago it was suggested, during the review of an analysis of reducing chemical exposures to workers in the construction industry, that regulatory costs reduce national income growth, and that since national income growth was correlated with longer life

expectancy, money spent to comply with regulations would result in statistical fatalities which should offset the lives expected to be saved through reducing chemical exposures.

Determining the degree to which cost-benefit analysis can or should be applied becomes a cost-benefit exercise in itself, which in practice can vary depending on the application. The primary determinants will be the technical strength of the available data and the intended purpose of the analysis. Additional resources for conducting analyses may yield better decisions, but with declining marginal returns. Clearly, at some point spending more resources on cost-benefit analysis at the expense of advancing available protective measures would become counterproductive.

Lastly, but not least importantly, the role of cost-benefit analysis will depend on policy considerations and the perceived implications of incorporating this activity into the regulatory process in different ways. As evident from the multiple studies submitted to the record in response to a single OSHA regulatory proposal, cost-benefit analyses conducted by different people on the same issue can produce drastically different results, even by several orders of magnitude. Cost-benefit analysis cannot be simply reduced to a formula or a step-by-step approach with consensus on specific assumptions or on the many novel methodological issues that continue to emerge. Many issues are matters of policy as much as of science. The fact that a legitimate range of reasonableness among estimates can be credibly discerned does not fully alleviate fears about the potential influence of analyses. The debate as played out in the political arena characteristically involves emotional rhetoric and distrust over ulterior motives. At the bureaucratic level, the debate reflects concerns about resources, decision-making power, organizational lines of authority, and how and by whom regulatory documents will be developed and reviewed.

The different perceptions regarding the impact of cost-benefit analysis on the regulatory process result in opposing views on the role of such analysis. On the one side, any role for cost-benefit analysis should be resisted and minimized. According to this view, conducting these analyses causes delays and draws resources away from the development of safety and health regulation. In addition, recommendations from safety and health professionals could be modified or overturned based on the cost-benefit results, and the flexibility of the Agency may be compromised. Finally, the explicit consideration of costs may be simply objectionable in the context of potentially limiting the extent of risk reduction: why should the lives of workers be potentially sacrificed because the reduction in profits would otherwise be too large?

An opposite viewpoint sees cost-benefit analysis as the solution for making sure that regulations appropriately reflect the limited resources available in society for reducing risks. The marginal cost of an additional reduction in risk generally increases as the risk is lowered, and it would be impossible to reduce all risks to zero. Thus, in order to provide the most aggregate reduction in risk and save the greatest number of lives with a given amount of resources, cost-benefit analysis should be applied to determine which risks should be addressed and to what extent they should be reduced. In addition, cost-benefit analysis can help reveal the relative effectiveness of risk reduction measures and design regulatory approaches that ensure protection while maximizing flexibility and efficiency.

Each of these two opposing perspectives has its shortcomings. Requiring cost-benefit analysis as a test to be met will not automatically achieve its intended goals for four reasons. First, the inherent limitations of such analyses as described above preclude their use for regulatory dilemmas requiring broader perspectives (beyond just an expanded set of variables); second, requirements for cost-benefit analysis that demand high levels of proof or detail may go beyond technical capabilities or available resources and impede regulation; third, depending on how cost-benefit analysis is implemented, it could potentially be applied abusively to force regulatory changes, or it could be conducted as an afterthought with the expectation that it simply accommodate desired actions; and fourth, complete reliance on the analytical results would require sufficiently detailed guidance covering the multitude of evolving methodological issues to be applied consistently across government programs. Although general guidance is currently imposed in the U.S. through the centralized review of the White House Office of Management and Budget, in practice analyses vary considerably from one agency to another, and disagreement and discretion in the technical particulars of analytical approaches inevitably remain.

However, despite limitations, cost-benefit analysis should and will play an increasingly important role in the development of occupational safety and health regulations. It represents systematic, quantitative research on existing conditions and alternative possibilities. It improves regulatory programs by identifying promising directions and avoiding unjustifiable positions. It demonstrates an awareness of the implications of government actions, as increasingly demanded by the public. It provides a valuable tool for defending and advancing public and private efforts to protect workers and for promoting occupational safety and health generally. It constitutes the evidence of the importance to workers, to industry, and to society of taking action to reduce hazards in the workplace.

Costs of OSH vs costs of flexibility and innovation

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Introduction

When stressing the argument that it is interesting for managers to invest in OSH because such an investment is profitable, one is arguing that companies mainly strive to compete on costs. Investments in OSH can lead to lower costs for companies or can improve productivity of the company on the whole. This cost impact from OSH can be weighted against the benefits it has in less overall costs for the companies and in higher sales.

But modern companies are not only focussing on lower costs. In figure 1, we can see for the Dutch situation (1993) that cost strategies are the primary strategy for only a third of the companies. In recent years, companies are starting to orient themselves at flexible response to market demand, and striving to become more innovative. Graph 1 shows that next to quality and cost strategies, companies do orient themselves at innovation and quick response.

Flexibility and innovation are also competitive goals for companies, more so than costs. Because these goals are relatively new to companies, there is a great interest among governments to help promote companies to achieve these goals. For example, the Dutch government supports any effort to make the labour market more flexible and to help companies achieve higher degrees of innovation (e.g. Flexibility and security, 1996).

Where does this leave the discussion on cost and benefits of OSH? It is not very clear how these new company and political goals are related to the cost and benefits of more and better OSH. In this article, I want to show how the cost/benefit approach to OSH should expand its argumentation to these new company priorities. I shall support my argument with results from surveys done in Europe and in the Netherlands on OSH and flexibility, and with case studies among Dutch innovative companies.

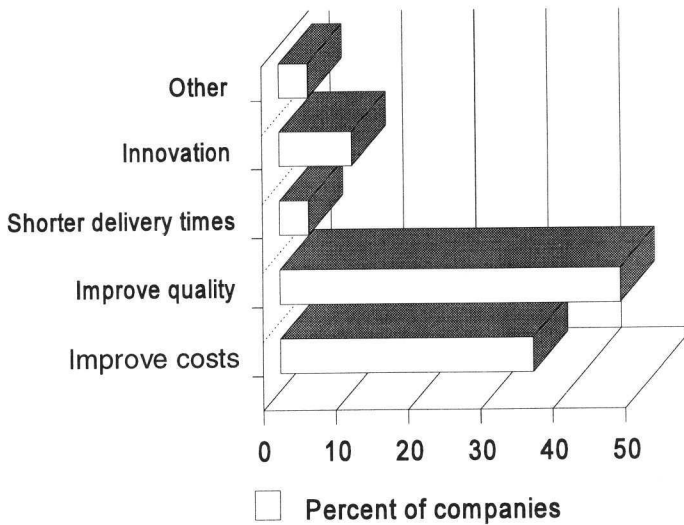


Figure 1 Future market strategies from Dutch companies in the Dutch Monitor Study 1993

The vices of flexibility: OSH as a countermeasure

As was stated in the introduction, companies are looking at different ways in which they can become more flexible. Flexibility is used in the sense of more responsive to volume fluctuations on the market. Now today companies have numerous instruments to respond to such fluctuations. The preferred situation by companies would be one in which the company could use hire and fire-measures at will. Since the 1980s, governments and employer organisations have sought to reduce the numerous rules which block labour market flexibility. Table 1 gives an overview of the different kind of flexibility measures which have become popular among companies.

Companies can use internal and/or external sources to respond to market fluctuations. They can also orient themselves at the number of workers (quantitative approach), and/or use more allocative measures for such responses.

Table 1 Types of flexibility

	Internal	External
Quantitative	Overtime Flexible yearcontracts Parttime work Variable working times Shift work Flexible pensioning systems/ parttime pensioning	Temporal agency work Labour pools Limited duration contracts Home work Borrowing workers from colleagues
Qualitative	Incidental other tasks Multi-crafting Combining jobs Job rotation Outplacement Consulting	Outplacement Consulting

Such 'flexible' personnel policies have always been resented by the workers. The need for security, which workers justly have, is strongly undermined by such labour market and company policies. It is clear from nearly all research that most labour rules do not provide much protection for the flexible labour force (van Hoof, 1987; Littek & Charles, 1995). The most common problems for flexible workers are:

- Such flexible workers are not or only badly represented by the company trade union or workers council.
- Such workers have little knowledge of the OSH-rules in the companies. Rarely do they get to know the company doctor, nurse or OSH-representative.
- Many companies use accidents or injuries as a reason to terminate contracts with such flexible workers. Such workers have little power to counter such acts. Even countries with strict rules on flexibility cannot prevent social dumping from happening.

The costs of flexibility are mainly carried by the flexible worker, and not by the company. Flex workers rarely profit from OSH.

In such a situation, only stressing that OSH is good from a cost-benefit-point of view, does not guarantee in itself OSH for all workers in companies. The price of such an investment could be paid by the flexible worker. OSH could be seen as one more advantage of the core worker. Such a result can be seen in the survey from the European Foundation (Veronique Letourmeux, 1997; van Dormolen & Dhondt, 1997). This survey shows that flexible workers are worse off on most working conditions when compared to core workers in companies.

The question then is, how to persuade companies to invest in OSH for all workers, and not only for the core workers? Improvements have been sought by regulating the position of temporary workers and temporary agency workers. The solution however, is not to go on defending the rights of the core workers or to counter flexibility. Such an effort is clearly futile. More sensible is it to look for evidence on how OSH-measures are not only beneficial to core workers.

From the Monitor-studies, we had the opportunity to find out to what degree OSH-policies help flexible workers. In these surveys, we have identified different types of flexible workers. For each of these groups, we have looked at how they report about the OSH-policies in these companies and how such policies have their effect on their working situation. It appears, and this in the survey from 1993 and 1995, that flexible workers which report good OSH-policies in their company, also report less health problems (burn out, musculoskeletal complaints) and better job satisfaction. When good OSH-policies are reported by workers, this has a positive effect on the working situation of the worker. This would mean that companies should have to have an interest in this dimension of company policy. OSH can work as an instrument to make flexibility more acceptable to the employees and their defenders. This could help companies to acquire the required flexibility more easily. In this sense, investing in OSH can reduce the costs (in terms of turnover, absenteeism, lower quality, etc.) flexibility itself bears for flex workers.

OSH as a precondition for innovation

Innovation is a second new goal which companies want to achieve. Innovation can be defined as product or service innovation on the one hand, and process innovation on the other hand. Companies want to bring more innovative products to the market, and this in an ever more rapid fashion. Such is the trust of new buzz-words as Rapid Deployment Cycle, Time-to-market, Time-Based-Management and so forth (Hout & Stalk, 1990). The company which masters this lead time, conquers the greatest market share and guarantees the greatest profits. In the automotive sector, the example of the successful Japanese producers is now common knowledge (Womack e.a., 1990). Not only innovative products are important, it is equally important for companies to improve their internal procedures and processes. Continuous improvement is sought by all companies. The question is of course, which measure should preferably be used to achieve such innovation. The answer is not that easily given as for flexibility. Up to this day, most effort is put into the development of technology. This is done by investing into technological institutes (for example the new technological top-institutes in the Netherlands), into technological infrastructure (for example the electronic highway), in education (OECD, 1992). Only recently, companies and governments have tried to investigate to which degree the organisational model and company practices are themselves factors which stimulate innovation.

In the Netherlands, we have executed case-studies among ten leading innovative companies and services. These companies were in the private and in the public sector. The goal of the project was to investigate, to what degree the employment and organisational practices in these companies helped to promote innovation. We have used a qualitative methodology to obtain answers in these companies. Information from our own investigations was confronted with the opinions from the employer and employee representatives. These results were again presented to all participating parties in the companies in a second feedback presentation. From these discussions resulted causal maps on how (product and process) innovation occurred in these companies.

The data from the ten companies were analysed again to obtain more general results. In the two figures(2 and 3), the innovation models are presented. It is clear that the presence of

an R&D-department and the investment in technology are important factors for innovation. But it is also clear that the human factor and good OSH are as important as these factors to stimulate innovation. Better working situations are a precondition for innovation. Better working situations help to support the dense communication between the marketing department, the work force and the R&D-department required for generating ideas. When workers have the opportunity to learn from their work, when they are allowed to get into the market and their customers, only then the R&D-departments can profit from the stimulating ideas of their workers. Information about how the companies are doing, about the results from work are also required to support these innovative initiatives on the work floor.

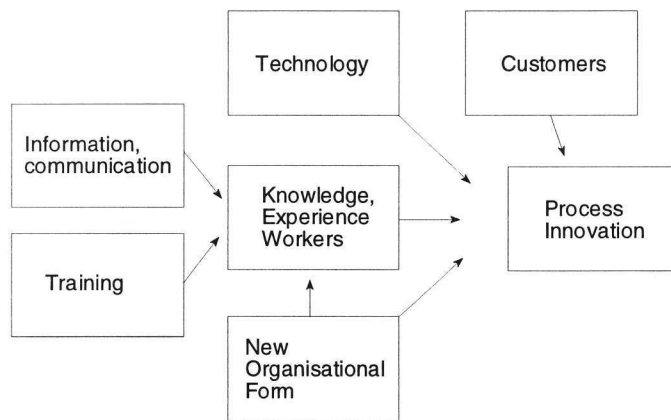


Figure 2 The model for process innovation

The investments needed to achieve such improved OSH-situations are easily balanced by the profits the innovative ideas workers have. But this result should be supported by more factual evidence which I do not yet have.

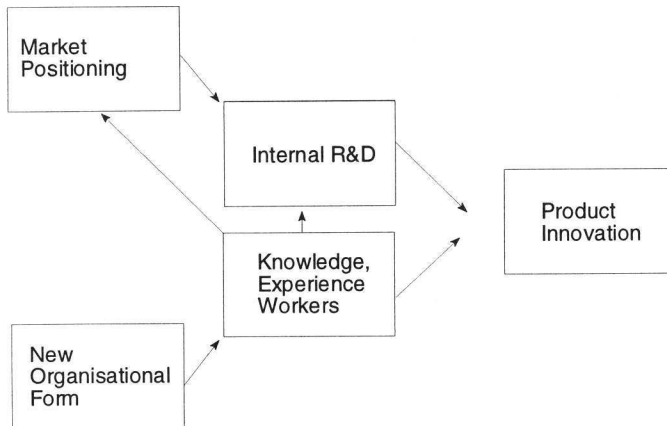


Figure 3 The model for product innovation

Another result from these case studies, is that flexibility and innovation do not necessarily complement one another. Companies professed that too high numbers of flexible workers in their companies impeded their innovative efforts. Flexible workers can bring new ideas with them to the company, but more so they can take away ideas from the company they are engaged by to competitors. Because there is a great mistrust from the flexible workforce in the sincerity of the engaging company, flexible workers do not team-up with the company. Here lies an opportunity for promoting OSH-practices in companies. If the lesson from our previous research is well learnt, then companies could use OSH as a means to make flexible workers more content with the company. This can itself lead to more investment from the worker in the company.

Such a thesis could be interpreted as idealistic, but we musn't fool ourselves. The future is flexible, a return to the fixed tayloristic past is out of the question. Therefore it is necessary to find ways to make flexible work more attractive for workers. But also to make companies more responsible for their flexible workforce. If such an effort does not succeed, then higher degrees of flexible workers will only work to the detriment of the innovative effort from companies and governments.

Discussion

Our main conclusions from our investigations is that companies are moving toward other goals than purely cost improvement. Volume flexibility and innovation are new goals. It isn't clear how investment in OSH can benefit these new policy goals in companies. We have shown from surveys and case studies, that OSH can benefit these goals. In the Dutch industry, it appears that flexible workers which report better OSH practices, also report better working situations. There even isn't any difference any more between flexible worker and

the core worker in such companies. OSH should be used as an argument to support the further development to more flexibility in companies.

From our case studies, we know that OSH is central to more product and process innovation. Higher quality of work is correlated with more innovation. Companies which have invested in better OSH, show improved innovation. Such benefits of OSH clearly outweigh the costs OSH imposes on companies. It is even so that OSH can help to reconcile flexibility and innovation in companies. Flexibility is not always a means to improve the innovation in companies. The resistance from workers to more flexibility can be countered by offering these flexible workers better working situations or at least those working situations the core workers can profit from.

The main results from these studies need more confirmation with more pointed research. It is also necessary that the cost/benefit-argument from OSH-investments, is further developed in the direction of these new company goals. This presentation is only a first departure in this field.

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Correlation between the working environment and productivity, a case study in the company level

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Productivity means the ratio between outputs and inputs. Considered by type of cost, inputs consist of material inputs, human resources, capital, and a number of special inputs. At the corporate level, productivity is a measure of the company's ability to combine the various inputs in order to achieve maximum performance. The basic elements of productivity are the human input, the well-being, skills and know-how of the staff, the available technology and the management's capabilities to supervise the system made up of these components. One potential explanation for the positive correlation between the working environment and productivity is the following: As safety at work improves, material damage and malfunctions decrease and accidents and the number of sick days decline, while the volume of production increases and quality improves.

At the same time, the management system and policy adopted by the company or the organisation affect the way in which employees perceive their working conditions. Poor conditions are reflected in accidents, occupational diseases, other health effects and an excessively high turnover of workers. In contrast, good working conditions manifest themselves as a high level of well-being, improved quality, and increased productivity. This study is one part of 'The Economics of the Working Environment' -project which was carried out in 1994-1996 by the Ministry of Labour, Occupational Safety and Health Division.

Correlation between the working environment and productivity

Studies on the inter-relationship between the working environment and productivity have revealed a positive correlation between the two. Thus, steps taken to develop the working environment have also improved productivity, while measures adopted to increase productivity have had a positive impact on the standard of the working environment. However, few organisations monitor this relationship by means of economic indicators, and there seems to be little knowledge about which individual areas of the working environment have a particular effect on productivity.

Studies show that companies investing in production to cut down throughput times and to increase productivity, also improve the standard of safety in the workplace as a by-product.

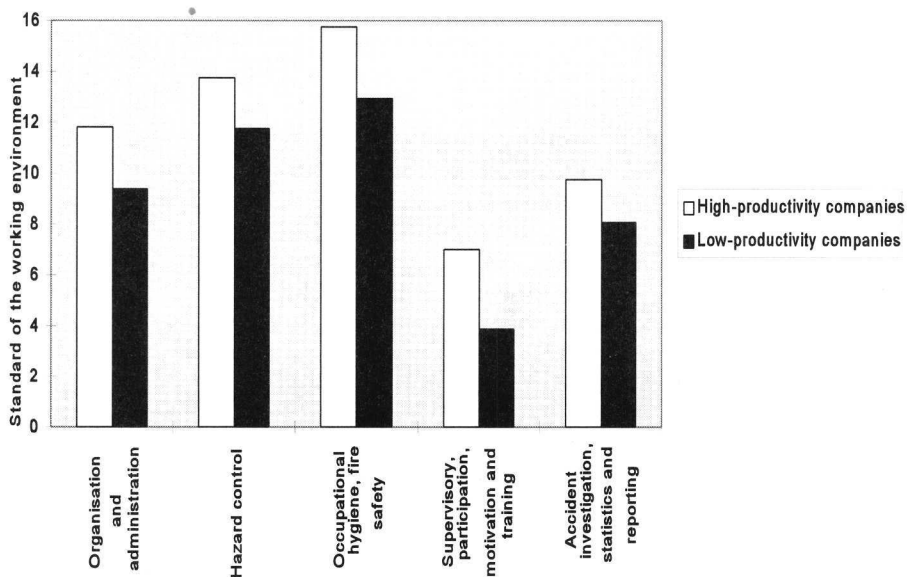


Figure 1 Correlation between individual aspects of the working environment and productivity

At companies, safety performance has been assessed using the occupational safety and health audit. The bars in the chart indicating performance in various areas are not directly comparable. Instead, high-productivity and low-productivity companies within each area can be compared.

How can the working environment become a competitive tool? How does the working environment contribute to the company's financial performance? How do investments made to improve working conditions affect the company's productivity?

The quality of the working environment and the working capacity and skills of the personnel have a significant meaning to the company economy. When the working environment improvements have been well-carried out, the activity conditions can significantly improve. At the company-level the attitude towards the working environment improvements depends on the matter if it is profitable or not.

The evaluation of the inputs and outputs made in the occupational safety action is not a simple task at the company-level. The improvement of the occupational safety and working environment require often remarkable inputs on technology, orientation, training, informing

and maintenance. It is difficult to point out the outputs of occupational safety or the improving of the profitability. It is easier to calculate the costs of poor working conditions. The costs of accidents, absenteeism and disability pensions can be evaluated at the company-level, usually they vary considerably according to the size and branch of the organisation. Beside these costs even more remarkable are the benefits resulting from the working environment improvements and better production management which can be seen as diminishing malfunctions, lower wastage, improving the productivity of the work or improving quality. These benefits can be remarkable great.

This paper will discuss how investments made in the various areas of production affect productivity.

Effect of ergonomics on productivity

Consequences of poor ergonomics: musculoar-skeletal complaints, impaired efficiency, low motivation, disability pensions, high turnover of staff.

Measures to eliminate problems: workplace and ergonomic studies by occupational health personnel, activities that help maintain work/functional capacity, instruction, training in appropriate working methods, planning, financial analysis of factors relating to the working environment.

Effects of investments in ergonomics on productivity: improved work/functional capacity, fewer sick days and lower turnover of staff, improved work motivation.

Example

At an engineering workshop, the repair of engines involved work stages were that very difficult to carry out and ergonomically unfavourable. As a result of these problems, absenteeism was high because of a high incidence of muscular-skeletal complaints and near-accidents were common. To alleviate these problems, money was invested in the purchase of an installation workbench. Introduction of the workbench was found to have a favourable impact on working conditions, productivity, safety, deployment of labour force, flexibility of work organisation, quality, atmosphere, motivation, efficient use of space, and customer satisfaction.

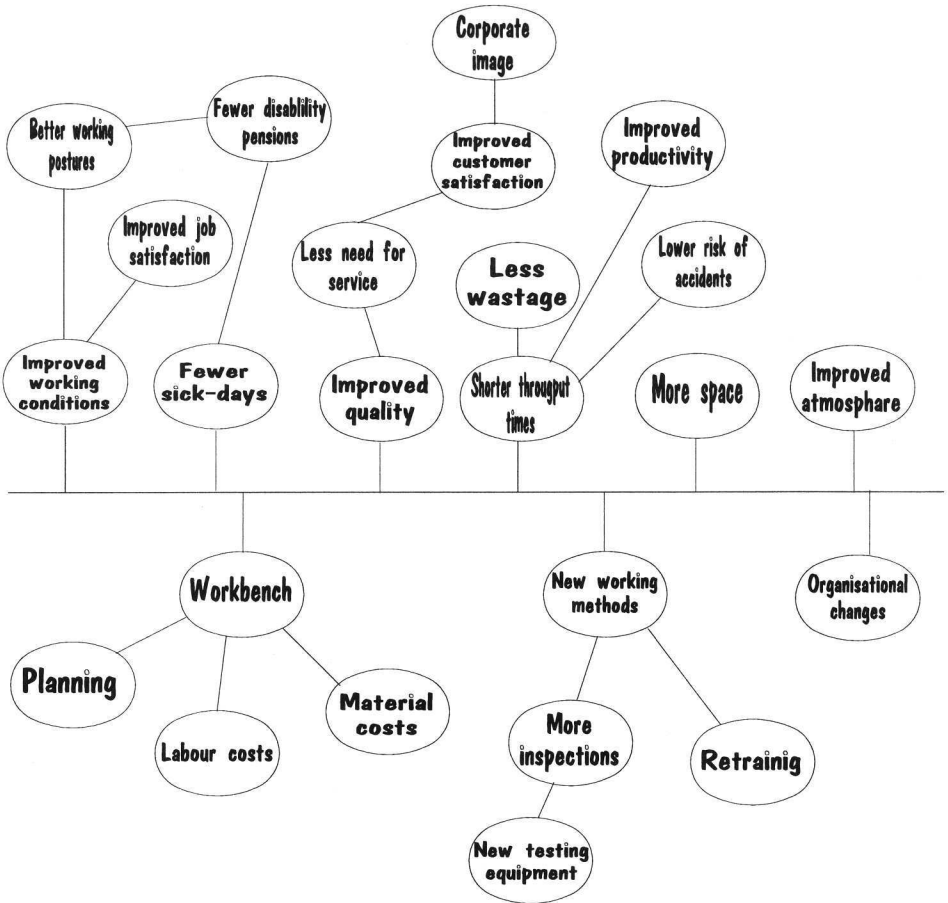


Figure 2

The total cost of the investment was FIM 50,000. After the new workbench was purchased, the number of sick-days decreased, throughput times were cut down, and the need for in-service engine repairs declined. As a result, savings of about FIM 270,000 could be made annually.

Effects of the working environment items on productivity

ITEM	PROBLEMS	MEASURES	EFFECTS ON PRODUCTIVITY
Noise	<ul style="list-style-type: none"> * accidents * noise injuries due to noise * insomnia * stress * effects on quality * interference with social interaction * interference with social interaction * effects on quality 	<ul style="list-style-type: none"> * noise protection/abatement * working instructions * planning * reducing/minimisation of exposure time * personal protective equipment/gear 	<ul style="list-style-type: none"> * improved functional capacity * reduced noise level * elimination of quality problems
Temperature/ Heating and ventilation	<ul style="list-style-type: none"> * joint diseases/ muscular-skeletal complaints * head-colds * impaired working efficiency * declined motivation 	<ul style="list-style-type: none"> * structural and technical means * planning * reducing/minimisation of exposure time * protective clothing * personal protective equipment/gear 	<ul style="list-style-type: none"> * improved work efficiency * reduced energy costs
Lighting	<ul style="list-style-type: none"> * headache * fatigue * impaired performance * declined motivation 	<ul style="list-style-type: none"> * improving/greater lighting intensity * maintenance of lighting service of fixtures * planning 	<ul style="list-style-type: none"> * reduced number of accidents * improved quality

Risk of accidents	<ul style="list-style-type: none"> * accidents * loss of profits/income * loss of floating assets/ inventories and fixed assets * loss of working hours * impaired performance * impaired efficiency * declined work motivation 	<ul style="list-style-type: none"> * good housekeeping/ cleanliness and order * safety means of access passageways * protective equipment on machinery and equipment safeguards * good/sound planning * careful work orientation * instructions on working methods * personal protective equipment * intensive work familiarisation * working instructions * personal protective gear 	<ul style="list-style-type: none"> * improved standard of safety * improved work/functional capacity
Work climate/ Atmosphere	<ul style="list-style-type: none"> * lack of mutual trust and in-house competition * lack of social support * poor flow/dissemination of information * poor manager-subordinate relations * low quality of work performance * low job satisfaction * absenteeism * problems in social personal relationships at the workplace 	<ul style="list-style-type: none"> * interesting and challenging duties * task variability/variation * independent work * development of team work 	<ul style="list-style-type: none"> * improved work/functional capacity * improved work motivation * development of co-operation
Content/ Meaningfulness of work and motivation	<ul style="list-style-type: none"> * meaningfulness of work tasks * task invariability/monotonous work * haste/hurry * lack of definition of duties and responsibilities * appreciation of work/occupational esteem * professional skills and lack of career progress hindered opportunities 	<ul style="list-style-type: none"> * job enlargement/expansion of work * job enrichment/enrichment of work 	<ul style="list-style-type: none"> * high level of work motivation * high-standard work performance * job satisfaction * reduced absenteeism * reduced/lower staff turnover

Orientation/ Familiarisation and training	<ul style="list-style-type: none"> * accidents * negligence/indifference * material damages and losses/ wastage * delays in deliveries and inaccuracy/unreliability of sup- ply 	<ul style="list-style-type: none"> * intensive orientation/familiarisation * regular retraining of orientators/instructors 	<ul style="list-style-type: none"> * improved flow disse- mination of information * reduced number of accidents * improved quality of work * reduced lower absen- teeism
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Effect of working environment on productivity

The competitiveness of industry depends on productivity and its continual improvement. Measures to improve productivity should be accompanied by steps to ensure that work is meaningful, varying and educational. Through employee involvement, it is possible to get people interested in improving productivity, in reducing costs, and in developing the workplace and the work itself. Excellent work performance, high productivity and a high quality of life as well as the staff's well-being can only be achieved if the work itself, the working conditions, the work community and the employees are in good shape.

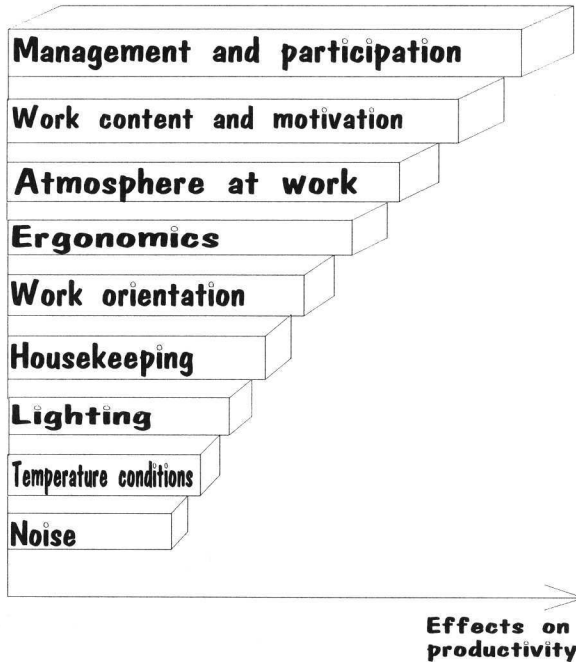


Figure 3 Effects of improvements to the working environment on productivity in the light of the latest research findings. In practice, the internal order of the effects on productivity achieved as a result of investments in the working environment may vary considerably on a case-by-case basis.

The Profitability Of Investments In Work Life Rehabilitation Programmes: A Measurement Of Perceptions¹

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Abstract

This study may be recognised as a contribution to the lack of economic evaluations of investments in health promotion programmes. The study also contributes to the evaluation of the Swedish work life experiment in the beginning of the 1990s, and the establishment of the Swedish Work Life Fund (SWLF). Perceptions of the profitability of investments in work life oriented rehabilitation, including changes in work organisation, changes in work methods and competence development, were investigated in 108 randomly selected organisations. The findings indicate that the investments, which were partly financed by grants from the SWLF, contributed to a reduction in sick leave and an increase in productivity. The median value of the pay-back period was estimated to be 3.0 years. Public organisations, a considerable number of employees, a high percentage of women employees, a significant reduction in sick leave and an ongoing organisational change are some of the characteristics of investments with a short pay-back period. The findings further indicate that grants from the SWLF were an important factor in the initial implementation of investments.

Background

On July 1, 1990 the Swedish Work Life Fund (SWLF) was established with the objectives to improve health and increase productivity in Swedish work life. Employers could apply for grants devoted to rehabilitation and other measures to improve the work environment.

The Fund was terminated according to schedule on July 1 1995. At that time 10 billion SEK had been paid to help finance 25,000 workplace programmes (WP). Nearly 3 million Swedes (70% of the work force) have, in some way, taken part in WP partly financed by the SWLF. The majority of the programmes included different measures to improve working conditions, such as changed work organisation, changed work methods, competence development, medical treatment and physical investments.

In most studies concerned with the effects of health promotion programmes, economic consequences have been ignored. Pelletier (1993)² refers to 24 evaluations of workplace health promotion programmes, between 1980 and 1991, an area closely linked to rehabilitation. These studies indicate positive effects on people's health, but only a few have dealt with the issue of efficiency. Conrad (1987)³ proposes that one reason for this may be that the effects of health programmes are mostly subjective individual results. Although this is certainly true, changes in sickness rates and productivity, among others, should usually be possible to measure and evaluate in monetary terms.

The scarce number of investigations of the economic consequences suggest that the main effect is changes in productivity.

Research questions

The following questions were formulated in this project:

1. From an organisational viewpoint, what is the pay-back period for investments in work life oriented rehabilitation programmes, as based on the opinions of the employers?
2. What are the characteristics of the rehabilitation programmes with the shortest pay-back period, as based on the opinions of the employers?

The idea underlying the project was to quantify the employers opinions about the pay-back period. The opinions include objective data, such as changes in sickness rates and productivity, or purely subjective opinions concerning the causal relationship between the investment and the effect. These opinions, which are based on both the objective and subjective data, are supposed to influence the decision maker in his future willingness to invest in rehabilitation.

The concept "work life oriented rehabilitation" was used by the SWLF. This includes not only measures aimed at bringing sick or injured employees back to work, but also measures to prevent accidents and work-related sickness. The measures can either be individual or organisational. For example, changes in work methods or competence development can be preventive measures, and changes in work organisation can be a means of easing an injured employee's to return to work.

Methodology

A stratified random sample was used to select 120 WPs. To obtain quantitative data, telephone interviews were conducted with the head of each chosen programme.

After checking data about the WP, the costs were estimated together with the respondents. Concerning the effects, the idea was to help the respondents to express as much as possible in monetary terms. This was done on a gradual basis. At first the respondents were asked about the consequences of the programme. The respondents were asked to mention only effects that had already occurred. Anticipated future effects were not included. They were asked whether these consequences could be measured quantitatively. The next step was to translate the quantitative effect into monetary terms. Because a change in a variable (e.g., sickness rate) could normally be influenced by other factors as well as the WP, the respondents were asked to estimate how much of the change was attributable to the programme. Finally, they were asked how certain they were in their estimation. Changes in sales, productivity, sickness rates etc. were selected from different information systems, whereas the relation between the WP and the identified effect was estimated on a subjective bases.

Once the initial contact was established, there were no serious problems in getting the respondents to answer the questions. The respondents themselves were very interested in the outcome of the calculations. In most of the cases two to three interviews were sufficient.

All data were gathered in a database consisting of 70 variables. Of the 120 randomly selected programmes, 10 could not be evaluated because the organisations no longer existed. Another two were excluded from further statistical treatment because the data obtained were judged to be unreliable. Thus 108 pay-back calculations were available for further analyses. In the Appendix, the calculation of the pay-back period is demonstrated by means of an example. To answer the second research question, further statistical analysis was undertaken. This quantitative analysis was supplemented with a qualitative one. The programmes with the shortest and the longest pay-back periods (41 WPs) were interviewed with the aim of comparing the implementation process of the programmes. This part of the study was inductive. The aim was to generate theory, rather than to test any particular hypothesis.

Some data concerning the programmes in the sample are presented in the table below.

THE PROGRAMME

Number of employees involved	30	Median
Percentage of women	42	Mean
Length of the WP5	20 days	Mean

THE INVESTMENT

Total investment	718,000 SEK	Median
Total investment per person involved	30,000 SEK	Median
Intangibles as percentage of total investments	50	Mean

THE GRANTS

Grant	223,000 SEK	Median
Grant as a percentage of total investment	37	Mean
Grant per person involved	9,000 SEK	Median

Table Data concerning investments and grants of the programmes.

Results and contribution

The findings indicate that the programmes, which were partly financed by grants from the SWLF, contributed to a decrease in sick leave and a concomitant increase in productivity in accordance with the objectives of the SWLF. Changes in productivity was in all respects the most dominant effect. The respondents were more certain concerning this effect than the effects upon sick-leave.

The median value of the pay-back period was estimated to be 3.0 years. If this study had been done later, however even shorter pay-back periods would have been possible because the evaluation was done shortly after the programmes were terminated and only those events that had already occurred were considered. Taking this into account and given the respondents' opinion that 3.0 years is a reasonable pay-back period, the investments investigated in this study seem to have been very profitable based on the perception of management.

Despite results with regard to the pay-back period, nearly all of the organisations consider the investments successful. The findings indicate that most of the organisations experienced increased knowledge about rehabilitation and work environment matters and a heightened

awareness of the importance of health care to prevent work diseases. Many of these changes have come to stay. Thus the investments will probably influence the health and safety culture over a longer time span.

Public organisations, many employees involved, a high proportion of women, a significant reduction in sick leave and an ongoing organisational change are characteristic of programmes with a short pay-back period⁴. The conclusion is that investments in large female professional categories with a sizeable long-term sick leave in public organisations seem to have been most successful when measured in pay-back terms.

The study further indicates that the grants from the SWLF were essential in the implementation of the programmes. The dependence on the SWLF has been greater for extensive programmes. Respondents state that the programmes should have been implemented even without the grant, but at a later time or not so extensive.

In summary, the five year experiment with the SWLF has, according to management's perceptions, contributed to an increase in extensive investments in work organisation, work methods, competence development, and rehabilitation. These intangible investments have had a short pay-back period.

Pelletier (1993) has commented on the lack of economic evaluations of health promotion programmes. One reason for the paucity might be because of methodological problems. Often the idea of making an evaluation occurs after a change of some kind. Thus it is too late to compare with a pre-estimate. Another problem might be that data are normally not easily obtained because they come from many different information systems, including accounting, production, sales or human resource management information systems. A third problem is that it is difficult to obtain objective results because the causal relationship between investment and effect is crucial and perhaps impossible to be certain about.

In this study, the intention was to take these three methodological problems into account. Crucial elements include (a) a systematic means of asking in order to end up in a pay-back calculation, (b) the open-ended question about the effects of investment, instead of predetermined alternative responses, and (c) the estimation of proportions of a specific effect. With this method it was possible to prepare pay-back calculations on most of the selected programmes. Although the respondents had not performed this type of calculation earlier, the keen interest in the outcome and the fact that the preparation of the calculations was successful indicate that the method was useful. Underlying this study is the anticipation that it is the beliefs that govern action; not objective reality.

Appendix

The following example demonstrates the calculation of the pay-back period:

Of the 37 employees, 26 participated in the programme in company ABC, which is one of a group of companies. The company wanted to reduce sick leave and increase motivation and productivity. To attain this goal, they had invested in training, changes in work

organisation, changes in wage system and rehabilitation measures. The president of the company noted that the following changes had occurred:

Proportion attributable to the WP:					
70%	70%	30%	30%	30%	
Short-term < 15 6.2 to 4.7%	Long-term > 14 8.3 to 3.4%	4% less personnel 14% in- crease in volume	Complaints, scrapping costs -91 = .5% on SEK 220m -94 = .2% on SEK 250m	Wages costs lower	KSEK 200
Sick-leave		Productivity		Quality improvement	Less overtime
+		Investment			

Figure Consequences of the programme in company ABC

The following pay-back calculation was made:

Investment	SEK per year:
Total effect	736,000
(1) Productivity; $1.14\%/0.96\% \times 14,400\text{SEK} \times 1.45$ (pay-roll tax) $\times 12$ months $\times 26$ persons $\times 30\%$ (proportion) =	366,000
(2) Sick leave < 15 days: $(6.2-4.7\%) \times 14,400\text{SEK} \times 1.45$ (pay-roll tax) $\times 12$ months $\times 26$ persons $\times 62\%$ (average level of wage during short-term sick leave) $\times 70\%$ (proportion) =	42,000
(3) Sick leave > 14 days: $(8.3-3.4\%) \times 14,400\text{SEK} \times 1.45$ (pay-roll tax) $\times 12$ months $\times 26$ persons $\times 10\%$ (average level of wage during long-term sick leave) $\times 70\%$ (proportion) =	22,000
(4) Complaints: $(0.5\% \times 220,000,000\text{SEK} - 0.2\% \times 250,000,000\text{SEK}) \times 30\%$ (proportion) =	180,000
(5) Reduced overtime: $200,000 \times 1.45$ (pay-roll tax) $\times 30\%$ (proportion) =	87,000

Pay-back period in years: $736,000\text{SEK}/697,000\text{SEK} = 1.06$

Comments about the calculation

- (1) The increase in productivity has been evaluated in monetary terms by multiplying it with the average wage per employee, including pay-roll tax. In this example, the average wage was 14,000SEK per month, and the pay-roll tax was 45% of the wage. Because there has been a decrease in the number of employees, the productivity figure has been corrected. This procedure of evaluating productivity changes was chosen because it allows comparison between organisations in the

private and public sectors. Finally, only the proportion of the increase in productivity that is directly attributable to the programme has been included in the calculation.

- (2 and 3) The reduction in sick leave has been multiplied with the average monthly wage, pay-roll tax, number of participating employees, average level of wage during sick leave and the proportion of the change that is attributable to the WP.

Notes

1. This paper is an abbreviation of an article formally accepted for publication in *Personnel Review* vol 26 issue 6 or vol 27 issue 1
2. Pelletier, K., 1993. A Review and Analysis of the Health and Cost-Effective Outcome Studies of Comprehensive Health Promotion and Disease Prevention Programmes at the Worksite. *American Journal of Health Promotion*, Vol. 8, No. 1.
3. Conrad, P., 1987. Wellness in the work place: Potential and pitfalls of work-site health promotion. *The Milbank Quarterly*, 65, 255-275.
4. Using Spearman rank correlation test, significant ($p < 0.05$) correlations were found between pay-back period and number of employees involved, percentage of women, reduction in sick leave attributable to the WP, and increase in productivity. Additionally, the pay-back period was significantly shorter in the public sector. The qualitative factor "ongoing organisational change" was found in the inductive part of the study when WPs with the shortest and longest pay-back periods were compared.

Strategic and Operational Approaches to Improved Competitiveness of Occupational Safety and Health

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Abstract

Unfavourable prevailing economic and social conditions in Germany still impede the implementation of recent legislation in OSH with preventive and holistic goals. The responsible state institutions are developing bundles of strategies and operational measures to improve competitiveness of the companies, organisations and actors involved. New concepts for state inspectorates and statutory occupational accident insurances are formulated and pursued. The formation of networks in certain trades and branches für OSH provide models as practical instruments and vehicles for preventive and integrative approaches fostering competitiveness.

Unfavourable prevailing conditions...

Germany is in a rather paradox situation in this field:

- An ardent promotor of European integration, Germany is a latecomer in implementing the European guidelines concerning OSH - three years behind schedule.
- While supporting an important governmental programme of research and development in humanization of work, later work and technology until the early nineties, the political and managerial impetus to pursue actively such human and social goals receded. Managerial concepts of lean, reengineered and virtual companies gained ground instead.
- The new further reaching and holistic laws on OSH and new structures in the field of collective funds (Berufsgenossenschaften) which became enacted in August 1996 found therefore not too much positive echo in industry and service sectors.
- Under the overwhelming German labour market problems - nearly 4.7 million registered unemployed recently -, new OSH legislation and policy was seen as rather ill-timed.
- While the new concepts in OSH became law for a now much wider field of application (e.g. all public services, small and smallest businesses), the gap between legal standards and implementation is (still) growing in many companies.
- The new demands of OSH on the actors are looked upon with great suspicion by many employers and some of their associations. Rising costs of OSH are assumed and seem further to weaken competitiveness in many companies. Even many workers are indifferent to the new standards - the old ones appeared sufficiently high...
- The new legislation is perceived by many actors in the arena as superfluous and counterproductive: The number of occupational accidents, especially fatal ones, has gone down considerably over the years so that a more demanding legislation could well be missed.
- Much lower standards of OSH on global markets, especially with respect to child labour, lax and uncontrolled standards in developing countries, form part of the discussion of competition hindrances (WTO, ILO).

Recent positive developments: A shift in paradigmata

German competent experts and officials were - until some years ago - proud of the rather high standards and strict regulations in OSH and the achievements over decades in terms of lowering numbers of accidents and occupational diseases, fatal and non-fatal. But with the expansion of the European internal market and growing globalisation of commerce, economic aspects of OSH became more important in Germany. Steadily increasing hourly wage costs and even more quickly accelerating extra labour costs became a headache, in part conditioned by the social insurance contributions which also include contributions for occupational accidents and prevention.

More recent approaches indicate a strong and swift shift in basic paradigmata pursued - at least by the OSH "community" and political promoters of modern OSH concepts. This shift has been well expressed e. g. by the Conference of Ministers and Senators of Labour and Social Affairs (Nov. 1996; the federal states are responsible for the implementing and sanctioning of OSH legislation). This body interpreted very positively the newly enacted "Arbeitsschutzgesetz" (Law on OSH) and the "Unfallversicherungs-Einordnungsgesetz" (Law on the Integration of the Occupational Accident Insurance), both of August 1996; here some major points of the statement:

- The role of modern legislation on OSH underlines its economic and social importance for the employed, the companies, the whole economy and the social security system.
- Preventive OSH concepts now encated safeguard the health of the employed, the companies' productivity and thereby jobs.
- "Therefore it is an essential corner pillar of Germany's economic position".
- A holistic approach should perceive OSH at the work place as promoting health prevention and protection of the employed "in the context with all work relevant factors".
- Work related risks and strain should be detected and removed in early stages.
- OSH is participation oriented. Initiatives in designing work by the employed and a close cooperation between employer, managers and OSH experts form part of this concept.
- All actors within and outside the OSH system should join forces to get "healthy workers".
- An integrated OSH management is required to reduce sicknesses and accidents, to improve safety and disposability of equipment.
- Regular checks by the supervisory authorities could be reduced by applying "preventive care" within companies, e. g. by internal auditing.
- The state authorities should see, besides their controlling role, themselves as initiators, moderators and coordinators in OSH.
- The state authorities should act result oriented and therefore adopt the new strategies and approaches, focus on particular problem areas and assist in developing consultative, controlling and promotional strategies (in companies)

German participation in the development of European guidelines as well as European standards has always been pursuing preventive human goals alongside with economic feasibility. Intra-European and global competition was kept in mind while maintaining a rather high level of OSH (cf. standardisation of products and parts following art. 110 and the implementation of art. 118 and 118 a EC Treaty).

Until the most recent "Health Reform", the collective sickness insurances were encouraged to undertake greater efforts in the field of health promotion together with the companies engaged in the efforts - a wide range of activities were started especially in the company sickness insurances (but also by many regional or occupational insurances) reaching workers at plant level, also outside working hours with preventive measures, sports, gymnastics and the like. Health reporting of companies used anonymous data of workers in the companies concerned. (cf. session 2a of this conference). Some renowned companies like Volkswagen made the pursuit of set "health quota" a major objective of its overall and personnel strategy, supported by a bundle of company and sickness insurance promotive measures.

Guiding principles of competitiveness in OSH at macro level

The Expert Committee on Research and Research Application of the Federal Institute of Occupational Safety and Medicine passed a discussion paper on strategic orientations „OSH as Factor of Competitiveness“ in November 1996, some points:

- In order to utilize the innovative potentials of a holistic OSH to contribute to a better competitiveness of companies and organisations, wider concepts, instruments and methods are needed to comply with the need to foster competition.
- The system of OSH is urgently challenged to contribute by
 - removing or diminishing obstacles to competition
 - removing distortions of competition, but mainly
 - by promoting competitive impulses.

A list of major obstacles together with some approaches to avoid or reduce them were developed. A translated excerpt follows:

Tables 1 and 2 demonstrate the need to remove distortions and obstacles to competition and competitiveness as far as possible by adequate measures in order to facilitate a feasible integration of OSH in all fields concerned.

At European and, to some extent, national level more "strategic alliances" are needed.

- Policies, strategies and major measures in OSH must be linked up more closely with related policy fields, especially ecology, health, social insurance system, traffic safety, consumer protection, education, labour market, research and technology.

Table 1 Distortions of and obstacles to competition at European and national level in OSH

Distortions of and obstacles to competition	Avoidance, reduction
Intransparent and inconsistent regulations	<ul style="list-style-type: none"> ● Reduction of intensity and volume of regulations, "40 basic rules" ... ● implementation of uniform European standards
Too complex regulations	<ul style="list-style-type: none"> ● simplified procedures and actions ● securing standardised norms for work systems ● improved labelling obligations (concerning compliance with OSH standards) ● more freedom for users in interpreting standards

Table 2 Global distortions of and obstacles to competition in OSH

Open flanks of global competition by lower OSH standards	<ul style="list-style-type: none"> ● guaranteeing adequate OSH standards of globally marketable products and services ● international treaties to secure adequate OSH standards at plant level ● ban of child work
open flanks in European and national competition, e. g. by <ul style="list-style-type: none"> ● teleworking ● „Scheinselbständigkeit“ (freelance work) ● subcontracted worker ● work by subcontractors ● misuse of market position to lower OSH standards 	<ul style="list-style-type: none"> ● Same OSH standards independent of the legal character of work ● checking quality standards of OSH measures ● harmonising of legal conditions

- European and national promotive strategies at sectoral, structural or regional level should include incentives to foster holistic OSH.
- An integrated OSH must form integral part of all sectors and activities in vocational initial and further training.
- Public tenders should expressly contain the requirements of a modern OSH
- The competent state institutes as well as the Berufsgenossenschaften (statutory occupational accident insurances) should initiate, consult and coach model projects to promote efficient and competitive concepts of OSH in companies and organisations.
- As far as possible, incentives, competitions and bonuses for excellent models and measures should be used as means of moral and public promotion.

Potentials for better competitiveness within the German OSH system

The Sozialgesetzbuch VII (Social Law Book) redefined the roles of the Berufsgenossenschaften (statutory occupational accident insurances) by extending its preventive tasks to the somewhat softer field of work related sicknesses. It thereby strengthened politically not only the somewhat precarious peculiar German dual system but gave a strong impetus towards

holistic consultancy and coaching. As indicated above, new roles are sought also by the OSH inspectorates. New forms of cooperation between these legally established institutions, the companies and the increasing number of OSH services, technical and medical, can emerge and should be supported. The integrative aspects of such a cooperation with respect to efficiency and competitiveness make it more attractive to smaller and medium companies.

- A consultancy in OSH by these institutions shall be holistic and involve the clients much more than usually in the past.
- A competent surveillance of OSH by these institutions should gain more service character, with whole plant or work systems in view.
- A new and enlarged concept for the qualification and accreditation of OSH experts is on its way into practice. It must be supplemented by major efforts to update and upgrade the qualification and competence of longer serving experts.
- A Europe wide recognition and accreditation is due for the experts in the field. Such a measure would improve competitiveness and mobility in the European labour markets, realising that the national standards differ so far.
- Networks of OSH partners and actors, including other parties concerned (cf. following paragraph), deserve full support by the institutions in the OSH system.
- Market transparency concerning OSH in products and services should be promoted, together with objective quality standards.
- Efficient and competitive forms of OSH services for smaller and smallest companies have to be conceived, developed and tested, with support for models and experiments.

The actors in the OSH system will have to promote und support integrated concepts also in the design of products and services. The successful marketing of cars by stressing their ergonomic, humanly adequate and safe design, the successes of insisting on hardware and software ergonomics (though sometimes more claimed than realised) show customer orientation, a sense for competitiveness as intrinsic elements of economic successes.

Some world renowned companies but also many medium sized ones have undertaken successfully strong efforts to pursue and practice modern concepts of integration OSH as part of company strategies, practices and methods. Some of the approaches taken and the results achieved will be presented during this conference.

Networking in OSH as a practical approach to improve competitiveness

Here one aspect is sketched which appears to be exemplary for an implementation of the principles underlying the European guidelines as well as the recent German legislation: it is the promotion of rather complex networks in branches or trades concentrating on OSH, centred on mastering safely new technologies, improve work organisation and qualification. Such networks imply the wider concept of OSH wich logically leads to holistic and integrative approaches. The Federal Institute of Occupational Safety and Medicin (BAuA) conceived and supported such networks. Some structural characteristics of such networks are especially the combination of partners,

- research institutions
- research application agencies
- companies from industries and crafts
- consultants
- chambers of commerce and industry, of crafts, professional associations

- institutions of further education and training, schools and universities,
- to name the most important ones. The transmission of specific know-how and competences including the mastering of new and innovative technologies as well as the social and problem solving qualifications are in the focus of such networks.

They develop jointly in interdisciplinary teams media and methods for qualification, offer consultancy and professional assistance. The underlying OSH concepts eventually serve as a catalyst or vehicle for fostering qualification and improved competence not only in OSH but at the same time in the mastering of recent technologies, new forms of cooperation and approaches to clients and markets. Customer orientation as a major objective contributes significantly to improved technological standards by those participating in the activities. It fosters better competitiveness of the actors and companies involved.

First empirical studies showed rather positive assessments of those participating in network activities. They stressed the manifold aspects contributing to better competitiveness by improved competence, better cooperation on markets and improved productivity of labour together with better working conditions and more attractive tasks.

A major network "OSH in Welding" has been developed over the years along these lines; financial Federal assistance was given in establishing part of this network in East Germany after unification, successfully. Actors of this network have produced over the years a wide variety of media and curricula for teaching and training; competence and demonstration centres were established and are used widely by a broad range of OSHs. The network has been extended to Europe, West and East, and has also international partners. A theoretical and practical examination with quality and OSH as major features is compulsory for welding in many fields. The qualification processes and the professional advice rendered by these centres provide at the same time technological and professional competence which is reflected in marketable products and services.

Part of a programme of model projects for the adaptation of the new Länder in East Germany to the European standards and levels were again competence and demonstration centres - mainly in the crafts - for

- stonemasons and stone sculptors
- the automotive trades and
- building control technologies, involving several trades.

The concepts developed and practiced included an even wider range of network partners at times. The range of topics covered (cf. automotive trades centre) could naturally not stop at pure OSH topics; the following topics became important and integrated parts of the parcel:

- plant layout
- the whole business process of repair and maintenance in such plants
- the technology of exhaust checks
- all processes and technology of body repair
- storage and administration of spare parts
- organisation and technology of disposed and recyclable materials
- office and administration planning, including VDU and EDP
- space for social purposes (sanitary, rest, training)

All aspects as formulated in the recent German law on OSH have been covered, including ecology, qualification, business administration, efficiency and competitiveness as managerial objectives - a holistic approach. In a way, this centre became a "pilgrimage place"... All

these centres were initially supported by funds of the Federal Ministry of Labour and Social Affairs under the condition that after an agreed period of a few years they had to be sustained independent of such support. At present, all seem to work within a reasonable economic environment. There is a mixed finances by contributions, fees for teaching, training, consultancy and paid projects for third parties.

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Occupational Safety & Health as a Competitive Factor

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The purpose of occupational safety and health is to prevent harmful incidents, which, however, are not visible and cannot be calculated in terms of economic consequences - nothing has happened in actuality. Because of these methodical problems, it is conveniently but erroneously assumed that all industrial accidents and work-related diseases can be prevented. The real accident rates and cases of illness - i.e., incidents that have not yet been prevented - thus constitute the reduction potential, which expresses the benefit of occupational safety and health.

Attempts are often made to calculate this benefit on the basis of so-called accident or lost-time cost calculations. This method however, has proven to be impractical in terms of business economics, as is evident from comprehensive studies conducted at 16 companies in various branches of industry and size categories. It is generally not possible to demonstrate a causal connection between individual occupational safety and health measures and incidents that did not take place - the accident that was prevented or the disease that was avoided. Working days lost only have an impact on a company's financial results if planned production can no longer be achieved by appropriate substitutional measures. Built-in flexibility, reserve capacity or planned and unplanned production buffers (organizational slack) are in most cases able to prevent loss of production time.

In addition, reduction potential is not all there is to it. Contemporary occupational safety and health is much more than just the prevention of undesired incidents. Occupational health and safety can become a competitive factor if it is integrated into the business management of the company. The following hypotheses will show that occupational safety and health really does have the effect of enhancing the position and competitiveness of companies, and give an idea of how these can be developed.

Hypothesis 1): Occupational safety and health guarantees undisturbed production

From the point of view of business economics, occupational safety and health helps prevent production interruptions. Occupational safety and health already existed in businesses before there were any legal obligations or EU directives whatsoever enforcing it, for no company could or can do business without at least a minimal guarantee against lost time. Moreover, protection against unforeseen events promotes the continuity of the production process and, consequently, the planning and observance of deadlines. Industrial accidents and absenteeism due to sickness constitute interruptions of the production process, resulting in production losses, down-time, lost time and loss of materials. Occupational safety and health prevents or at least reduces losses of production and resources.

Hypothesis 2): Occupational safety and health leads to improved productivity

Prevention of accident- or disease-related losses of resources saves on production costs. The same holds true for production losses that would result in profit losses.

- Guaranteeing uninterrupted production prevents or reduces time lost through absenteeism and fluctuations. Personnel presence is increased and the need for personnel buffers and the availability of specialists reduced.
- High levels of attendance, employability and willingness to work can only be achieved when accidents, occupational diseases and work-related diseases are efficiently prevented. Preventive occupational safety and health provides companies with the instruments to achieve these.
- An efficiently managed corporate occupational safety and health control system is, therefore, an essential prerequisite for the introduction of innovative production and service concepts. After all, the objective of process innovations is to use resources more profitably than before.
- The increasing application of "lean" production concepts in Europe illustrates what is meant by this: the "trimming down" of expendable production buffers and capacity. But with minimized or even reduced personnel and production buffers, the reliable employability and willingness to work of the remaining core of employees becomes more and more important. Without preventive occupational safety and health, companies would be at the mercy of accident- and disease-related production interruptions. Systematically planned occupational safety and health is thus a vital prerequisite for new production concepts.

Hypothesis 3): Occupational safety and health promotes product and process quality

Occupational safety and health elevates the standards of product and process quality by decreasing the number of rejects as well as the need for subsequent processing. In addition, an autonomous safety system can be expected to result in process innovation synergies. Increased individual responsibility for safety and health results in employees having a keener eye for improved and uninterrupted production processes.

- The greater internal availability of production factors that can be attained with occupational safety and health makes for a more flexible production process.
- Safe working procedures encourage systematic awareness of corporate bottlenecks and consequently facilitate the finding of solutions.
- Occupational safety and health requires work in circle work, which often generates production-related proposals for improvement (continual processes of improvement!).
- Working in teams on occupational safety and health reinforces individual responsibility for methodical production and the willingness to participate in process innovations.

Hypothesis 4): Occupational safety and health results in a direct reduction of personnel costs and ancillary labour costs

Improvement of the health rate (= reduction in the number of employees absent from work owing to sickness) is a corporate objective with direct monetary effects. It reduces:

- accident insurance premiums because of the lower category;
- continued payment of wages where disability has been prevented;

- the costs of personnel buffers (e.g. substitutes), which become obsolete in the long term.
- Companies in the Federal Republic of Germany spend over DM 60 billion (more than ECU 30 billion) a year on continued payment of wages and salaries alone.

Hypothesis 5): Indirect reduction of personnel costs and ancillary labour costs through relief of social insurance

Expenditure for preventive occupational safety and health measures is counterbalanced by a relief of pressure on social insurance. Because of the reduced ancillary labour costs, this benefits all parties involved, especially companies.

- Loss of production due to disability amounts to over DM 90 billion a year (approx. ECU 45 billion). Approximately the same amount is spent on treatment and rehabilitation (for the five major disease categories in 1990: DM 87 billion). Twenty to 30 per cent of these are work-related (according to Scandinavian research results), that is to say, they can be prevented by means of occupational safety and health measures.
- The German Federal Association of Corporate Health Insurance Funds also studied how loss of production can be divided over the different types of disease. Musculoskeletal diseases account for the largest part: 31% or DM 28.5 billion (approx. ECU 14 billion).

Although the amount of savings that can be obtained with health promotion can be estimated at 20 to 30 per cent of all disabilities, it is still not known what kind of prevention expenses would be needed to actually prevent up to approx. 27 billion (approx. ECU 13 billion) in national loss of production (in Germany).

The necessary information in this respect is generally also lacking in individual companies. It will first have to be elaborated and made ascertainable as part of occupational safety and health controlling. Specific control of the efficiency of the corporate occupational safety and health system requires a univocal, methodical set of instruments, the outlines of which have now been sketched.

Hypothesis 6): The use of occupational safety and health as a corporate competitive factor supports integrated efficiency management

Occupational safety and health is not really a new competitive factor. What is new is that it is now taken into account in management decisions in an integrated and controlled manner. Only then can its competitive effects be fully developed.

This requires that decisions in the realm of occupational safety and health be prepared and tested, as is customary in business management. Appropriate instruments are Extended Economic Efficiency Calculations and Efficiency Management Controlling using key indices (e.g. the "costs of uninterrupted working hours") and occupational safety and health controlling.

Hypothesis 7): Limits of occupational safety and health as a competitive factor

Management of occupational safety and health as an integral part of corporate planning and controlling processes largely eludes standardization due to the necessarily individual and company-specific structure. The corporate circumstances (size, economic branch, organizational form, corporate philosophy, etc.) and the options of integration into developed management systems are too diverse.

- The great majority of companies in Europe are small and medium-sized businesses. These companies need a simple and practical system for the integration of occupational safety and health into planning and control, a system that is not too burdensome.
- Occupational safety and health management requires flexible, integrated and company-specific control and monitoring methods. Regulations that are too strict are neither necessary nor helpful. Instead, a customer-oriented consultation system geared to the corporate interests should be developed.
- Occupational safety and health as a product's added value depends on the clients' willingness to pay. It may be clear that an ergonomically sound car can be sold for more money than a non-ergonomic one. Whether this car was made under healthy working conditions should only be of interest to customers when this brings about a decrease in costs and, therefore, price. Very few customers would be prepared to accept a higher price because of better working conditions during production.

Summary

Occupational safety and health as a competitive factor is only of significance to companies when it is integrated as a corporate objective and managed by appropriate controlling methods. It is to be embedded in the business management systems of the company in order for it to become a natural element of corporate decisions. Yet each company has to determine for itself which requirements uninterrupted production has to meet - even beyond the standards set by the law and in EU Directives.

In actual practice, an important target quantity is the so-called health rate - the percentage of personnel that is present in relation to the personnel complement as a whole. The development of the health rate at Volkswagen AG, for instance, illustrates how a single indicator can influence the results of a process of continuous improvement of the occupational safety and health system. In the period from 1988 to 1995, disability was reduced by over three percentage points, and the company has still not yet reached the point where further improvement of the health situation would be more expensive than the attainable cost savings. The new orientation of occupational safety and health toward optimization and integration rather than minimization and isolation is directed at the changing role of occupational safety and health providers. Rather than reacting in a defensive and peremptory way, they must start seeing their role in terms of active cooperation in the optimization of corporate processes. Occupational safety and health should not only make its contributions in terms of enhancing a company's position and reinforcing its competitive strength, but it should also make it possible to plan and quantify these contributions. This boils down to the fact that business-like thinking and acting must become an intrinsic part of occupational safety and health.

Contingent versus genuinely joined interests

Uses and structure of economic arguments to improve occupational health and safety

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OHS-enlightenment as marketing a professional group

"According to the law, each death costs the company about \$5 .. and each cripple costs \$10 ... These compensations are due so long as the company does not introduce certain precautionary measures. But they have calculated that the four hundred casualties a year cost less than would the necessary precautions. The company therefore does not introduce them" (Weber, in Stearns 1980:22).

Technology, economy, politics and society have changed since Weber described the scant value of workers' life and limb around the turn of the century. However, the economy of occupational health and safety (OHS) investments remains of fundamental importance. Their costs and benefits (C/B) have since long been calculated. Parallel to the rise of economics as the dominant paradigm of explanation in society, the number of and attention to such C/B studies has grown rapidly since the 1980s. Of this, the Hague conference and the accompanying Dutch R&D program are prominent examples.

Yet to realise much of the potential for OHS-prevention of the prolific C/Bs, we have to critically examine their arguments, like those of any OHS expertise. The applicability of the economic arguments may be considerably less than what is often claimed. The rationalistic idea that C/B information will improve OHS - because employers and workers are assumed to base their OHS decisions on such calculations - is but a new variety of the old OHS enlightenment strategy. For more than century various professional groups have seen OHS as one of many arenas, in which they have struggled for recognition. Safety engineers, physicians and psychologists each have their paradigm to explain the social problem of OHS. Through these, each profession tries to define what is essential of all the complex workplace reality (Berger & Luckmann, 1967). Thereby they imply, that if we hired their expertise, they could give tell us how to improve OHS (see Frick, 1994: chap 3; Quinlan & Bohle, 1991: chap 2 and 11; Dwyer, 1991; Rabinbach, 1990; Wyatt 1995).

Now, the economists try to corner the large OHS market. They claim that if we employ their professional techniques and spread their results, this new form of enlightenment will reduce injuries and diseases at work. And partly this true, as it is with the other professions. We certainly need a lot of expertise to combat OHS-problems. However, the problem with the economical, and indeed any model, is its misuse. Models do not describe reality. They are simplifying mental constructions, deliberately excluding most aspects, according to each models paradigm of explanation. To apply a model as a means to explain and to solve real problems therefore always requires a cautious, non-exact interpretation.

The knowledge of how to use each model, and especially its inherent limitations and margins of error, is a part of the professional competence of the group using it. However, professions are more active in promoting their expertise than in enlightening their potential customers of the limits to their knowledge. OHS-models have therefore been misused. E.g., explanations of accidents as unsafe behaviour, disregard the social and organisational mechanisms which causes errors and risky behaviour (Perrow, 1986:244; Wyatt, 1995). Likewise, the scientific model - so successful in developing abatement techniques - is grossly misapplied when the social phenomena of inaction is explained as lack of scientific knowledge (e.g., in Ds 1990:88). The belief that C/B of OHS will be applied by employers and workers, as if they were "economic men", also confuses the (economic) model with reality and disregards its assumptions and limitations. In this way, the economists continue the old natural science pseudo-explanation of social processes. They only interject an extra link of C/B in this mechanic model of decisions on OHS.

"The most important thing in evaluating a cost benefit study is the name of the sponsor "

Economic arguments on OHS are thus mitigated through complex social processes. The information about C/Bs which support OHS investments seem so far to have had little impact on actual management (see Frick, 1997, on management resistance to such arguments). There are also two problems of methodology within the C/Bs of OHS, which at best may make them difficult to apply and at worst may seriously misguide OHS policies.

Firstly, there is a quality or reliability problem: As the economy of OHS is complex, C/Bs of OHS often have a questionable methodology. This easily makes them biased towards suitable conclusions. The infamous vinyl chloride case and other similar made the US Congress conclude that "the most important thing in evaluating a cost benefit study is the name of the sponsor" (Wilson, 1985:16). Likewise many too crude economic regulations have given employers stronger incitements to manipulate statistics than to improve OHS at work (UAW, 1987; Larsson & Clayton, 1994; Hopkins, 1995:32).

To implement more of the knowledge of the profitability of improving OHS we thus need to elevate the whole C/B discourse to a new and more mature level. Not only are most of the very many calculations of a poor quality. Few even try to improve their methodological quality by comparing their C/B with other. Instead, writers seldom even mention that many other, and only slightly different, models already exist. To be of use, new models must have a much higher quality than most of the many existing ones (but there are exceptions, see e.g. Berger, 1995; and Ruttenberg, 1983 and 1994 for more ambitious C/B studies). Even then, no C/B can be properly applied without a critical examinations of how its assumptions fit the existing situation,. This requirement is at present rarely fulfilled.

OHS effects on personnel costs are only the tip of the iceberg

Secondly, there is a problem of relevance or validity: The methodological difficulties make C/Bs of OHS focus mainly on what they (think they) can measure and calculate, not on what is important. If this is not corrected, economic arguments for OHS may instead of promoting joint interests to develop work and production, lead to new arenas of conflict between

employers and workers. The large majority of OHS C/Bs focus on the costs of an uncertain and insufficient labour supply, because of accidents, turnover and absenteeism (Frick, 1996). Around the turn of the century, the budding corps of safety engineers started to calculate the costs of accidents at work, to show the profitability of their profession. In 1917, US Steel claimed that they invested US \$ 0,7 million in safety annually which gave them a return of \$1,6 million (Dwyer, 1991:50). After World War II many more such calculations have been made (Andreoni, 1986; Schneider, 1986). Du Pont maintained that in 1970 their cost for each lost-day accident was some \$30.000 (Webber, 1973) while a recent British estimate claimed only \$150 per lost day (HSE, 1993:16). But most calculations arrive at a cost level of some \$400–3.000 per accident with injury (Andreoni, *ibid*; Söderqvist & Persson, 1988).

The costs to employers of uncertain and insufficient labour supply have also been counted. Especially since the 1950s, economists and others have calculated the costs of turnover and - with greater difficulty - absenteeism (Orkan, 1974; Goodman & Atkin, 1984; Walsh, 1991). In Sweden, the unusually strong labour market between 1950-90 made it hard to recruit and keep personnel in unpopular jobs. Volvo and other employers therefore built new factories, like Kalmar and Uddevalla, to satisfy the increasing demands for better jobs and work environment. It also led them to promote studies of absenteeism and turnover. These studies estimated the economic consequences for individuals, for employers and for society and they paid more than usual attention to the influence of the poor work environment (Jönsson & Svensson, 1979).

Sick leave has in Sweden been estimated to cost from \$8 to 80 (at a 1988 price level) per hour for workers, mainly depending on their tasks in production. But even a conservative estimate of \$60 per day is far above the traditional view among Swedish employers that this was free for them, as the sick pay was paid by a public insurance. Since 1991 the (reduced) wages for the first fortnight are paid by the employers. Yet, these calculations show that the costs of disturbances in production usually amount to much more than the wages. On labour turnover, both the levels and uncertainty of the estimates are adequately summarised in Gröjer & Johansson (1991:40). They estimate the standard costs for turnover of three types of employees to be around \$ 4-5 000 for an unskilled worker, \$15 000 for a skilled worker or a lower salaried employee and some \$40 000 for a higher salaried employee. The costs of personnel problems caused by poor OHS may be considerable, especially for society at large. Yet, for the employer they are only the visible tip of the iceberg of economic effects of OHS. Accidents, sick leave and to quit are single events, while conditions of work, workers and their work output continuously interact. Only when the OHS is so poor that workers either cannot or do not want to work, that this iceberg of ongoing economic OHS effects manifests itself in the tip of absenteeism, registered injury or turnover.

The danger with this focus on the visible tip of OHS costs is that they depend on so much else than conditions at work. A lot of these costs can be cut simply by reducing social benefits, as indeed has been done in Sweden and in many other countries exactly for this reason. These costs are also largely dependent on strength of the labour market. Now, when Sweden has a "normal" European unemployment level, turnover is rarely a problem. And after many workers with poor health have been laid off - partly C/Bs because managers had

been alerted to the labour costs of sick workers - and the sick pay reduced, absenteeism has also dropped sharply.

How much it pays for individual employers to invest in OHS to secure labour, thus also depends on external circumstances, especially the balance of power on the labour market. The position workers have as "job customers" on that market, determines how they can choose and - by way of exit - demand better jobs. And as OHS improvements to buy labour are compromises of interests, at levels set by the balance of bargaining power. employers often use political means to reduce labours alternatives, in place of paying for "expensive" OHS investments. Also within enterprises the burden of poor OHS is transferred unto the workers, through strict regulations of "safe behaviour" in hazardous environments, through prescribing personal protection, through a selection of the strongest and the least sensitive and through health promotion to make workers live more healthy lifestyles (Boonstra, 1985). Finally, as mentioned above, when it is the figures which matter, claims management is often more important than prevention.

Though often useful within single organisations, OHS C/Bs on labour costs should be used carefully and the attention of both research and information (i.e. propaganda) should be turned to the effects of OHS on productivity. Equally important is to spread the message that very many improvements can be made at low costs. This partly requires available OHS expertise but especially integration of OHS into management and extensive participation to use the experience and competence of the workers. The official EU policy of promoting competitiveness through more competent and productive labour plus the fact of an ageing and thus more experienced workforce, both points to that OHS C/B must emphasise the quality of work output much more than the quantity of labour costs.

The berg of ice - OHS's ongoing productivity effects

Work environment improvements which are made profitable because they may reduce labour turnover and absenteeism thus represents compromises of interests, at levels determined by the balance of bargaining power between employers and employees. To make OHS and profits actually join interests, improvements have to more directly benefit the efficiency of production. That reduced work hazards can increase productivity, has also been shown in some studies. Measures aimed at e.g. abating noise, heavy lifting, polluted air have at the same time cut expenses for heating, the handling of materials and waste. Likewise, work accidents analyses show how preventive safety also can avoid damages to material, machinery and products (Andreoni, 1986:9 and 30). Especially companies with hazardous production therefore see prevention of normal accidents as a safeguard against catastrophes (Kjellén, 1990:238; Dawson, 1991:13-5).

Other studies bring to light how noise, too hard work, poor lighting, difficult postures and other shortcomings of the work environment prevent employees from doing a good job. Eklund (1992:2 and 11) found that ergonomically poor work - besides more injuries - led to multiplied quality faults and reduced quality motivation among assembly workers. In a chocolate factory management invested in continuous improvements of the food industry's traditionally poor work environment. The reason was that the women around the production lines - despite their machine paced and unskilled tasks - greatly influenced the net output of the expensive raw materials. Their motivation, competence and ability to work well was therefore of great economic importance (Frick, 1986). To improve the very poor work

environment for a group of maintenance workers, a special service platform was developed in a steel mill. This not only led to reduced labour turnover and absenteeism but also to improved maintenance quality. With higher product quality, fewer stops and a faster production flow, the OHS-investment became extremely profitable (Broms et al, 1991; cf. McLeod, 1995, and Goldmann & Lindbergson, 1991:78 for similar examples). The 60 examples of work environment improvements in four countries in Oxenburgh (1991) also gave a rapid return on their investments, through cut labour costs, increased efficiency, technical rationalisations etc.

Stay clear of the bergs: Cheap solutions align interests

Yet, the results of C/Bs do not only depend on their revenues, but on that these are higher than the costs (cf. Cutler & James, 1994:6). In practice, low abatement costs are at least as important as high revenues in order to align of OHS- and profit-interests. As was discussed above, when not only the ill-health of poor work environments is seen to be expensive but also the measures to improve them, employers often try to avoid the latter costs by shifting the burden of preventing damages unto the employees.

When improvements are cheap this conflict is, however, greatly reduced. Employers then have little reason to avoid costly ill-health problems by other means than by reducing the causes in the work environment. The significance and possibility of this is less noticed in the political OHS-debate, but the practical literature is full of advice on how costs of reducing risks can be cut, often sharply, with technical competence and by integrating measures into other changes of production. Prevention is often estimated to cost at most 20 percent of so called add-on solutions, i.e. extra measures added to the existing production system (Ahlman 1985). The difference may be even greater, as the latter often are cumbersome and disturb production while safety, noise reduction, etc. often can be achieved simply and efficiently by making minor changes on the drawing board (Malmholt, 1984, Kiil & Heide, 1986).

Furthermore, despite regular protests that increased OHS-demands would ruin the affected industries, stricter OHS-regulations have in many instances turned out to be cheap, or even profitable. They have forced companies to adopt or develop new and more efficient technologies (Marx, 1974:215; Olsen, 1992; Ruttenberg, 1994). A well-known example is vinyl chloride. The proposed drastically reduced HTV was first claimed to be technically impossible by the producers, and then to be ruinous. In the end, the required changes became an impetus of modernisation into a more profitable industry (OTA, 1985:332; Corn, 1991:26). Even in ongoing production, there are abundant examples of how important improvements can be made by simple and cheap means. E.g. noise can be reduced by exchange of tools, by inserting pieces of rubber etc. (Arbetskydds-fonden, 1977). A nozzle on pressured air guns, which muffles the noise to less than a fifth (from ca 100 to 85 dbA), costs only \$4. Simply making inventories - to be able to discard hazardous chemicals - has often also led to reduced costs of purchasing and of handling of materials (Magnusson, 1987; Oxenburgh, 1991:chap 8).

Summing up the different views on OHS profitability

Many other cases could be cited of considerable improvements at low costs and of the high costs of doing nothing. The work environment literature is full of them (as it is of cases where abatement is expensive and in open conflict with the profit motive). There is no need to continue the enumeration. The sum of individual cases, however great their number, cannot define a general rule on when the OHS- and the profit-motives are compatible and when they are in conflict. But what these examples thoroughly demonstrate is that, when you take in account their total economic effects and use the most efficient means, very many risks at work are profitable to abate.

This does not eliminate all conflicts. OHS and profits remain separate interests. While they may be possible to combine in many cases, antagonism between them can and will often occur. In such instances, ethically or otherwise motivated measures have to use other means to be implemented against the opposition of a necessarily profit oriented management. Although economic self interest cannot be permitted alone to rule the level of OHS, these studies reveal that there are vast opportunities to jointly increase OHS and profitability at work. Market mechanisms can and should thus also be used as a major factor to promote a better management of occupational health and safety. These different profitabilities of OHS can be expressed graphically (figure 1), as on how many improvements alternative curves of cost and of revenues meet:

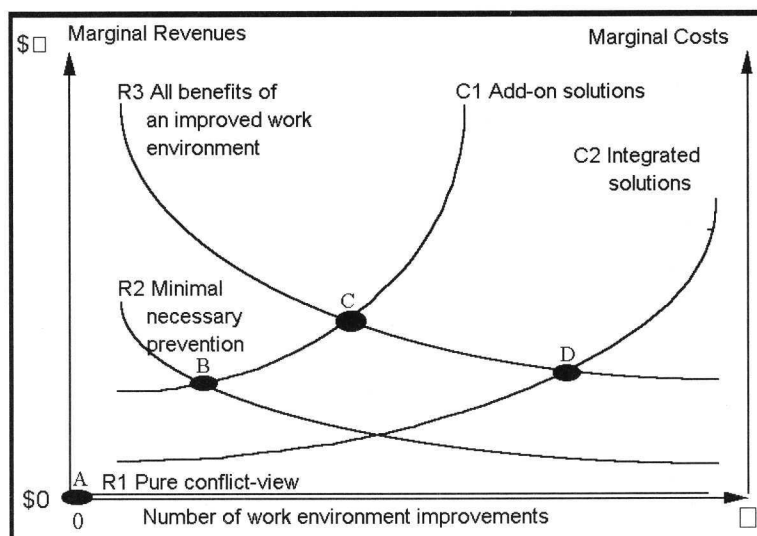


Figure 1 Number of profitable work environment improvements under different assumptions of their costs and revenues

- A. When all possible benefits of work environment improvements are disregarded, the revenue curve R1 is flat, at zero, and only "meets" the cost curve at no measures at all.

- B. Experience has taught many employers that the environment of work also is that of production. A minimum level of safety is thus necessary, i.e. profitable (curve R2). However, as single, remedial measures, they are usually of the costly add-on type, i.e. cost curve C1. In this conservative view few improvements are profitable.
- C. More and more studies show how an improved work environment can promote both the supply and the productivity of labour and be a means of rationalisation. Risk abatements can therefore greatly reduce expenses, which make more of them profitable (revenue curve R3), but they are still limited, as the high costs for add-on solutions must be compensated with high revenues.
- D. With learning and experience of how to abate important risks through integrated and cheap measures, abatement costs will gradually drop to curve C2¹. Then small revenues are enough to pay the improvements, which makes a large additional number of them profitable.

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Notes

1. The costs of in C2 are much lower than in C1 for several reasons. Lower expenses when abatements are integrated into planned changes of production are most important. There is also an economy of scale, when one has invested in learning cost-effective methods for the intended results. Some writers on product quality maintain that the cost curve is rising slowly even when you approach zero defects, if you only do it right from the beginning. According to Lillrank & Kano (1989, p 34-35) Japanese quality thinking therefore rejects the idea that quality costs and, accordingly, the western idea of quality assurance as opposed to quality control for a continuous improvement.

The Added Value of Total Health & Safety Management

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Introduction

In the "safety pays" philosophy, or the policy to create economic incentives for Occupational Health & Safety (OHS), the axiom is that it is generally in the company's economic interest to invest in OHS; this interest is supposed to trigger (further) improvements in OHS Management.

In economic terms this implies the assumption that OHS Management generates *added value* for enterprises. The management process then focuses on enlarging or optimizing the added value; this requires regular performance measurement and feedback to management decisions. Indeed we observe a growing interest in performance indicators for OHS Management both at policy level (HSE 1993), and at company or sector level (Van Steen 1996). In a broader perspective similar developments can also be found in quality management and environmental management (Zwetsloot 1994, ISO 1996).

The traditional performance indicators of OHS Management, e.g. accident rates and sickness absence percentages are, however, not very useful for this purpose: for SMEs and bigger companies with a relatively good performance they are statistically unreliable. Furthermore they are by nature rather a mirror of the past than predictors of future performance. The tables 1 and 2 give some examples of conventional performance indicators, and the main draw-backs of this category of indicators.

Table 1 Examples of conventional performance indicators (at system level)

-
- frequency of loss time accidents
 - total recorded incidents
 - sickness absence (total percentage; frequencies for short- and long absence)
 - frequency of occupational diseases, disability etc.
-

Table 2 Main draw backs of conventional performance indicators for OHS

-
- focus on things that go wrong instead of things that go right
 - have no or poor predictive value
 - loose their management relevance in the case of good performance
 - are statistically unreliable in SMEs
-

Potential areas of added value

Contrastingly, it is not difficult to define areas where OHS Management might generate added values at company level. Examples are the potential contribution of OHS Management to:

- * attractiveness at the labour market;
- * financial business results; losses due to poor OHS Management, influence on premiums;
- * reliability of production processes;
- * the motivation and involvement of personnel;
- * the capability to innovate;
- * the societal company image/reputation;
- * quality and/or environmental management;

We are therefore interested in what we call non-conventional performance indicators for OHS Management that focus on the positive values of Occupational Health & Safety for companies. Some relevant findings of other authors in working in the same direction are given in (Worksafe Australia 1994, Budworth (1996), and BSI (1996).

An overview of the main differences and similarities with more conventional cost/benefit approaches is given in table 3.

Table 3 Overview of differences and similarities of current cost/benefit approaches and the approach to increase the added value of OHS Management

current cost/benefit approaches of OHS	our approach: increasing the added value of OHS Management
aim: to identify the <i>economic optimum</i> for OHS	aim: to trigger <i>continuous improvement</i> of OHS Management and OHS performance
main users: <i>OHS experts</i> that want to promote OHS measures in terms of money.	main users: <i>managers</i> that want to improve the quality of their organization through OHS Management
economic focus: on <i>return of investment</i>	economic focus: on <i>positive target values of the organisation</i> and the <i>added value generated by OHS management</i>
OHS focus: on cost and benefits of <i>discrete measures</i>	OHS focus: on <i>system/organizational level</i> ; this includes the coordination of all measures and the interaction with the underlying business processes

Challenge

The central aim in our research project was to develop a set of performance indicators, that enable top managers to get steering information for OHS Management.

This information should make it possible to (further) improve OHS Performance, and/or to improve the general management and organization through OHS Management.

Methods

A research project carried out in 1996 explores the experiences with the use of what we called "non conventional" performance indicators (some authors prefer the term positive performance indicators -Worksafe Australia 1994-, or proactive performance indicators -BSI 1996). The aim was to identify and analyze experiences of frontrunner firms, with measuring the above mentioned types of added values, the use of performance indicators (e.g. in the decision making process or in benchmarking), and associated management information systems. The research includes assessment of relevant experiences in The Netherlands and, to a lesser extend, the UK.

In the Netherlands we used the snowball method to identify companies with relevant experiences, combined with a fact finding workshop with auditors from the Dutch Labour Inspectorate.

For experience in the UK we identified key informants, and interviewed them by E-mail, Fax and Phone to exchange experiences.

Results: a model for Total Health & Safety Management

We have clustered the relevant performance indicators that were identified, according to the model inspired by the self assessment model for Total Quality Management of the European Foundation for Quality Management (EFQM 1994, Hardjono & Hes 1994). The model that was constructed in this way consists of 13 performance areas, and we called it the model for Total Health & Safety Management; seven of thirteen areas are *enablers*, the other six represent *results*. These are shown in figure 1.

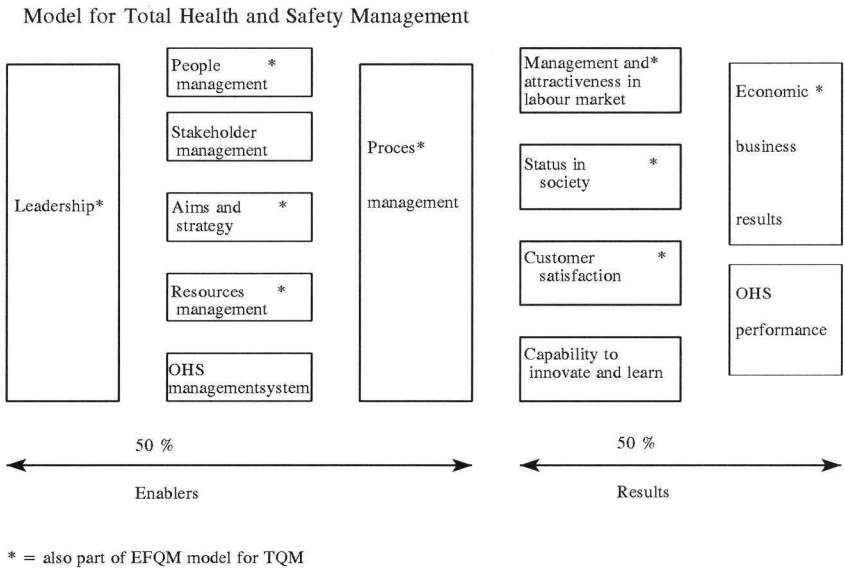


Figure 1

For each area a set of 4-10 relevant subindicators has been identified.

We use the terms enablers and results, following the EFQM 1994 approach; the same terminology is used by Conti (1993), Hardjono & Hes (1994), INSEAD (1997).

The *enablers* represent added value because they improve the company's structural ability to generate values, to improve OHS and to predict future performance. The *results* represent added value because they measure both the concrete and intangible values that are decisive for the company's continuity and the continuous improvement of OHS (compare to quality management -Conti 1992- and environmental management -INSEAD 1997). The same differentiation into two categories is found by others that do not follow the EFQM approach; some use different terms for the same concepts. E.g. enablers are called "performance indicators" by ISO (1996), and proactive indicators by BSI (1996); results are called "impact indicators" by ISO (1996).

Now we give two examples of the items that are addressed in the boxes of the Total Health & Safety Management model: People Management and Worker's motivation/Attractiveness at the labour market.

People management (enabler area)

- personal policy (age conscious Human Resources Management, personnel mirrors organizational environment, career planning - support in case of problems)
- support in case of sickness absence
- use of the knowledge and creativity of people
- team work
- job content offers room for initiatives, involvement by improvements
- development of competencies / learning processes / employability
- competence and qualification

Attractiveness at labour market (result area)

- capability to attract scarce personnel
- percentages women, age categories, minorities etc (per job level, compared to supply at the local labour market)
- number of open solicitations
- job leave
- employee satisfaction

Discussion

Performance Indicators are in potential a very important management tool and should be -to a large extend- specific for the company and reflect the maturity of OHS management in this company. Sets of indicators should be simple and easy to use. Every Performance Indicator should generate an added value in itself. Experience with the use of sets of indicators is still in its infancy.

The results show that there is a growing interest of companies in OHS performance indicators. Enablers are more often used than non-conventional performance indicators.

Proactive management of OHS added value seems to be a rare exception still; the state-of-the-art is not very advanced, especially when compared to similar areas of management, e.g. quality management (EFQM 1994) or environmental management (ISO 1996).

The model that has been developed offers an interesting framework that needs further elaboration. First of all, the model could be developed to a self-assessment model for companies; such a model could also be used to compare the performances of individual companies, e.g. for bench marking reasons.

Compared with the more traditional cost benefit approach OHS that aim at the development of economic arguments for the investment in the improvement of OHS we see several differences. The often implicit assumption of traditional approaches is that this will lead to a better involvement of top managers, because managers are used to speak the *language of money*. However, we think that, just as with quality management, this is only true to a very limited extend. In fact traditional cost benefit approaches primarily dominantly help OHS experts to communicate in terms of money with managers; this is certainly no guarantee that this is the language of the managers themselves (compare Conti 1992).

In our view, for taking the managers as the primary target group, it is most important to know what are the concerns of the managers, and then to assess the added value of OHS Management in these terms. In other words, OHS Management should be more strategic, that is geared to the company's goals. These goals are usually broader than only monetary considerations.

The optimum point exists only in a given, fixed situation. The continuous pursuit of improvement (and the developments in the *state-of-the-art* technology) will continually generate opportunities for a positive shift of the "optimum". Total Health & Safety Management then develops to the art of maximising added value and minimizing costs of OHS Management.

In that case a discussion on the micro-economics of OHS must therefore begin with the *target values* the company wants to achieve through its processes (values for customers and other external stakeholders, values for internal stakeholders like the employees, and other values that are relevant to the company).

Perspectives

More than conventional cost/benefit approaches, our findings make it possible to measure the added value of OHS Management and to express this in the language of managers. This may contribute to the development of more strategic policies for OHS.

However, our findings are not yet very concrete; further research and development is needed to get concrete and validated measurement tools for companies. We intend to carry out further developments in close cooperation with the users: companies and their managers.

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5 Company policies

Introduction

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It has been noted many times, that preventive action at the company level is crucial and has large impact for the national level as well.

Where it comes to stimulate companies to take preventive action, three issues seem to be of major importance:

- convincing that safety and health problems and its related absenteeism can have a serious financial impact, and, at the same time to overcome the misconception that health and safety costs are uncontrollable.
- showing that models for reliable estimation of cost and benefits of preventive activities are available;
- demonstrations of successful interventions in a wide range of different companies.

This chapter is about these three aspects of the marketing of occupational safety and health to companies. The case of workplace health promotion is a good demonstration of the aspects of marketing to business and the role cost benefit analysis. Also the effectiveness of financial arguments is discussed in this context.

Demonstrating the importance of health and safety at work

Creating awareness is one of the essential step towards improvement. One way to do this is to stress the costs that are incurred by bad working conditions and absenteeism. Muto studied the costs of occupational safety and health in four larger Japanese companies. His findings are that the losses in these companies vary between 4.4 and 6.4 percent of the total payroll. Preventive action (improving facilities and equipment) are not included. From the same four cases Itoh concludes that absenteeism is a common component in cost of OSH studies at the company level. However, the actual situation within the company is very important. In the companies studies lost working days are not an immanent threat to the companies. As Japanese companies have a legal obligation to pay insurance premiums, the costs of absenteeism are not an effective incentive to health promotion.

Demonstrations of profitable OSH activities are presented by Brandenburg, Graça, and Engels. Brandenburg indicates that various intervention programmes at Volkswagen AG have proven to give economic benefits. The cost of the OSH program at VAG is about 38 DM per car or 605 DM per worker per year. With regard to the use of economic motives he concludes that the economic benefit is not the sole argument, also company philosophy and non monetary values are pursued.

In 1992 a comprehensive health promotion project was initiated in nursing homes in The Netherlands. Engels describes the findings of an ergonomic-educational programme, aimed at reduction of physical exertion and harmful working postures. From the study it results

that some reductions in perceived physical workload were statistical significant. For future research, cost-benefit evaluations are suggested to gain insight in the effectiveness of ergonomic-educational programmes.

A short example for a Portuguese municipality is presented by Graça.

Workplace health promotion: marketing to business

Where workplace health promotion is concerned, it seems that application and practice is ahead of research, most programmes in practice are more integrated than in research. Concepts on workplace health promotion are still to be developed, and there seems to be no understanding of what workplace health promotion is. The importance of cost-benefit analysis is secondary: practical programmes are not based on research and it is important to show that these programmes work and only after that cost-benefit analysis is relevant. Cox and Griffiths argue that few workplace health programmes are evaluated and even less are evaluated adequately. Nevertheless, in health promotion as an applied science, evaluation is a critical part. The problem is that there is no general evaluation model available, objectives are not clearly formulated and measures are poorly developed. Their general conclusion is the good company health programmes work at three levels: the individual, the public health level and the socio-economic level. A good programme provides fast feedback on the results.

The need for "hard" evaluations in occupational health promotion and education programmes is also stressed by Boraston. From a literature survey he concludes that evaluations are a link between employee involvement and management integration. The evaluations should not only give evidence of cost savings, but also demonstrate reductions in risk exposure, improved health and participation.

Wynne explores the options of marketing workplace health promotion. In literature efforts to market workplace health promotion are often framed in a cost-effectiveness context. However, in company decision making, generally involves a large number of stakeholders with potentially different interests. Workplace health promotion finds itself (among other) in a context of economics and legislation, new trends in management practice and structures of decision making. Cost-benefit analysis may not be the best tool to market workplace health promotion in this context.

Gründemann evaluates the activities and achievements of companies with respect to reduction of absenteeism. He distinguishes four types of measures (procedural, preventive work oriented, preventive person-oriented and reintegration measures). In the Member States of the EU there is a great emphasis on procedural activities to reduce absenteeism whereas preventive actions are taking place at a modest scale. Successful approaches have a number of characteristics, including systematic approach, commitment and a treatment of workplace absenteeism as a normal phenomenon. Gründemann concludes that the costs and benefits are hard to calculate as estimation models are just emerging, the estimation procedure is labour-intensive in itself and foremost because preventive activities and reduction of absenteeism cannot be linked axiomatically.

Special attention is given to stress prevention in the workplace. Figures from Costa and Verborgh indicate that 28% of the European workers is affected by stress, a figure that is rising. According to Kompier, the economics of stress prevention is little developed. Stress

prevention programmes generally do not include outcome variables that can be expressed in terms of money (like productivity and absenteeism). However, in order to increase the impact of stress prevention to organisational decision making, it is important to address these 'hard' outcomes. An analysis of ten cases shows that sick leave is often the starting point of a stress prevention programme. In six of the cases, sick leaves dropped significantly.

Conclusions

The common implication for policy development is that well evaluated studies are scarce and can hardly be used as a marketing tool. Better studies are needed but the required research is expensive. Moreover, the effectiveness of more research for marketing purposes is uncertain. An adequate evaluation model is a prerequisite, as badly evaluated studies hinder more than they help.

The role of cost-benefit analysis appears to be rather limited. Evaluation models are not as just fit to give clear insight in the economics of health promotion and workplace improvements. Sound estimation methods will contribute to the credibility. However, methodological difficulties can make the results of cost-benefit estimations questionable. Therefore, not everything must be expressed in terms of money.

The lack of practical cost-benefit evaluations underlines this. More important, the effectiveness of the cost-benefit argument in promoting improvements at work is doubted. It is better to show that health promotion programmes work, preferably in company language. For cost-benefit evaluation this should be "accountancy" language.

Costs of Occupational Health and Safety in Japanese companies

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Abstract

This study was conducted to clarify the costs of occupational health and safety (OHS) services in Japanese companies. The fiscal 1995 costs of health and safety of fiscal 1995 in four large companies were analyzed. Total costs for health and safety ranged from \$2,790 to \$5,055 with a mean of US\$3,918. Direct costs constituted 94% of total costs, while indirect costs were only 6% of total costs. The proportion of health and safety costs to total payroll ranged from 4.4% to 6.4% with a mean of 5.5%. Health insurance premiums were the main component of direct costs, constituting 68% of the total. Worker's accident compensation insurance (WACI) premium and working environment ranked second and third, representing 15% and 5%, respectively, of total direct costs. Companies spent US\$1,168 for each employee on OHS, which constituted 32% of total costs, while health insurance premiums constituted the remaining 68%. The proportion of WACI premium to the total payroll was 0.8%. The proportion of WACI premium to total cost of OHS was 47%.

Introduction

With the continuing economic recession in recent years in Japan, industries are more and more concerned with the cost of occupational health and safety (OHS). The evolving partnership between occupational health personnel and the business community is contingent upon the awareness of cost control associated with preventive and clinical services. It is, therefore, very important to delineate OHS costs in order to make plans to decrease them. In spite of the importance of OHS cost analysis, however, there are very few studies in Japan reporting on costs related to OHS. Although the Japan Federation of Employers' Associations (JFEA) (1) surveys the cost of health care every year, indirect costs and the costs of improving the working environment and work conditions are not included in the survey, making it difficult to estimate the total costs of OHS. This study was conducted to clarify OHS costs in Japanese companies.

Methods

Four companies were selected as subjects of this study. The profiles of subject companies are shown in table 1. They consisted of an automobile company, a chemical company, an electronics company, and a railway company. They were all large companies with minimum of 1,339 employees and maximum of 18,469 employees. Ninety-four percent of employees were male. The average age of employees was 40.2. On average, they had 3.3 occupational physicians, 8.0 occupational health nurses and 1.8 pharmacists.

One of the main reasons for selecting these companies for the survey was that their occupational health staffs were very cooperative. Because of the time required to prepare data for this study, cooperation of occupational health staff was indispensable. The other

reason for selecting these companies was that the number of employees was large enough to estimate costs. Questions in the questionnaire were asked to be completed by persons in charge of accounting or OHS.

The survey was conducted via mailed questionnaire in November 1996. Items in the questionnaire included total payroll, costs of health and safety, and demographic items such as type of industry, number and mean age of employees, and number of OHS professionals. Total payroll included salaries, wages, allowances and bonuses, but retirement allowances, fringe benefits and costs of safety and health were not included. Items of costs included human resources, premises and facilities, general management, management of work environment and working method, employee health checkups, health insurance premium, health promotion, and indirect costs. In order to estimate indirect costs, time spent in attending safety and health committees, waiting time at company dispensaries, time spent on health guidance, health education and promotion were calculated. Indirect costs were calculated by multiplying time by the employee mean wage.

In this study, payroll and costs were described per employee per year, and were calculated by dividing the total payroll or costs by the total number of employees in 1995.

As the exchange rate, 1US\$=100 yen was used.

Table 1 Profiles of Subject Companies

	Companies				Mean
	A	B	C	D	
Number of Employees	1,339	2,448	11,800	18,469	8,514
Male	1,027	2,093	17,532	8,038	8,037
Female	312	355	937	476	476
Average Age of Employees	40.3	42.2	43.5	37.9	40.2
Number of OPs	1	1	6	5	3.3
Number of OHNs	1	4	24	3	8.0
Number of Pharmacists	1	1	5	0	1.8

Ops : Occupational Physicians

OHNs : Occupational Health Nurses

Results

The total payroll ranged from \$58,200 to \$98,700, with a mean of \$71,900. Total costs for health and safety ranged from \$2,790 to \$5,055, with a mean of \$3,918. Direct costs constituted 94% of total costs, while indirect costs constituted only 6% of total costs. The proportion of health and safety costs to total payroll ranged from 4.4% to 6.4% with a mean of 5.5% (table 2).

Table 2 Health and Safety Costs in Japanese Companies (\$/employee/year)

	Companies				
	Mean				
Total Payroll (A)	98,700	62,900	67,800	58,200	71,900
Direct Costs (B)	4,520	2,750	3,800	3,600	3,668
Indirect Costs (C)	535	40	277	146	250
Total Costs (D = B + C)	5,055	2,790	4,077	3,746	3,918
Proportion of Costs (D/A)(%)	5.1	4.4	6.0	6.4	5.5

Health insurance premiums accounted for most of the direct costs, constituting 68% of the total (table 3). Worker's accident compensation insurance (WACI) premiums and the costs of improving the working environment ranked second and third, representing 15% and 7%, respectively, of the total of direct costs. Manpower costs were 4.8% of all direct costs.

Table 3 Direct Costs of Health and Safety in Japanese Companies /employee/year (%):%

	Companies				
	Mean				
Manpower	178 (3.9)	140 (5.1)	310 (8.2)	80 (2.2)	177 (4.8)
Facilities and Equipment	50 (1.1)	50 (1.8)	20 (0.5)	20 (0.6)	35 (1.0)
General Management	20 (0.4)	20 (0.7)	10 (0.3)	10 (0.3)	15 (0.4)
Working Environment	0 (0.0)	20 (0.7)	60 (1.6)	1,000 (27.8)	270 (7.4)
Work Management	0 (0.0)	30 (1.1)	20 (0.5)	120 (3.3)	43 (1.2)
Health Examination	40 (0.8)	20 (0.7)	100 (2.6)	100 (2.8)	65 (1.8)
Health Promotion	2 (0.0)	10 (0.4)	20 (0.5)	30 (0.8)	16 (0.4)
WACI Premium	1,130 (25.0)	260 (9.5)	460 (12.1)	340 (9.4)	548 (14.9)
Health Insurance Premium	3,100 (68.6)	2,200 (80.0)	2,800 (73.7)	1,900 (52.8)	2,500 (68.2)
Total	4,520 (100.0)	2,750 (100.0)	3,800 (100.0)	3,600 (100.0)	3,668 (100.0)

WACI: Workers Accident Compensation Insurance

Table 4 shows a comparison of direct costs of OHS between this study and JFEA. Both total payroll and health insurance premiums were greater in the companies chosen for this study than in the JFEA companies. The direct cost of OHS (C + D + E, in Table 4) in this study were almost double those of JFEA. The proportion of health insurance premiums to total payroll was 3.5% and 3.7%, respectively, in this study and in that conducted by JFEA.

The proportion of WACI premiums to total payroll was 0.8% and 0.5% in these studies, respectively. The proportion of WACI premiums to total costs of OHS was 47% and 50%, respectively.

Table 4 Comparison of direct costs of our study with those of results
Conducted by the JFEA\$/employee/year

		This Study	JFEA
Total Payroll	(A)	71,900	61,609
Health Insurance Premium	(B)	2,500	2,278
WACI Premium	(C)	548	329
Safety and Health	(D)	600	103
Health Care	(E)		226
Total (B + C + D + E)	(F)	3,668	2,936
OHS (C + D + E)	(G)	1,168	658
B/A (%)		3.5	3.7
C/A (%)		0.8	0.5
C/G (%)		46.9	50.0
WACI	: Workers Accident Compensation Insurance		
JFEA	: The Japan Federation of Employers' Associations		

Discussion

This is one of the few studies which clarified the costs of OHS services in Japanese companies. In the JFEA survey, the costs of OHS include safety protective wear (safety gloves, safety glasses, etc.), health checkups, measurement of the work environment, and safety and health education. Namely, the cost of improving facilities and equipment were not included in the JFEA survey. In this sense, our survey seems to reflect the real costs of health and safety in occupational settings in Japan.

Direct costs of health and safety in Japanese companies were shown to be \$3,668. This is nearly compatible with the \$3,510 in the USA reported by the Health Care Financing Administration in 1994 (2). The national average cost per employee for medical benefits was US\$3,250 in the USA in 1990 (3).

According to previous studies, indirect costs range from 20% of total costs to ten times direct costs (4-6). In this study, indirect costs were negligible, and there was a great difference between the indirect costs of one company and another. This may be a reflection of the difficulty in defining and measuring indirect costs (7).

The proportion of health and safety costs to total payroll was shown to be 5.5%. This figure is greater than that (4.8%) obtained by the JFEA survey. This difference may reflect indirect costs and the cost of improving the working environment and work conditions which were not included in the JFEA survey.

Insurance premium costs were almost the same in the two studies. These figures are far below those of the USA where medical benefits costs exceed 13% of the total payroll (8). The amounts of health insurance premiums are determined by the Health Insurance Society, and WACI premiums are determined by regulations issued by the Ministry of Labor, therefore, they are difficult to decrease. Occupational health staff is required to provide workers with OHS services with a limited budget.

Weakness of this study should be mentioned. In this study, questions were completed by persons in charge of accounting or OHS. Information on payroll and company costs are usually confidential issues at companies. It is, therefore, difficult to assess the reliability and validity of the information provided. Other drawbacks include non-random sampling and the small sample size. All the subject companies were large companies with more than 1,000 employees, and these constitute only less than 0.2% of all Japanese companies (9). The companies selected as study subjects should not be regarded as a representative sample of all Japanese companies, and caution should be exercised in making generalizations based on this study.

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Costs of leaves of absence due to illness and accidents in Japanese companies

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Abstract

Leaves of absence due to illness or work-related accidents is a serious problem that decreases the productivity of many companies, but it is still not fully understood in terms of loss of wages and working hours. This study investigated the costs of leaves of absence due to illness and accidents as an indirect expense concerning OHS (Occupational Health Service) in four major companies. Health insurance represented the highest cost, with worker's accident compensation insurance premiums second. Wages for lost working hours during leaves of absence ranked third, with the portion of total wages represented by those lost wages ranging from 0.07% to 0.16%. The cost of lost working hours due to preliminary meetings for reinstallation was calculated as 0.02% of total wages. The wage for replacement workers showed a similar ratio. However, generalization cannot be made based on these results due to the insufficient sample size. Nonetheless, the results seemed to indicate the difficulty of reducing the cost of leaves of absence in Japan.

Introduction

Worker's leaves of absence due to illness and accidents place a great burden on many companies. In particular, as Japanese society ages, this burden is expected to increase. Reducing this cost has already become a major problem, therefore, the health promotion as a preventive manner is considered an important aspect of this effort. Unfortunately, few studies have been conducted concerning the cost of leaves of absence. In this study, we report on the cost of leaves of absence in four major Japanese companies. Reduced illness and injuries associated with increased morale, productivity and competitiveness can play important dividends that may lend themselves to quantification. Although it will be difficult to grasp all benefit and savings, it should be possible to show a rather return.

Methods

The four major companies consisted of a chemical company, an electronics manufacturing company, a railway company, and an automobile company, which were surveyed by questionnaire concerning the cost of six items during fiscal 1995. These items were health insurance fees, worker's accident compensation insurance premiums, gifts of money to injured workers, wage compensation by the company for lost working hours during leaves of absence, wages to replacement workers, and hours spent in preliminary meetings held by health care staff to reinstall workers in their former positions. Each of these companies had between 1,000 and 10,000 employees.(shown in Table.1) The cost of hours spent in preliminary meetings was calculated by multiplying the number of hours by the number of persons participating and the average employee wage. Costs per employee were calculated by dividing the total cost by the number of employees. In the case of work-related illness

or accident, costs for medical treatment and leaves of absence are paid by the company or through the worker's accident compensation insurance (WACI). On the other hand, in the case of non-work-related illness, costs are paid by the company or through health insurance. Therefore, these two insurance fees were included in the cost of leaves of absence. In this study, the currency exchange rate used was 1US\$= 100 yen .

Table 1 profiles of Subject Companies

	Companies				Mean
	A	B	C	D	
Type of Industry	Chemical	electronics manufacturing	railway	Automobile	
Number of Employees	1,339	2,448	11,800	18,469	8,514
Male	1,027	2,093	11,500	17,532	8,038
Female	312	355	300	937	476
Average Age of Employee	40.3	42.2	43.5	37.9	40.2

Table 2 Costs concerning Leaves of Absence in Japanese Companies (\$/employee/year)

	Companies				
	A	B	C	D	Mean
Total Payroll (A)	98,700	62,900	67,800	58,200	71,900
Direct Costs	4,520	2,750	3,800	3,600	3,668
1) Health Insurance Premiums	3,100	2,200	2,800	1,900	2,500
2) Workers Accident Compensation Insurance Premiums	1,130	260	460	340	548
3) Gift of Money to the Injured Worker	15	22	21	14	18
4) Wage Compensated by the Company for the Lost Hours	24	29	18	25	24
5) Wage for the Replacement Worker	22	28	14	unknown	21
6) Wage to the Spent Hours of Preliminary Meeting to Return	26	19	25	unknown	23
Total (B) (the sum of NO.1 to NO.6)	4,317	2,558	3,338	2,279	3,134
B/A %	4.37	4.07	4.92	3.92	4.36
Total (C) (the sum of NO.3 to NO.6)	87	98	78	39	86
C/A %	0.09	0.16	0.12	0.07	0.12

Direct costs means the total of the costs for facilities and equipment, general management, working environment, work management, health promotion, health checkups, and insurances.

Results

The total annual wages per employee per year were \$70,000. As the total annual working hours were nearly 1,900 hours, the hourly wage per employee was \$36.8. The highest cost was for health insurance, with worker's accident compensation insurance premiums second. Wages for lost working hours during leaves of absence ranked third, and the portion of total wages represented by these lost wages ranged from 0.07% to 0.16%. The cost of lost working hours resulting from preliminary meetings for reinstallation was calculated as 0.02% of total wages. The wages for replacement workers showed similar percentage. The total cost of the six items was 3%-5 % of the total wages paid by the companies, and 5%-30% of the ordinary profit of the companies. (shown in table 2)

There was no evidence that an increase in the number of medical staff members decreased expenses for accidents and illness.

Discussion

According to Walsh et al¹, "Leaves of absence are the most frequently measured component of indirect costs", but the definitions of leaves of absence are often unclear.

Boden² noted that workers' compensation systems can reduce the need for litigation. Though litigation is still not an urgent problem in Japan, it will become more so in the future, and costs for preparing for the litigation or maintaining it should be counted in the near future. This is one of the few studies³⁻⁴ that has clarified the costs involved in leaves of absence. In Actual company policies and various financial arrangements can affect reported leaves of absence. The results of our study show that, at present, wages for lost working hours during leaves of absence are not imminent threat to the health of the companies surveyed. However if the absent employee plays a decision-making role of the company, recalculation taking into account added value is required. Because the insurance fees that a company must bear are determined by Japanese law, such costs are difficult to reduce. Therefore finding ways to reduce other aspects of the costs involved is a key to effective health promotion. The implementation of cost analysis in the occupational health field seems to be a contributing factor in cost savings.

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What do European Companies do to reduce absenteeism associated with Ill health

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Introduction: the underlying framework

Workplace absenteeism related to ill health is a phenomenon which is influenced by a large number of factors. In the absenteeism study of the European Foundation (Grundemann & van Vuuren, 1997) the process of becoming ill, being absent from work, recovering and resuming work, is viewed as a result of a (mis)fit between the person and the environment (Van Dijk et al., 1990, French, Caplan & Harrison, 1982). This means that health problems may arise as a result of a discrepancy between the workload (demands and requirements) and the capacity of the worker (abilities and skills). Depending on the attendance motivation and the pressure to attend which refer to the opportunity and the need for absenteeism - health problems result in incapacity for work or absenteeism (Nicholson, 1977, Steers & Rhodes, 1978). These last factors are reflected in the so called 'absenteeism barrier'. Return to work depends on the course of the illness and the 'reintegration barrier'. By the reintegration barrier is meant the totality of the factors which affect the course of the illness and the return to work (for example the actions of the doctor acting for the insurance company, attachment to the company, the availability of specially adapted work, waiting times in medical care sector, etc.). This whole process is in turn influenced by individual factors, company and workplace factors, and societal factors. In the figure this framework (based on De Groot, 1958, Philipsen, 1969, Van Dijk et al., 1990, Veerman, 1991) is represented schematically.

Types of intervention

Four types of interventions can be distinguished, which attack different elements in this framework. The first kinds of intervention are **procedural measures**, which are aimed at raising the absenteeism barrier; these are measures for the monitoring and control of absenteeism. This could be keeping detailed attendance records, requiring medical verifications for reported illnesses, employing a sick visitor, using financial incentives such as forfeiting a day's holiday in the event of illness and giving a bonus in the event of no absenteeism and disciplinary measures like warnings and punishment. The measures are therefore aimed at reducing the need for absenteeism in employees and/or the opportunity for absenteeism. Contrary to the other three types of interventions here discussed, the use of procedural measures will in general not have an effect on the health of the employees. These measures will only make employees - with or without health problems - to report oneself sick earlier or later depending on how tight the procedures are, or to attend work despite feeling unwell.

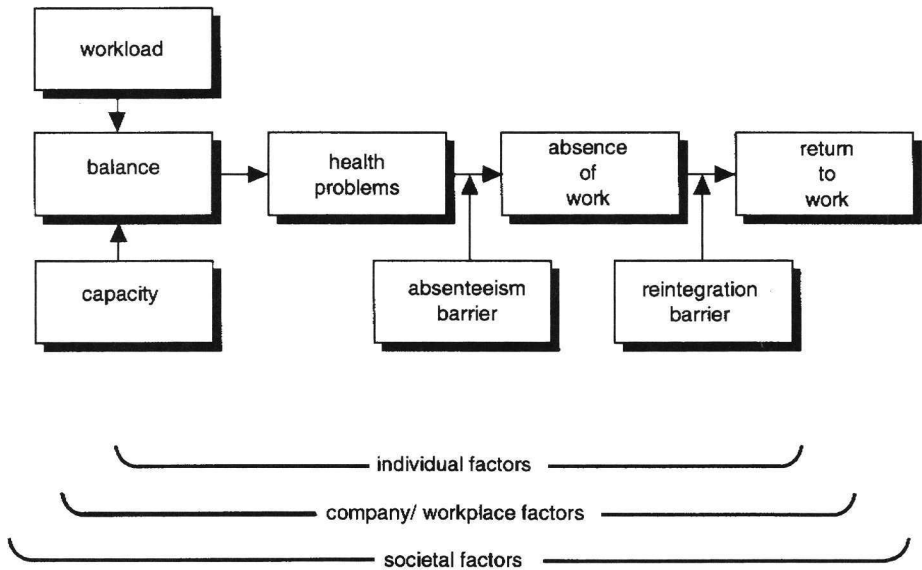


Figure 1 The process of becoming ill, being absent from work, recovering and return to work.

The second and third kinds of intervention are intended to prevent employees from getting ill. These preventive measures are work-oriented and person-oriented respectively.

Preventive work-oriented measures aim to reduce the discrepancy between workload and capacity by reducing the workload. This is done by removing the work-related causes of the problems in the area of safety, health and well-being. This means that aspects are tackled, for example by acquiring safer equipment, climate control, rotation of tasks, better information system, work organisation, safety management etc.

Preventive person-oriented measures are those in which employees are supported to work (and live) in a safe and healthy way. These person-oriented measures aim to improve the balance between workload and capacity by increasing the capacity of individuals. Here one can make a distinction between training courses which are more in the field of safety and others which are more in the field of health or well-being. These measures include activities such as training in the use of personal protection equipment, lifting courses, lifestyle activities (food, smoking, alcohol, exercise), cancer screening, physiotherapists, training courses on work consultation and courses on stress management.

The last types of intervention aimed at reducing workplace absenteeism are **reintegration measures**. These measures aim to lower the reintegration barrier and to accelerate the return to work of sick employees. This can be achieved through support by managers (maintaining contact, participating in a socio-medical team; meetings between the company management, company doctor and personnel officer on cases of absenteeism), medical care by the company

medical service (medical surgery, physiotherapy, treatment by private specialists) and direct reintegration activities (drafting a return plan, offering specially adapted work, rehabilitation).

The daily practice of absenteeism reduction at the workplace

With reference to the four types of intervention, general practice in reducing absenteeism related to ill health can be described for the Member States of the EU and Norway. This description is based on the information from the national correspondents. They have been asked to answer to give information on aspects as:

What is being done in your country to reduce absenteeism related to ill health? Which general patterns can be distinguished?

On basis of the descriptions of the national correspondents a slightly fragmented picture emerges of the strategies used in the Member states of the European Union and Norway to reduce workplace absenteeism.

It is striking that all correspondents report a great emphasis on procedural measures to reduce workplace absenteeism in their country.

Although on the subject of reducing absenteeism the employers' organisations often argue in favour of the introduction of financial incentives for employees to prevent misuse of social regulations, these kinds of measures do not occur very frequently in practise. Bonuses to encourage attendance and reductions in benefits are mentioned by the Portuguese, Italian and the Belgium correspondents. Research has shown that one must not have exaggerated expectations of the effects of these incentives. Generally there is a short-term effect. In various investigations counter-productive effects were also noted.

Procedural actions can also be aimed at monitoring and control like the absence strategy in Belgium which is limited to a check on the legitimacy of the absence by an independent monitoring physician. These procedural activities do not help automatically the employees to recover earlier, they can even make the health of the workers worse as was the fear of the Norwegian trade union representatives. Procedural actions can make employees reluctant to stay off work or make them to start working too early and therefore the employees risk that in the end they will be sick (again) for a longer period than was necessary. In general one can say that procedural measures are only good to prevent misuse of absenteeism regulations, but at most do not prevent ill health. Combating absenteeism related to ill health by tackling the underlying problems by way of preventive activities and encouraging resumption of work by long-term absentees therefore seems to offer greater prospects than the use of these kinds of procedural measures.

Despite the introduction of the European Framework Directive on Health and Safety in almost all member states, prevention activities at the workplace are still taking place only on a modest scale in most European countries. There appear to be some regional differences, such that, in Southern European countries preventive measures are aimed more at the improvement of work environments for safety and health, while in Northern European countries, more emphasis is put upon promoting the health and well-being of employees.

Preventive measures are often limited to person-oriented activities such as education and not directed at the work-related causes of ill health. This is a missed opportunity, because

workoriented preventive measures can reduce absenteeism to a large extent. For example, it emerged from a important Norwegian evaluation research project that the twenty to thirty per cent of companies which had focused clearly on improving working conditions were most successful in reducing absenteeism. In those places the level of absenteeism fell on average by 10% a year.

Reintegration activities are not very common (yet) as an intervention strategy at the workplace to reduce absenteeism related to ill health in the Member States of the European Union and Norway. This is remarkable, because the absence percentage is most influenced by the scale of long-term absenteeism. Experience in the Nordic countries shows that much could be achieved through reintegration measures as a means of reducing absenteeism. Interesting initiatives include the establishment by the Danish government of a centre for work adaptation for partially disabled and the endorsement of the 'maintenance of work ability programme' by the Finnish government (Ilmarinen, 1995).

To summarize: there is great emphasis on procedural measures to reduce workplace absenteeism; prevention activities at the workplace are still taking place only on a modest scale and are often limited to person-oriented activities; and reintegrative activities are not very common (yet) as an intervention strategy.

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What do European Companies achieve to reduce absenteeism associated with ill health

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Introduction

In most European countries initiatives are undertaken to promote health at work and to reduce workplace absenteeism. Examples of good practice from 23 workplaces have been described and analysed (Gründemann & Van Vuuren, 1997a). The examples are taken from eight European countries: Austria, Belgium, Germany, Italy, the Netherlands, Norway, Portugal and the United Kingdom, in which research was made as part of the project 'Ill health and workplace absenteeism: initiatives for prevention' organised by the European Foundation for the Improvement of Living and Working Conditions (Gründemann & Van Vuuren, 1997b). The examples covers a wide range of sectors: industrial companies (food, meat, chemicals, glass, earthenware, ceramics, metal, motor vehicle parts, cars assembly, construction) and services (post, transport, cleaning service, hospital, utility, sewage and waste treatment, printing), sizes (from 66 to 200.000 employees) and private as well as public companies.

The companies have been selected because they are dealing with the absenteeism problem in a more systematic way than most other companies in their country. The cases are consequently not a representative selection of workplace activities. The case studies take place in the forefront of companies which are more active than others in the field of absenteeism and working conditions. The companies often opt for new innovative activities to reduce ill-health absenteeism. But 'being ahead of one's time' at the national level does not necessarily mean that one is also doing something which is innovative at an international level. In this way the companies also demonstrate the fact that the various countries in Europe can learn from each other in case of reducing absenteeism related with ill health.

The information about the case studies is based on interviews with representatives of employers and employees. Interviews were generally conducted with the head of personnel affairs, the company doctor and a member of the works council or a trade union representative. As far as possible an attempt was made to speak to those who were primarily responsible for the activities undertaken in the organization or those who were most closely involved.

Successful approaches

Although 'hard' impact data are often lacking the analyses give a rather clear picture of the aspects which are of importance to successfully reducing absenteeism. These factors are:

- a systematic approach;
- a co-ordinating project team;

- clear tasks and responsibilities for the persons involved in the activities;
- active support from senior and line management;
- an active role for employees and the recognition of employees as experts;
- good information and communication with all staff;
- involvement of the personnel department, the company medical service or external guidance;
- involvement of the workers council, the safety, health and well-being committee or trade unions;
- a balanced package of measures and
- the treatment of workplace absenteeism as a normal company phenomenon.

Systematic approach

It is important that workplace initiatives directed at the reduction of absenteeism related to ill health go beyond a piecemeal response to health problems as they arise, so that they address problems before they become serious through a systematic and comprehensive approach to improve the health of the workforce. An approach based on the 'policy cycle of problem solving' seems to work well in practice. This includes different steps such as: preparation of the project; investigation of the health problems; organising solutions before interventions are carried out; and evaluation of the impact.

Co-ordinating project team

The success of a workplace project on absenteeism and ill health depends on a number of factors, of which the main one is the building of a committed project team which has a clear brief to manage and implement the project. This project team can be established by adapting the existing workplace structures or by setting up a new team.

Clear tasks and responsibilities

An essential feature of any workplace activity is an explicit agreement at the beginning of the project concerning its scope, the resources that are needed and the tasks and responsibilities of the project team and other stakeholders. These agreements may be formal or informal, depending on the culture of the company.

Support of senior and line management

Active involvement of higher management is a key for the success of workplace initiatives; not only at the beginning of the project but also at the later stages. This increases the identity of the project within the organization, facilitates decision-making and is of decisive importance for the implementation of measures and the cooperation of middle management and workers.

Active worker participation

Employee participation should be an explicit goal in designing a prevention project, because it is a condition for programme effectiveness. Workers are the primary experts on their work and work environment. Furthermore they are the first and most affected persons by good or bad working conditions. So they are the experts and they have a major interest. It is efficient and effective to make use of their creative and problem solving capacity. Besides

health benefits - as the objective of the prevention project - can only be achieved through employee participation. Health improvement cannot be inflicted on employees from above.

Good information and communication

There are two groups who must be informed of the progress of the absenteeism initiative. Firstly there are the participants themselves who should be informed about the developing programme. Secondly there is a need to communicate progress to management structures within the organisation. Good communications are an essential requirement for integrating health improvement measures into organisational policy and practice.

Active involvement of personnel management, occupational health service and external guidance

The participation of the personnel department and the OHS can help middle management to reduce ill-health absenteeism, but should not absolve middle managers from responsibility for the handling of absenteeism. The involvement of outside parties may increase the credibility of the project and enhance the sense of objectivity. It often makes it easier to initiate a project and promotes closer collaboration between the different parties within an organization. During the project outside experts must, however, endeavour to build upon the existing know-how and helps the organization itself to identify and resolve problems.

Involvement of work councils, health & safety committees and trade unions

It appears that participation of the works council or H&S committee members contributes to good results, while the participation of trade unions appears less important for positive effects. It may be that works council members and H&S committee members are more involved with matters of content, while the trade unions are more involved as formal representatives.

Balanced package of measures

A balanced package of measures also appears to be related to the successful reduction of workplace absenteeism. A balanced approach involves procedural measures to raise the absenteeism barrier and to make it less simple to report oneself sick, but also preventive measures focused on both the person and the work, through which health problems can be prevented. Finally reintegrative measures are important to lower the reintegration barrier and to facilitate the return to work of the sick employee.

The treatment of absenteeism related to ill-health as a normal company phenomenon

Finally absenteeism and ill health are common features confronting every workplace. They can have a great impact on the productivity and the competitive position of companies. It is important that companies realise this, and integrate measures to reduce absenteeism and ill health into their organisational policy and practice.

The positive influence of some of the factors seem to be contingent on the national context. The use of a project team and the participatory approach appeared to be more important in the Norwegian, UK, Dutch and German case studies. In the Belgian, Austrian, Portuguese

and Italian case studies the companies mostly used the existing structure in the organisation to coordinate the absenteeism activities and used participation by representation. But it must be clear that a workplace initiative can only be successful, when the activities are in line with the specific problems in the company and fit in the culture of organisation and the country.

Results

In order to evaluate the effects of the measures undertaken, in every case was checked whether workplace absenteeism has decreased amongst staff. In 18 of the 23 cases absenteeism had been reduced. In five cases absenteeism has remained at the same level. In three companies this was because absenteeism was already low.

The other gains resulting from the measures undertaken must be sought in an improvement in the working situation (improved physical environment, information provision, job content, decrease in work pressure, improved safety), relative participation in the measures, decrease in accidents, improved performance, reduction in extraordinary leave and disciplinary measures, increase in problem-solving capacity, positive attitude towards the measures undertaken, increase of the insight of employees and managers into their own role in reducing workplace absenteeism, increased satisfaction and/or motivation among staff. With a few companies, however, negative effects were (also) noted (for example social conflicts).

Costs and benefits

Facts on the costs and benefits of the projects turned out to be difficult to retrieve. In the literature also it appears that there is only a limited amount of data about costs and benefits of absenteeism activities available. It is striking that companies often set up such large-scale projects without a sound insight into the financial perspectives of these activities and that such an evaluation does not even take place after the event.

This may be connected with the fact that establishing the exact costs and benefits of these kinds of activities is in itself a labour-intensive and therefore costly chore, although recently some simulation models have been developed to assess the costs and benefits of health and safety activities at the workplace (Oxenburgh, 1991; NEI, 1995). In addition the cause (absenteeism activities) and effects (trends in absenteeism) cannot be linked together axiomatically. Even without targeted absenteeism activities there are trends from year to year in absenteeism.

Also many other activities are taking place at the same time which may affect absenteeism. Finally the question also presents itself how long the effects of the measures taken will persist. Companies involved turn out to calculate costs and benefits in widely differing ways. This leads to widely differing conclusions. In one project (public transport) a subsidy from the government was counted as a benefit, besides the decrease in the degree of absenteeism and working incapacity for the company. Two other companies (hospital and ceramics industry) included on the benefit side the savings achieved through the fall in absenteeism (as a percentage of the gross wage bill). The copper mine compared the actual absenteeism in the organization with the average absenteeism in the underground mining sector, according to international standards, and took this difference as a percentage of the wage costs saved as a benefit of the activities. In another case (metal industry) direct and indirect (wage) costs of decreased absenteeism were counted as benefits. For the sake of convenience the same

amount has been counted for the indirect absenteeism cost as for direct costs. With a building company on the other hand, only 30% of the reduction of absenteeism through illness (a percentage of the average wage costs) was counted as a result of the project. On the basis of statistical analyses (regression analysis) it was established that approximately 30% of the fall in absenteeism in the company could be attributed to the absenteeism activities. The difference in these methods of calculation between the most cautious (the construction company) and the most wide variant (public transport) amounts to at least a factor of six.

The extent to which companies attach importance to such calculations is open to question. Sometimes we get the impression that companies which require fuller substantiation of the costs and benefits of absenteeism and health activities, are actually looking for arguments to enable them to get not involved in such activities. For companies which do wish to develop those activities, a notion of a positive gain may be sufficient for them to set those activities in motion.

Another factor is that a large proportion of the gains, such as a better motivated workforce, an increased problem-solving capacity, better industrial relations, etc. cannot be immediately expressed in money terms. A broadly-based survey in eight countries in the European Union (Wynne & Clarkin, 1992) showed that many companies develop activities focusing on the health of their employees. The principal motives for undertaking these activities related to regulations and legislation and to promoting the motivation of the workforce. Many companies also reported positive gains as a result. Almost two-thirds of companies noted a reduction in absenteeism through illness as a result of the activities in the field of work and health. Other gains related to better motivation in the workforce (78% of companies), better health among employees (76%), increased productivity (62%) and a better company image (64%). It is not very plausible that these benefits should have been based on a statistical analysis.

This supports the assertion that companies which initiate real absenteeism and prevention activities do not generally require detailed statistical support. These companies often launch such activities based on a broader vision, in which costs and benefits are not the primary concern. An example of this is the UK company Unipart, which is heavily investing in its workforce by means of health-promotion activities, while absenteeism through illness is low. The costs of the measures are considerable, totalling over ECU 1.1 million (over ECU 600 per employee). In the company the motive cited for the health-promotion activities is that great value is attached to the workforce and that by investing in employees the company expects to be able to produce competitively. Unipart expects increasing numbers of changes in the work in the years ahead. The rapidly changing working conditions will lead to more stress and more physical and mental problems. The company's strategy aims to teach employees how to deal with this stress and to view change as a symptom of progress. Another example is the Dutch Waterland Hospital. The management of this hospital argues that it wishes to be an above-average hospital, both for patients and for staff. So that the image of the organisation is an important stimulus for initiating the absenteeism activities. One of the gains of the project is that the Waterland Hospital has no longer any problems in recruiting new staff, despite a tight labour market in the region. One can observe that 'pacesetting

companies' regard their staff differently and are prepared to invest in the health of their staff, even if the financial benefits cannot be precisely quantified in advance.

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Using Health Protection and Health Promotion to Increase Economic Efficiency

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Health Protection and Health Promotion at Volkswagen

At Volkswagen, the protection and promotion of the health of the workforce is considered a humanitarian and social obligation as well as an economic necessity - independent of legal stipulations (figure 1).

Health Protection and Health Promotion at Worksite

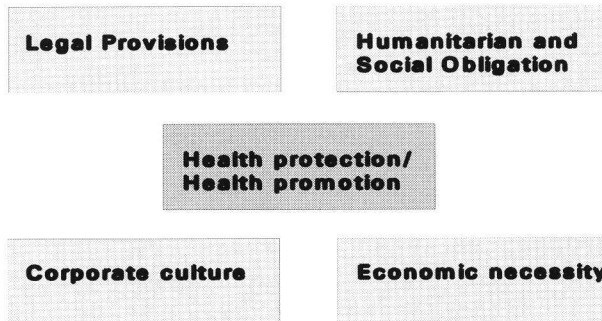


Figure 1 Health protection and health promotion at worksite

The objectives of the health department (figure 2) are to protect employees from health impairments and to promote their health in order to contribute to humanization of the workplace and, at the same time, to the profitability of the company.

In concrete terms this means that employees are to be protected against work-related health risks, and that their efficiency and willingness to work are to be maintained and promoted by means of medical care geared towards their specific needs, healthy working conditions, and specific measures to promote health. This should result in increased health rates and help to improve economic efficiency.

At Volkswagen, health protection and health promotion are considered a long-term process based on regular progress inspections and continuous improvement. This process is not limited to individual employees and their immediate places of work, but includes the company as a whole and its business environment.

Objectives of the Health Department

- To protect the workforce against all forms of health impairment
- To promote the health of the workforce
- To contribute to humanisation of the workplace
- In this way to contribute to the profitability of the company

Figure 2 Objectives of the health department

At Volkswagen, health protection and health promotion have a modular structure, as only this allows a problem-oriented and target-group-oriented approach. Examples of such modules can be found in figure 3. Pillars of this structure are ergonomic job design and employee participation.



Figure 3 Healthy people = healthy company

As regards the health care provided for employees, Volkswagen AG's health department is guided by a number of principles (figure 4):

- A holistic approach to health care and promotion
- Ergonomic job design given priority over other aspects
- Open dialogue with all those concerned with occupational health
- Active involvement of employees
- Problem-oriented and target-group-oriented approach
- Permanent, innovative development of health protection
- Consistent account taken of cost/benefit aspects.

Principles

- **Holistic approach to health care and promotion**
- **Priority accorded to health in the design of work over other aspects**
- **Frank dialogue with all those concerned with occupational health**
- **Active involvement of employees**
- **Problem-oriented and target-group-oriented approach**
- **Consistent account taken of cost/benefit aspects**

Figure 4 Principles

Costs and Benefits of Health Protection and Health Promotion

Health protection and health promotion always entail costs for any company. At Volkswagen, for instance, the direct costs for health protection, safety at work, environmental health, and occupational safety and health amount to DM 38 per manufactured vehicle, or DM 605 per employee.

At first glance, these costs are not balanced by any corresponding proceeds. The question, then, is whether health protection and health promotion "pay" at all. What is their economic benefit?

The question of the economic efficiency of activities related to health protection is a very legitimate one. After all, the available but limited resources must be used as efficiently as possible and misallocation avoided.

The question as to the economic benefits of health protection and health promotion is also important because

- (1) useful measures are often not taken because of inaccurate cost/benefit estimates, and
- (2) health protection programmes would be easier to implement if their monetary benefit could always be verified. Investments in health care usually require more argumentation and justification than investments in machinery.

For health protection activities based on legal obligations there is no question as to whether the measures will be implemented given the cost/benefit aspects. If a question is raised at all, it is that of how the measures can be implemented. In terms of cost-effectiveness, there is sometimes still a great margin of improvement.

The cost/benefit question is much more present for health protection activities a company introduces voluntarily. Then it is not primarily a question of how a measure will be implemented, but rather whether it will be introduced at all.

Cost/benefit analyses in the field of health protection are associated with numerous operationalization and measurement problems. Whereas costs can be determined more or less reliably, the measurement and valuation of benefits meets with considerable difficulties. The benefit of health protection consists largely in "soft", qualitative reflexes and the prevention of negative incidents.

The benefit of health protection and promotion can often not be precisely quantified or valued in monetary terms. "Prima facie evidence" is frequently required here: logic and experience speak for the benefits.

Improvement of Economic Efficiency due to Health Protection and Health Promotion

Nevertheless, there are health protection areas for which benefits can be expressed in monetary terms. Concrete examples at Volkswagen show that health protection and health promotion contribute to increased economic efficiency:

- (1) After outpatient medical care, over 97% of all patients return to the workplace (figure 5). In one plant, this resulted in a higher health rate and, consequently, a saving of DM 6 million.

Improvement of the health rate through industrial medicine measures - examples

Medical care

Outpatient/first-aid-posts - Hanover 1995

Total number of treatments:	70,090
of which referred to GP, specialist, company doctor	1,886
Return to work	68,204
	= 97.31 %

DM 6 million saved by a 0.5% health rate increase

Figure 5 Improvement of the health rate through industrial medicine measures - examples

- (2) The "skin" prevention programme resulted in a considerable decrease in the incidence of illness related to eczema, in time lost through absenteeism and in

occupational disease notifications in one plant (figure 6 and figure 7). The number of days lost due to absenteeism dropped from over 2,000 to a little under 1,000; occupational disease notifications fell from 30 to 6.

Improvement of the health rate through industrial medicine measures - examples

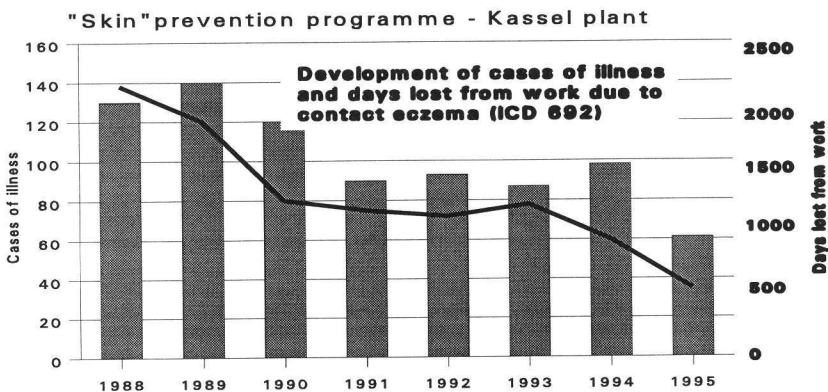


Figure 6 Improvement of the health rate trough industrial medicine measures - examples

Improvement of the health rate through industrial medicine measures - examples

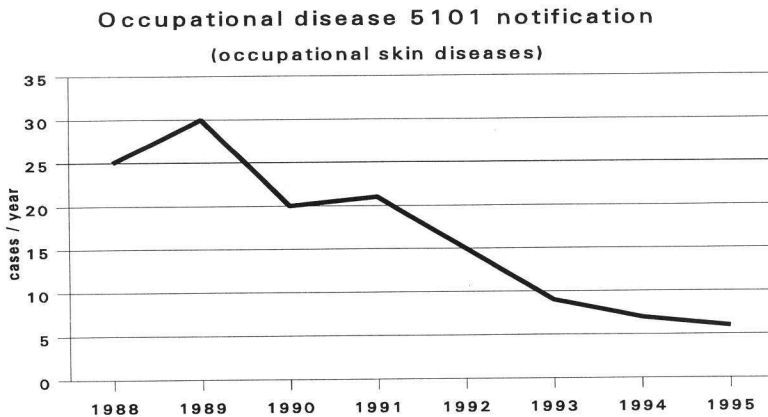


Figure 7 Improvement of the health rate trough industrial medicine measures - examples

- (3) A study we conducted showed that on-site physiotherapy has an economic effect (figure 8). While 8.4% of employees are referred to their GP with relevant complaints if no physiotherapy is offered, this was only 1.6% with on-site physiotherapy. In other words: 98.4% of employees were able to continue their work after treatment, while experience has taught that GPs prescribe an average of 1 week's rest at home.
- In one plant, physiotherapy measures resulted in 2,470 fewer sick days in 1996, representing a saving of some DM 1.2 million with personnel costs of DM 300,000 for physiotherapy.

Physiotherapy as part of health protection

	Referred to GP	Not referred to GP
Without physiotherapy	8,4 %	91,6 %
With physiotherapy	1,6 %	98,4 %

Significant differences ($p < 0.05$)

Source: Hannover Health Department

Figure 8 Physiotherapy as part of health protection

- (4) We made an integral cost comparison for noise control at a bodyworks operation. It showed that in this area of production investments in secondary noise control are economically justified (figure 9).

Integral cost comparison

Primary and secondary noise control over an investment term of 8 years
Example: surface area 250x24m, 3 transfer lines (each 50m long), 200 employees

	Alternative 1 Primary noise control	Alternative 2 Secondary noise control	Alternative 3 Without noise control
Investments E.g. damped welding cylinder, screen grids	1,050,000	1,043,000	915,000
Operating costs - Extra operating costs heating -ventilation	136,000	---	136,000
- Costs of health screening, ear protection, social security payments	257,000	---	257,000
Running costs over 8 years	393,000	---	393,000
Personnel costs (higher sickness rate, greater fluctuation)	750,000	---	750,000
Total	2,193,000	1,043,000	2,058,000
Extra costs compared with the secondary noise control alternative	1,150,000	---	1,015,000
Sound level	< 90 dB (A)	< 85 dB (A)	< 96 dB (A)
Retrofitting of total enclosure	1,500,000	---	1,500,000

Figure 9 Integral cost comparison

- (5) The elimination of certain forms of exposure resulted in fewer employees having to undergo special industrial medicine precautionary tests. This leads to cost savings of approx. DM 250,000 a year (figure. 10).

Exposure	Area	Number of employees	Duration of screening	Savings in DM/year	
chromium, lead	paint shop	800	18 months	Laboratory travelling time, onsulation time	48,000 43,000
sealant	paint shop	2,000	24 months	Laboratory, lung function, EKG travelling time, consulation time	80,000
noise	paint shop	1,000	36 months	Travelling time, consulation time	27,000
epoxy resin/ PVC adhesives	bodywork	500	36 months	Laboratory, travveling time, consulation time	13,000
isocyanate adhesives	Hall 54	400	24 months	Laboratory, lung function, tra- velling time, consulation time	16,000
climatic chamber	R&D	400	36 months	Laboratory, ergonomic tets, EKG, travelling time, consula- tion time	11,000

Figure 10 Cost savings when special occupational health screening are no longer necessary - examples from the wolfsburg plant

- (6) In one plant, the introduction of job design measures visibly reduced the number of permanent transfers of employees to other jobs (figure 11). This resulted in distinct savings in wage replacement payments (DM 410,000 p.a; DM 6.2 million for the remaining working life).

Reduction in wage replacement costs (§ 13.2 of the collective labour agreement) (assembly worker, 43 years old)

Costs of permanent transfer:	6,318 DM p.a.
Reduction in the number of permanent transfers 1993 : 1992	65
Annual savings	410,670 DM
Savings with an average remaining working life of 15 years	
DM. 6,610,050	

Figure 11 Reduction in wage replacement costs

- (7) Introduction of ergonomic and working condition measures greatly reduced the occurrence of skin complaints in one operation (figure 12). This resulted in a decrease in the number of employees absent from work owing to sickness by over 2%.

Example: "Skin Problems"

Problem

- Employees complain about skin problems more often
- Increase in the number of employees absent from work owing to skin problems from 5.2% to 6.7%
- Assumed cause: new cutting oil

Measures

- Test with the new cutting oil
- Change cleaning cycle of machines
- Instruction of personnel
- Special skin protection programme

Result

- Distinct decrease in number of complaints
- Decrease of 4.2% in the number of employees absent from work owing to skin problems

Figure 12 Example: "skin problems"

- (8) Evaluation of the number of employees absent from work owing to sickness among participants in physiotherapy courses involving specific back exercises shows that this number is lower after the course. Whether this is really an immediate effect of the course is, however, not entirely certain. Other evaluations of back exercise courses indicate that the reducing effect on the number of employees absent from work owing to sickness is present only as long as preventive action continues (figure 13).

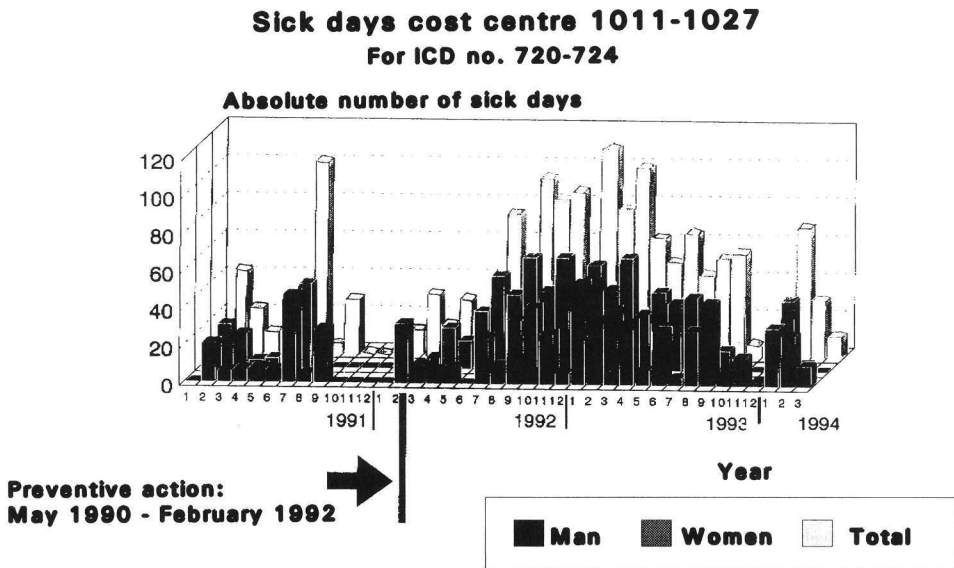


Figure 13 Sick days cost centre 1011-1027

- (9) A one-year analysis of cases in which employees were released from three-shift work on the advice of the company health department demonstrates that absenteeism dropped from 20.5% in the year prior to the employees being taken out of three-shift work to 9.5% in the following year.
- (10) An evaluation by the corporate substance abuse counselling department has indicated that the number of sick days decreased significantly among addicts who received counselling. In one plant, counselling of 25 alcoholics resulted in savings of DM 4.1 million; in another plant, the reduction of absenteeism of alcoholics over a period of 5 months corresponded with savings worth DM 405,000.
- (11) The health rate at Volkswagen has continually increased in recent years (figure 14) is not least the result of comprehensive health protection and health promotion measures. Given the fact that 1% point equals a saving of DM 90 million p.a. in personnel costs, it may be clear what kind of cost volume the health rate involves.

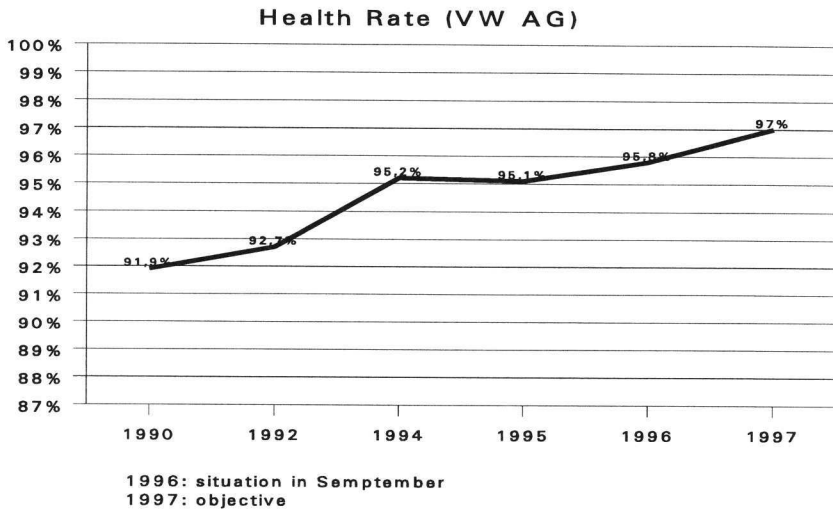


Figure 14 Health rate (VW AG)

The benefits of employee surveys, information programmes and workshops can only be valued in monetary terms to a limited extent, if at all. In the context of the evaluation of such measures, it has become clear, however, that they contribute to an improvement of well-being and competence. It has also become clear that such measures improve cooperation, the general work climate and work routines. These effects will no doubt also help to increase productivity and improve quality, even though it is difficult to quantify their exact contribution. In this case, a cost-effectiveness analysis should be preferred to a cost/benefit assessment.

Summary

Health protection and health promotion contribute to the improvement of economic efficiency, although this contribution cannot always be determined down to the last penny.

Investments in health protection should not only be considered from the point of view of short-term costs and benefits. They are strategic investments, and their effect will only become clear in the medium to long term.

Health protection and health promotion should not only be seen from a cost perspective. They are also a manifestation of the corporate philosophy and represent part of the corporate culture.

The Portuguese case: Almanda, a large-sized, pioneering municipality

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National background

In Portugal, as in other Southern European countries, workplace absenteeism is not strictly defined as incapacity for work as a result of illness or disability. It includes also absences from work for other reasons (e.g., maternity leave; social, family and legal duties; very short-term voluntary absences; disciplinary sanctions). Concerning the 2,000 largest sized-companies (currently employing about 800 thousand, one quarter of the employees), and according to the corporate social audit, the average percentage absenteeism days per person was about 9.0% in the period of 1989-1993 (table 1). But there are great differences, when the figures are broken down by business sector and company size. (No data are available concerning absenteeism, broken down by gender, age, type of work, position in company, working conditions, job satisfaction or organisational culture). Furthermore, these figures are not including the civil servants (e.g., National Health Service, Education, and other public sectors, like local authorities) neither the companies less than 100 employees.

Table 1 Portugal: Percentage absenteeism days per person, due to illness, accidents and other reasons, concerning companies equal to or over 100 employees (1989-1993)

Year	1989	1990	1991	1992	1993
Percentage	8.1	8.5	9.2	9.5	8.7

Currently, sick-leave (56%) and work accidents (7%) account for less than two thirds of the total number of days lost by absence. Concerning direct, indirect and hidden costs of workplace absenteeism, one can only estimate them: They are probably equal to or even greater than the National Health Service 1995 budget (over 3 thousand millions ECU). In spite of the relatively low level of social protection of Portuguese workforce, sickness benefit represents an increasing cost for Social Security (about 500 millions ECU in 1995). During the period from 1987 to 1993, an average total number of about 63 millions sick-leave days (!) have been paid yearly through the Social Security schemes to one in five Portuguese employees and self-employed (not including the civil servants), probably the highest proportion in the European Union. And the mean duration of spells was about 90 days (!).

The perception of misuse of sickness benefit is largely shared by Government and social partners (specially the employers' representatives), more and more concerned with the growing financial costs of social protection, and stressing the need for cost containment and for improving competitiveness, due to the challenges and threats coming from the globalisation of economy and the introduction of European Monetary Union (EMU). But people in business and Government are, in general, much less sensitive to the other economic, social and psychological effects of workplace absenteeism, including health, well-being,

quality of life and workability. In spite of a relative low level of unemployment (7%), the number of those in black economy and in atypical employment has been dramatically increasing in the last years, as a result of downsizing, re-engineering and outsourcing initiatives in Portuguese companies.

Shortly, in the last ten years, the economic and political climate was not the most favourable to the implementation of initiatives, at national level or company level, in order to reduce and to prevent ill-health and workplace absenteeism, in spite of the so called historical social agreement on occupational health and safety (1991), as a consequence of the introduction of the 1989 European Framework Directive. Some employers are, nevertheless, in advance of Government and social partners, taking action in order to improve their employees' health as the working environment. In our national research report (1995), we have presented and discussed three case studies: a copper mine (1.000 employees), a local authority (1300) and a transformer plant (350 workers), a subsidiary of a German multinational in the field of electronics.

The local authority: Some labour indicators

At the Portuguese context, this local authority (Almada Municipality and Municipal Waterworks) is a big employer (approximately 1700 staff). It is a non-profit organisation, delivering a lot of services for its population (about 190,000 inhabitants) and visitors (more than 100,000 in the summer week-ends and holidays, looking for its beautiful, sunny and clean ocean beaches). Almada, from a Moorish name, is a medium-sized town, located in the estuary of Tagus River, just in front of Lisbon. It is part of Setúbal region, the most important industrial pole of the country.

The municipal services (excluding waterworks) are employing 1320 staff (in 1996), 65% of them being blue collars, largely unskilled workers. The females are 37%. The average age is over 40. Percentage absenteeism days per person is relatively high (table 2). Illness (53%) and accidents (15%) account for 68% of the working days lost in 1996. The average number of days lost by the blue collars (39.8) is greater than the white collars (24.6). Work incapacity is more serious in the first group than the second one: 29.3 and 12.8 days lost, due to illness and accidents, respectively. There are also great discrepancies when the absenteeism figures are broken down by gender, age and department. The directly cost (only wages paid to the sick-leavers) is estimated in 800.000 ECU, higher than the costs of occupational health and safety services and activities (500.000 ECU in 1994, including Municipal Waterworks).

Table 2 Almada municipality: Percentage absenteeism days per person, broken down by illness, accidents and other reasons (1989-1993)

Year	1990	1991	1992	1993	1994	1995	1996
Main reasons							
Sick-leave	4.3	4.7	4.5	4.7	5.2	5.5	5.8
Accidents	2.0	1.0	2.0	1.4	1.2	1.0	1.6
Other	5.0	5.7	3.6	6.2	3.6	4.5	3.5
Total	11.3	11.4	10.1	12.3	10.0	11.0	10.9

III health absenteeism policy

In 1989, Municipality and Municipal Waterworks have decided to create an common occupational health and safety service, in anticipation of national legislation and regulations. Absenteeism policy is part of this pioneering project, based in following innovative principles: (i) the integration of health care; (ii) a multidisciplinary team; (iii) the involvement of employers' and employees' representatives; (iv) a written health policy; (v) a specific budget, partially supported by an insurance company; and (vii) the adoption of workplace health promotion concept, principles and methodology.

Health policy, aiming at improving health, working environment and quality of life, is part of the municipality mission ("To build up a city for its citizens"). The most important factor, concerning absenteeism project, is the perceived high economic and social costs of absences from work (including poor motivation and job satisfaction of staff, poor quality and public image). Like in other local authorities, one third of absenteeism is due to misuse of sickness benefit. There is also a problem of turnover among the blue collars workers.

Only more recently, the absenteeism policy is following a formalised plan, but there some problems of co-operation between Occupation Health Services and Human Resources Department. Works council is only informed and consulted. The approach is largely topdown, occupational health services playing the leading role. Participation of middle and bottom management is encouraged.

Health needs and problems (but not the workers' expectancies and preferences) are currently identified and assessed by means of analysis of absenteeism, interviews with short and long-term absentees, health status questionnaire, annual reports (including social audit), and so on. The main factor risks and ill-health problems are identified: for blue collars workers, weather constraints, painful working positions, heavy loads, dyslipidaemias, back pain, alcohol abuse, poor pay and low status; for the white collars, VDU work, organisational stress, mental health problems.

The project is targeted at the entire working population in the municipality, with special attention for long term absentees and works with disability.

The main actions taken place to address the causes of employee absenteeism are the following ones:

- Procedural activities (e.g., medical certificate issue by the inside medical doctors has been encouraged; for example, in 1992, only one third of total number of medical certificates has been issued by the GP's and other physicians belonging to the municipality's occupational health service).
- Person-oriented preventive activities (e.g., surgery facilities; periodic health screening in order to prevent occupational diseases and work-related diseases; voluntary flu, hepatitis and other vaccinations; safety training; health education; stress treatment; psychosocial counselling; prevention and treatment of black complaints; prevention and treatment of work-related alcohol problems).
- Working environment-oriented preventive activities (e.g., improving lifting, VDU work and other ergonomic modifications; noise reduction, ventilation, light, climate control and other improvements of physical working environment; systematic investigation of all work accidents with or without incapacity, in order to know their aetiology and to prevent them in the future; encouraging communication and participation; setting

- up the Workplace Well-being, Health and Safety committee.; job design of white collars).
- Reintegrative activities (e.g., rehabilitation and reintegration of 103 long-term sick-leavers).

Evaluation and follow-up

In spite of a lot of person-oriented preventive programs and activities, total absenteeism have remained high in the period 1990-1996 (table 2). But the offering of alternative work to 103 long-term sick workers have led to a reduction from 25% to 15% for this group (in 1992). Municipality has no sound cost-benefit analysis, at least until now. Costs of absenteeism program are part of Occupational Health and Safety budget (300 ECU per person, including assurance premiums).

The main enabling factors are: political support from the governing board; available resources (human and financial). But there are also a lot of barriers: blue collars' poor living and working conditions; low level of literacy, low status and poor pay; public administration culture.

The main weaknesses of the project are, until, the topdown approach, the difficulty of improving the psychosocial working environment and the lack of sound cost-benefits analysis. Its strongest point is the holistic understanding, by the project team, of the process of becoming ill, being absent from work, recovering and return to work. *Last but not the least*, the project team must be more conscious of the need of intersectoral action and re-orient the absenteeism initiative in order to be more cost-effective.

Employee Involvement and Occupational Health Promotion and Education Programmes (O.H.P. & E.)

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Introduction

O.H.P.E. can be defined in numerous ways but certain principles should apply to "good" practice.

- Can be applied across all groups in the work force.
- Is directed at the underlying causes of ill health.
- Combines diverse methods of approach Aims at effective worker participation
- Is not primarily a medical activity, but should be part of work organisation and working conditions (Wynne 1994)

Thus published work on the context, setting and conceptualisation of such programmes has commanded attention (Twose et al), as have attempts to gauge pay-back periods and evaluate success or failure (from management's point of view) however defined. The source for much of the latter has been the USA, (Personnel Journal) however some work has been done in Europe (Sweden social fund). In Britain the Health and Safety Commission (HSC) through its then Director General has admitted that our record in Occupational Health and Safety is not as good as that in some of our EU partners (Rimmer).

Managing Change

I propose to examine the arguments for employee involvement in O H P & E, to assess whether there are any apparent trends for such involvement through contrasting the situation in the USA and the EU, and to look at certain implications for management and employee relations in the implementation process. Additionally evidence about costs and benefits will be assessed.

In targeting management implementation approaches in O.H.P. & E. issues such as employee involvement, decision making, pro gram evaluation, and integration of programmes with company operational and human resource activities will focus inevitably on the management of change in an uncertain environment.

Employee Involvement and USA-European Involvement

The 1986 Ottawa conference on health promotion, is credited as being the foundation for a new approach towards "enabling" employees to have control over their health: in the words of one writer moving from "responsibility for the problem (to) responsibility for the solution". (Yeo H) WHO (1988) accepts that whilst the "... prime responsibility for health and safety in a workplace rests with the management ...", the contribution by employees

is essential in the design and implementation stage, if programmes are to be successful in the eyes of the users (pp10, 33; HEA, 1993).

How far does the literature provide evidence of the practice of such an approach?

Much of the USA literature is in the nature of guides to management for the introduction of either a comprehensive OHPE program or just the adoption of one or two activities such as smoking cessation or weight reduction. The emphasis is strongly on the integration of OHPE into mainstream management, and the adoption of a quasi paternalistic style of employee relations. (PJ, Vol 69 NO. 7), ".... as part of a solution to the nation's health care problems". (AF in B).

Managerial involvement by employees is limited to an employee committee, representative of groups in the firm but appointed by management. Such representatives should be opinion formers with a high profile in groups, good communicators, and generally committed to the fitness goal. This committee has an important role in marketing, "... as a pilot group to assess how employees will react to the materials and strategy", and as ".... the vehicle for reaching the grass roots" (pps 64-65).

There is no question however of vesting the Committee with decision making power, as ".... management by committee is slow and politically complicated" (p5).

O'Donnell and Harris by contrast, see a more pro-active role for employee groups, one of direct involvement in the design process (p72).

It has been argued that American unions have not focused on negotiating OHPE clauses in contracts, because their members want more immediate gains such as wages and conditions (Chenoweth p38). There are however a number of examples of unions successfully negotiating OHPE provisions with employers. (Beaumont; Klesges et al).

Some unions have run joint OHPE activities with companies, one being the United Rubber workers which, with 4 major firms in the industry, developed a program acronym Ed TIPS - Tailoring - to employee needs - Involving - employee participation in planning and implementation - and Partnership - for building and developing support for behavioural changes (Schenk et al).

In the E.U. provision of O.H.P.E. services has been very patchy, and in poorer members there is little coverage if at all (the European Foundation for the Improvement of Living and Working Conditions (1989) Analysis of "Innovative Workplace Action for Health"). Wynne argues that unlike the USA where the emphasis is on changing behaviour and compliance with health promotion programmes (Wynne R 1994, p2), European experience is much more directed to work change either through legislation or national collective framework agreements, and will undoubtedly deepen through the influence of Scandinavian EU membership.

Some examples follow:

Finland

For some years the Finns have had a comprehensive and participatory OHPE service under the 1979 Occupational Health Care Act (Holgate). Employers must use professional OHPE advisors on programme, development and auditing, and the contracting OH service, supplies regular reports on progress.

Sweden

The end of the 1960s marked the establishment of the Occupational Health Institute, and other publicly funded research bodies, and a greater concern was shown for occupational health in small firms. By 1991 it was claimed that 85% of employees had access to such services, and the LO with government health boards was busy developing policy applications to reduce inter class health differences even more. (Hag Lund, Pettersson, and Tillgren; Evans; Eklundh B and Pettersson B).

Britain

There has been an official acceptance that our occupational health record may not be the best in Europe (Rimington), and evidence from surveys and union literature (MSF, IPMS, BF and AWU) suggests that they have for some time taken a very active interest in OHPE. For instance Webb et al found that 70% of unions had related policies, far higher than employers (Webb p18-19).

Some joint employer-union needs analysis surveys had been carried out in Britain and in fields of work such as fire fighting there is a well established system of joint working party determination on health and safety, medical standards for appointment, and the implementation of health education/lifestyle principles during health surveillance (FBU, 1989).

The literature on recent British developments points strongly to the desire by unions for involvement in the management decision making and implementation process in health and safety (HSIB No. 162, 1316189; No. 184, 514191; Nov. 1994). The TUC has argued that unionists are ideally placed to carry out risk assessment activities, and that shop stewards become aware before managers and occupational health professionals, of health problems, amongst their work-groups (IDS Study).

Both the TUC and CBI are wary of too much prescription in life style enhancing programmes (C.B.I./B.U.P.A. p8) but an environment of growing occupational health costs - £13 billion annually - increasing litigation, and pressure from unions and the EU, highlights the importance of benchmark OHPE schemes, for best practice. With small firms though the situation is bleaker.

In the Health Education Authority report "Health of the Nation" (Sept 1993), the workplace survey covering over 1300 organisations in England showed only 41% of small firms considered health promotion important. Whilst there is a relationship between size, unionisation and health concerns, (HE A pps6-7), only 5% of private sector workplaces, representing 14% of the work force had engaged in any formal evaluation of the benefits OHPE. A question mark hangs over the effectiveness of such programmes.

O.H.P.E. in the USA

Because O H & S is to do with work and because managing health promotion at work is closely linked with industrial relations and managing change, a key issue related to staff involvement is that of whether O H P & E innovations should be launched on site or off. This is controversial. Some evidence suggests that up to 40% of employees are involved in work site programmes in the USA whilst between 10 and 25% are in off site venues (Gibbs; O'Donnell & Harris). There are numerous arguments in favour of work site venues, eg captive audience, effectiveness (Ashton p25), achieving a greater "reach"

..... can make effective use of company communications programmes; allow for incentives for participation; have the potential for developing employee attitudes; can utilise peer group pressure and can be integrative so that health and fitness experiences can be related to work environment. The longterm effectiveness of on site activity is seen as an ".... investment in organisational effectiveness" (P.J. Nov. 87).

Clearly costs and benefits measurement is relevant to decisions about work site location. This approach is challenged by a rather different perspective which argues that 'bunions and Management have two very different perspectives in dealing with critical health issues facing workers in industry' and illustrated with union concerns about possible cancer forming chemicals, contrasted by employer unwillingness to investigate for fear of the consequences and adverse public reaction. Clearly those who set the agenda are in a powerful position to determine actions and outcomes and to set the parameters for cost and benefit measuring. Unquestionably, much of the argument in the USA is about who funds the programmes. Corporate America funds about 33% of all health costs (O'Donnell and Harris p.507), so it's not surprising that much of the literature in the States is costs and benefits oriented. There is though a growing body of research which suggests that failure in programmes can be related to poor strategic thinking, poor implementation and non existent or superficial evaluation, (O'Donnell & Harris, P, p.21). Chenoweth sees the solution to these problems as lying with program management in terms of better communication, careful screening and preparations and peer group and family support (Chenoweth).

Whether O H P & E programmes are conducted on or off site, the degree of and contribution by employee involvement, to success will be influenced by the web of organisation culture, attitudes, power relationships, the management of motivation, and the level of integration of managerial innovations and organisational change which exists in everyday life in employing organisations.

Thus the focus turns to decision making implementation and evaluation in the management of O.H.P.E.

The literature suggests that success however measured, is more likely to result if OHPE activities are seen as key management priorities. Thus the Conoco scheme is unique in that the senior OHPE manager is the only one to have direct "mandatory access" to the CEO, and briefs the latter daily (HSIB, No.236) whilst Pilkington Glass has revamped its OHPE efforts, to bring them into line with management responsibility and accountability and the health professionals into more of an advisory role. Line management, is not allowed to abdicate responsibility for employees (Occupational Health, Vol. 38, No.6, June 1986). The growing trend of decentralising and delegating specialist functions to line management is one which has been observed for years in human resource, finance, quality assurance and other fields. It is likely, that in OHPE, the result will be a more problem centred service, listening to the needs of each group in the context of the work environment and worker/management attitudes, and being partly assessed on overall contribution to company and group.

Decision Making

The search for innovative decision and organisation tools through which to integrate management's O.H. programmes, and the needs of the employees is ongoing, (HE A, 1992, App.B), but there is a lack of prescription about how to achieve this.

Kaluzny et al argue that health promotion activities unless seen as "organisational innovations" will almost certainly fail. Wynne (1994) reviewing Grossman and Scala, supports their view that OHPE interventions should be based on organisational change, utilisation of consultancy models, "settings" and project management techniques (p12), and goes on to discuss training programmes for employees and management as a way of inculcating OHPE into management processes.

An important issue here is the role which health professionals should play, were O.H.P.E to be extensively integrated in management activities. As earlier illustrated other specialist groups have been at least partially integrated (Personnel, quality), and many think that these specialists could be too, through development of health surveillance, integration of E.U. requirements and innovation in mainstream management (H.E.A, 1992, Q.14; Ziglio R.A.F; Cos, R.; Mitchell, J.G.)

Evaluation

An important link between effectively directed OHPE and management integration and employee involvement is the process of evaluation.

Some literature argues the case for comprehensive evaluation covering outcomes, impact, process, cost, standards and quality, and behavioural change (Association for Fitness in Business pps 74-76), others stress empowerment as a key to this aspect of programme design and evaluation (O'Donnell and Harris, Ch. 5).

Springett and Dugdill see evaluation as an aspect of quality assurance, in which change is measured, and progress to targets charted and Webb et al certainly foresee the demand by employers for evidence of "hard" evaluative data to convince them that OHPE is worthwhile. (Webb p33).

What is needed is "hard" evaluation from the perspective of employers, unions and employees. Not only hard evidence of cost savings and payback but also demonstrable evidence of reductions in risk exposure to harmful processes and substances, improved health and participation.

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Evaluation of an ergonomic-educational programme in Dutch nursing-homes. An intervention study.

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Introduction

In 1992 a comprehensive health-promotion project "Healthier Health Care" was initiated in seven nursing-homes in the Netherlands. A part of the project was designed to implement an ergonomic-educational programme, with the intention to reduce physical workload and to bring about safe working in order to prevent work-related musculoskeletal complaints [Engels et al. in press 1997].

Premises

The following results from a study previously conducted by us, and other research were taken into account in the design of the programme:

- (i) Lifting is known to cause a heavy burden on the musculoskeletal system [Garg and Owen 1992, Stubbs et al. 1983]. This activity is also perceived as strenuous by the nurses themselves [Harber et al. 1988, Engels et al. 1994]. However, it takes up only little time during an average working day [Engels et al. 1994]. Much time is spent on other patient-handling, and non-patient-handling activities. Due to the time spent on these other activities much burdening postures occur [Engels et al. 1994]. Therefore, the decrease of musculoskeletal load during tasks like household, preliminary, and patient-handling activities (e.g. washing and dressing a patient) is also strived after in the programme. In addition ergonomic awareness, improvement of the lay-out of the wards, proper use of lifting devices [Garg and Owen 1992, Friele and Knibbe 1993], and efficiency in work performance were stimulated. It is also stressed to alternate working postures regularly during all working activities, to sit down whenever possible, in order to reduce the load for the musculoskeletal system and to stimulate short moments of recovery.
- (ii) Nurses do not only suffer from back problems. The prevalence of complaints of the neck, the shoulder and the legs also seems to be high [Engels et al. 1996]. This is not surprising. Physical overload and/or awkward postures affect more than one part of the musculoskeletal system simultaneously, and damage to one structure often evokes damage to other structures [Schierhout et al. 1996]. For the intervention study, a decrease of the load on the total musculoskeletal system was aimed at, in order to reduce the occurrence of back problems, and of neck, arms, and leg troubles as well.

Costs: The programme

Small groups of nurses were trained in safe practice and ergonomic awareness, based on the principles mentioned above. They also learned to inculcate the necessity of following these safe working guidelines in their own wards. The trainees met on a regular basis once

the training course was over, and tried to solve minor ergonomic problems on their own. The main task of these 'ergonomically trained' nurses ("ET-nurses") was to transmit relevant skills and knowledge, to bring their colleagues about safer working habits, and to help increase compliance with new procedures. The programme was mainly based on the theories of planned behaviour and on concepts of habitual behaviour. To stimulate intended behavioral change and to guard against a relapse into unsafe working, lifting protocols for each individual patient and guidelines for risky tasks were introduced.

Two conditions, deduced from the total project, were taken into account in the design of the ergonomic-educational programme:

The first condition was, that the planning of the intervention programme should be flexible to reach the total nursing staff of the nursing-homes involved, because nurses have to supply continuous care to the patients. This was one of the reasons to follow the 'train-the-trainer' approach [McAleavy et al. 1996].

Secondly, the programme should be continued after our project had finished. In other words, the nursing-homes should be able to continue the programme on their own. To become a so-called "learning organization", the train-the trainer principle seems also to be a satisfactory approach. Furthermore, key-persons (like the physiotherapists of the nursing-homes) were recruited and supervised to become content experts for the programme and back-up the ergonomic-trained nurses. Also, steering committees were installed in each of the nursing-homes with the task to direct the implementation of the programme and to take care of those problems which the ET-nurses could not handle themselves.

To illustrate the points of application of the programme on the risk factors to which nurses are exposed, a model is used [van Dijk et al. 1990] (figure 1).

Effectiveness: The evaluation

To assess the effectiveness of the programme two studies were conducted. Again, the model elucidates the potential benefits (figure 1 *italic*). Firstly, it was established whether the ET-nurses themselves benefitted from the trainingcourse (*study 1*). Twelve nurses who had participated in the course (trainees), and twelve who had not (controls) were recorded on video while performing standardized nursing tasks. The tasks they performed were washing, lifting, and repositioning a patient, and additionally some non-patient-handling tasks. Video-recordings were made once before (1-2 weeks) and twice after the course (after 3 months and after 15 months). The number and percentage of harmful postures, and of ergonomic and biomechanical errors were assessed. We also studied the perceived physical exertion [Engels et al. submitted 1997, Engels et al. in press 1996]. The harmful postures, the errors made, and the ratings of perceived exertion were measured respectively by means of OWAS observation, a check-list, and Borg-scores. Comparing the first and the last measurements of all the above tasks taken as a whole, the trainees showed a significant improvement in the number and percentage of harmful postures and errors while the controls did not. The same could be concluded for lifting alone. An important finding is that after the course, the new work routine appeared not to have caused any extra perceived physical exertion.

A second study was carried out to evaluate the effects of the ergonomic-educational programme on the decrease of physical work load and of musculoskeletal complaints and sickness absenteeism on nurses working in wards where ET-nurses worked (*study 2*). Therefore, nurses of four Dutch nursing-homes were asked to participate in a questionnaire

survey. Nurses who worked in the halves of two of the nursing-homes participated in the ergonomic-educational programme (the intervention group). Those who worked in the other two halves or in the other two nursing-homes did not participate in the programme (the reference group). The questionnaire was completed before (t_0) and after (t_1) the programme (with an interval of 12 months between the two measurements). Questions were asked concerning knowledge on ergonomic topics, perceived physical exertion and time pressure, perceived hindrance from the working situation, musculoskeletal complaints and sickness absenteeism. At t_0 367 nurses (68.7%) responded, at t_1 201 nurses from this group participated again. A trend towards a decrease in most musculoskeletal complaints, perceived physical exertion and time pressure and an increase in knowledge could be established in the intervention group. However, only some of these trends were statistically significant, and the same trends could be established in the reference group as well.

Discussion and conclusions

From these results it can be concluded that the ET-nurses after the ergonomic-educational course *know* how to perform tasks in such a way that postural load decreases and ergonomic errors are avoided as much as possible. They are also able to apply this knowledge in an experimental setting. It is, however, a little rash to conclude that they will actually perform these tasks in a similarly safe way when working in the wards.

No specific effects of the programme could be assessed on the colleagues of the ET-nurses working in the wards. However, they can not be excluded either. This could be due to the fact that the start and the further implementation of the programme took up considerably more time than we expected. Some aspects of the programme had still to be carried out after t_1 , or had only been started up shortly before. Therefore, it was most probably too early to expect any significant effect in most of the outcomes at t_1 . Besides this limitation, it is also possible that the leap from a laboratory study conducted with the ET-nurses, towards a field study conducted amongst their colleagues in the wards has been too large. As yet, we are not sure whether ET-nurses themselves are capable of behaving safe during their daily work, and we do not know whether they are capable of training other nurses properly. Therefore, it is unknown whether (and to which amount) the colleagues in the intervention wards have actually been exposed to the prevention programme.

For that reason, it should be stressed that in future intervention research the effectiveness of an intervention should be evaluated step by step to weigh the benefits against the costs in more detail.

As yet, it can be concluded that the process to transmit knowledge and skills towards the colleagues in the wards and to guard the continuity of the programme of all the involved employees is a time-consuming one. In order to make nurses "watch their back" continuously, behavioral rules should be imbedded in the nursing activities. In this way, the conflict of self protection with patient needs, which nurses mention to argue why they do not behave safe, is solved: Moreover, the benefits of the intervention can reach the patients welfare as well [Hersey et al. 1996]. It is a prerequisite that nurses recognize that safe working does not interfere with good patient care, to reach a cost effective intervention.

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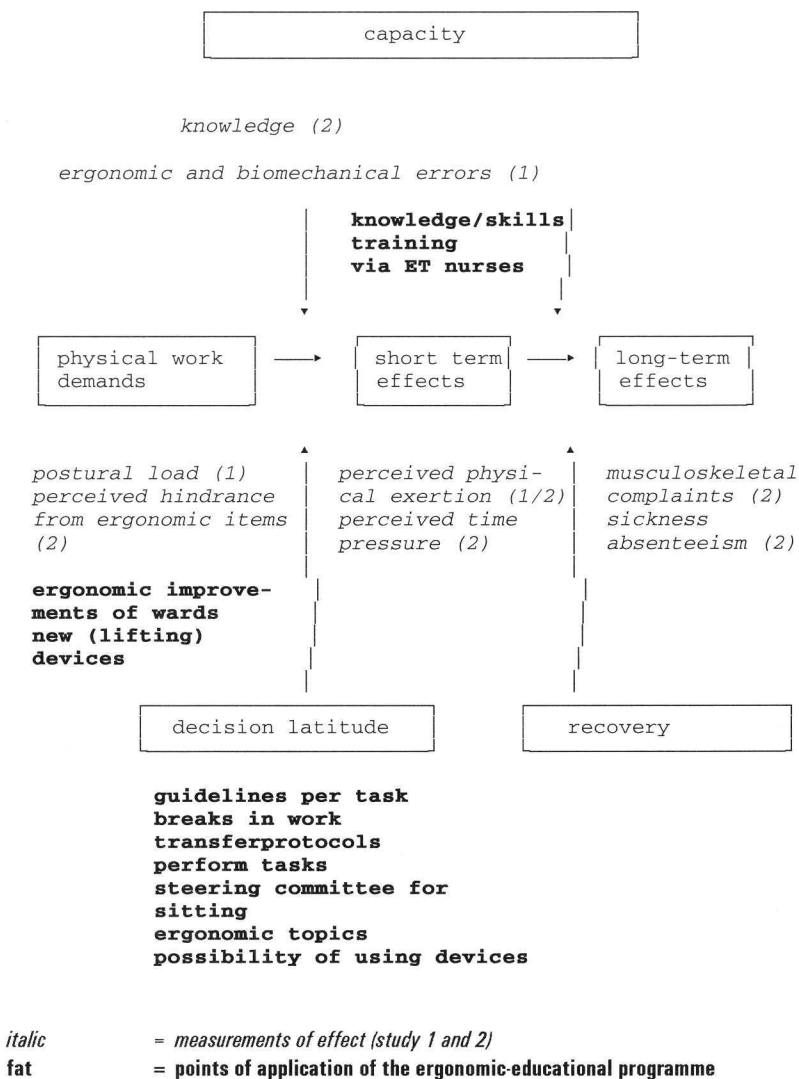


Figure 1 The model of reappraisal of work demands and capacity (van Dijk et al. 1990)

Stress among European workers

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According to the 1996 European Survey on Working Conditions 28% of workers consider that their job causes them stress. Stress becomes the second most common health ailment related to working conditions after muscle-skeletal problems. In addition, there is a marked increase on the percentage of workers affected by stress at work - from 20% in 1992 to 28% in 1996.

This trend could be explained by the intensification of work, the weight of repetitive and monotonous tasks and the still low autonomy in many jobs. In 1996, 54% of workers work at very high speed and 25% do so on a permanent basis. In relation to monotonous work, 37% of workers perform short and repetitive tasks and 57% make repetitive movements of hands or arms. There is an increase in autonomy since the last survey in 1991, nonetheless 28% still have no control over their working rhythms and methods.

The rise in precarious employment, the long working hours and the existence of violence at the workplace are other factors to be taken into account. Temporary employees and workers with fixed-term contracts are affected by worse working conditions such as repetitive movements, repetitive tasks or painful positions. In relation to working hours, 49% work more than 40 hours per week and 23% more than 45 hours. 2% and 4% of the workforce are the object of sexual harassment and physical violence respectively. Moreover, 9% report psychological violence and intimidation.

Finally, the number of workers exposed to physical, chemical and ergonomic risks is still very big. High level noise is found among 28% of the workers and painful postures in 45%.

The above has clear cost implications for the individual, the company and society as a whole. This should be reason enough to keep the prevention of stress at work high in the European and national political agendas and among the concerns of employers and trade unions.

Best cases in stress prevention: the success of a participative and stepwise approach

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Introduction

While reviewing the practice of stress prevention and intervention in the workplace three conclusions may be drawn. First, 'it is disproportionally concentrated on reducing the effects of stress, rather than reducing the presence of stressors at work' (Kahn & Byosiére, 1992; Murphy, 1996; Cox, 1993). Second, most activities are primarily aimed at the individual, rather than at the workplace or the organization. In other words, a worker-oriented approach, for instance, by improving employees' skills to manage, resist or reduce stress (McLeroy, 1988; Murphy, 1996), is followed more often than a work-oriented approach, for instance, by improving job content (Kopelman, 1985). A third peculiarity in the practice of stress prevention concerns the lack of a systematic risk assessment ('stress audit', identifying risk factors and risk groups) as well as of serious research into the effects of all the activities. In the words of Kahn & Byosiére (1992): 'The programs in stress management that are sold to companies show a suspicious pattern of variance; they differ more by practitioner than by company. When practitioners in any field offer sovereign remedies regardless of the presenting symptoms, patients should be wary' (p. 623).

Against the background of (1) clear evidence of the relationship between psychosocial work characteristics and health (e.g. Cooper & Marshall, 1976; Cox, 1988; Vaernes et al., 1991; Karasek & Theorell, 1990), (2) national and international legislation that put the emphasis on risk assessment and combating risks by changing the stressful situation (Cox, 1993; Kompier et al., 1994), and (3) the basic idea of prevention, that is, eliminating the stress producing situation ('prevention at the source'), the current practice of stress prevention and intervention seems a little disappointing.

Why could it be that companies express a preference for 'post hoc' individual-directed interventions, and why would it be that examples of work-directed interventions are merely lacking? At least four factors seem to play a role.

1. The opinions and interests of company-management. Managers are often inclined to blame personality factors and life-styles of employees who are absent from work or report health complaints. Logically, this approach also leads to one-sided recommendations to reduce stress, that is, concentrating more on the individual employee than on changing the stressful conditions.
2. The nature of psychology with its' emphasis on subjective and individual phenomena. Many psychology-oriented stress researchers are primarily interested in stress as a subjective and individual phenomenon. The potential impact of more 'objective' or 'collective' risk factors in the work situation (e.g. poor management, work-overload, and aggression), then may be - unjustly - lost out of sight (see also Frese & Zapf, 1988).

3. The difficulty of carrying out methodological 'sound' intervention and evaluation studies in a hectic organizational arena. The major goal of a company is not to facilitate 'sound scientific research', involving 'scientific outsiders' and detailed data collection on the scene. Decision-makers may even regard research as a nuisance to the primary organizational processes.
4. The denominational segregation of stress research with its neglect of studying the costs and benefits of stress prevention. Work and organizational psychologists concentrate primarily on 'soft' outcome variables (e.g. motivation, satisfaction, health complaints), and are well-known for their questionnaires. Traditionally, it has been rather unusual for stress researchers to cooperate with economists in order to study the potential 'hard' outcome measures (e.g. productivity, sickness absence rates, and accident rates), as well as the financial effects of interventions. To put it differently, a history of gaining empirical insight in costs and benefits is merely lacking in stress research.

Now, while overviewing the current (research)practice of stress prevention, the following three desiderata may be derived.

- (1) Stress researchers should extend their focus by also including 'hard' outcome variables (e.g. productivity and sickness absenteeism). Whereas work and organizational psychologists have often stated that an adequate stress prevention program may positively affect productivity and sickness absenteeism, until now they have not laid down a sufficient strong empirical fundament for this position (see also Kopelman, 1985). For too long stress prevention has become advocated with arguments based on a moral or humanistic appeal to the good employer (that is, on 'industrial charity'), or on legal regulations (e.g. working conditions acts). It is beyond doubt that these are important and strong arguments. Still, it may well be that they are not enough, since these arguments are not those that primarily affect company management, that usually emphasizes continuity and 'the bottom line'.
- (2) In order to increase the impact of stress prevention on what organizational decision makers really consider important (e.g., quality of product and services, organizational flexibility, continuity, absenteeism, productivity, labour market facets, and improved competitiveness), often a multi-disciplinary approach, rather than the traditional mono-disciplinary one, is required (e.g., cooperation with economists, ergonomists).
- (3) Accordingly, the demonstration of 'examples of good preventive practice' is considered as a 'conditio sine qua non' for developing effective stress-prevention procedures, and for the involvement of both social partners in this field (i.e. employers and employees) (Kompier et al., 1994). These examples may be crucial when trying to answer the question: 'How well - and why - do stress prevention programs work?'

Hence, the major purpose of the present contribution is to analyze and compare various selected projects that may provide an alternative to the 'post hoc' individual oriented approach described above. Can these projects be regarded as examples of good preventive practice?

Ten cases in stress prevention

Ten Dutch projects, derived from several branches of industry and aimed at the reduction of work stress, physical workload and sickness-absenteeism were selected: (1) Department of salary records of Ministry, (2) Prison, (3) Cigarettes factory, (4) Oil company, (5) Scaffolding company, (6) Bricklaying company, (7) Hospital, (8) Homes for the elderly, (9) Telecommunications, (10) Home-care institute.

There were four criteria for selection: (a) the inclusion of primary preventive work-oriented interventions; (b) the utilization of an adequate stress audit (problem analysis) in order to identify risk factors and risk groups; (c) a minimum methodological standard, following the research design rating proposed by Murphy (1996): evidence obtained without a control group or randomization but with an evaluation was considered a minimum standard; (d) the willingness from the companies to 'let researchers look into the kitchen'.

In six of these projects (the projects 1, 2, 4, 5, 6, 7) the author or one of his coworkers had been involved as a consultant or (action) researcher. Four other projects (3, 8, 9, 10) were tracked down through a network approach. These ten cases have been fully described and analyzed elsewhere (Kompier et al., in press). For each case, in a step-by-step approach, the following questions were addressed.

Step 1: Preparation

- * which were the motives for this project?
- * how was the project organized?

Step 2: Problem analysis

- * which instruments were used in order to identify risk factors and risk groups?
- * which risk factors, which risk groups were identified?

Step 3: Choice of measures

- * which measures (work directed, person directed) were selected and why?

Step 4: Implementation

- * how were these measures implemented?

Step 5: Evaluation

- * reduction in absenteeism (absence percentage)?
- * costs and benefits of the project (in terms of e.g. finances, productivity, ?)
- * which were obstructing factors?
- * which were stimulating factors?
- * efforts continued?

Results

Step 1: Preparation

In nine cases, high absence figures formed the starting point of the project. Sickness absenteeism was often supposed to be a result of a high psychosocial and/or musculoskeletal workload. Among the consequences of high absence rates were high costs, inefficiency in the organization of work, disturbances in work processes, and a decreasing social climate. In addition to these so-called 'internal' motives, also 'external' motives played a role, such as a stagnating market, high turnover, and shortages at the labour market. For example, the hospital explicitly chose to transform to 'a better than average hospital' in order to be more appealing for new personnel. Most organizations (7 out of 10) decided to install a

project-structure (project-group or steering committee) on a temporary basis. In all cases management remained responsible 'for the chain of events'.

Step 2: Problem analysis

A wide range of instruments was used in order to assess risk factors and risk groups. Most projects combined several instruments, ranging from simple instruments used for 'first line monitoring' (e.g. checklists and interviews) to more sophisticated 'professional' instruments (e.g. instruments for task analysis, for analyzing work organizational processes, and for observation). Also questionnaires and analyses of administrative data (such as sickness absenteeism, working overtime, changes in production standards) were used.

Step 3: Choice of measures

Companies tried to assess the present status (i.e. the 'ist'-situation), to define the 'soll'-situation, and to define the (dis-)advantages of various ways to reach the latter. In choosing measures, two factors seemed to play an important role. The first factor is a participative approach. Almost all companies, one way or the other, promoted active worker involvement in determining which measures should be taken ('It's their job, they are the experts'). The other factor was the explicit combination of both work-directed and worker-directed measures (Table 1).

Table 1 Most important interventions, ten projects (numbers between brackets relate to cases)

Work directed		
*	Ergonomics and technology	(1, 2, 3, 4, 5, 6, 7, 8, 9)
*	Better work organization and planning	(1, 2, 5, 6, 7, 9, 10)
*	Job enrichment	(2, 3, 7)
*	Work time schedules	(2, 7)
*	Introducing team work	(3, 10)
*	Organizational structure	(2)
*	Improving work consultation meetings	(6)
Person directed: sickness absenteeism management		
*	Better registration and manageable information	(2, 3, 7, 8, 9, 10)
*	Managing the absence report	(2, 3, 4, 7, 8, 9)
*	Inspection in case of sickness	(8)
*	Improving rehabilitation policies	(3, 9, 10)
Person directed: human resources management & training		
*	Training and development	(2, 3, 7, 8, 10)
*	Providing information	(1, 4, 5, 6, 10)
*	Promoting healthy life style	(4, 7)
*	Better work introduction	(10)
*	Coping with aggression	(7)

Step 4: Implementation

The organizations have clearly chosen to integrate the interventions in the regular company and management structure. This implies that (line)management is responsible and that stress

prevention (e.g., introducing the interventions) belongs to the 'normal daily duties' of supervisors.

Step 5: Evaluation

Stress monitoring and stress reduction is not merely a technical process (based on a technical analysis and on the simple, straight-forward realization of recommendations and receipts), but relates to changing and improving organizations and organizational processes. This clearly is a time consuming process.

Sickness absenteeism (absence percentage) significantly ($p < 0.05$) decreased in six cases, often equal to or below the average score for the branch of industry. In three cases the change in absence percentage was in the expected direction, but this effect was not significant. In one case data on absenteeism could not be provided. In seven projects, also the costs and benefits in financial terms were assessed. Three organizations found it too difficult to estimate these figures.

It is remarkable that, despite the variety in calculation methods, and in some cases more convincing than in others, all organizations that carried out a cost-benefit analysis concluded that the gains outweighed the costs, implying that the projects were successful from a financial perspective.

Of course, 'en route' there have been various obstructing factors (table 2).

Table 2 Main obstructing factors in the ten cases

- Bureaucracy (admissions, signatures)
- Project coordination
- 'Everything takes a lot of time'
- Differences in expertise in steering committee
- Difficulty in keeping middle-level and employees involved
- What is a constraint and what is not? (20%?, 30%?)
- Scenario not detailed enough
- Rivalry, competency (between departments, consultants, professionals)
- 'It's the problem of the project team'

Generally two rather straight-forward conclusions may be drawn with respect to the 'obstructing factors': (a) they are natural, and (b) they can be overcome.

Table 3 summarizes ten factors that contributed to the success of the projects.

Table 3 Ten success factors in the ten cases

1. Stepwise and systematic approach
2. Active role of employees and other 'parties'
3. Recognition of employees as 'experts'
4. Clear structure (tasks, responsibilities)
5. Emphasizing the responsibility of management
6. Proper risk assessment
7. Assessment of risks for whole company and certain departments/positions
8. Well-balanced package of measures: work and employee
9. Recognition of absenteeism as a normal company phenomenon
10. Continuity: 'business as usual'

Discussion

Methodological critique is possible. A first comment concerns the selection of these ten projects. They do not constitute a random sample of prevention projects. A quantitative comparison over cases (in terms of absolute figures), does not make much sense. Thus, conclusions drawn from analyzing and comparing these cases, do not relate to 'average', but rather to 'good' practice. Another methodologic issue involves the research ratings of the ten projects. Only projects 1 and 7 had a 'neat control condition', the others did not. Although from a methodologic point of view these designs may seem rather 'meagre', we considered them acceptable for the type of study we performed.

Are these indeed examples of good preventive practice? Generally speaking the answer should be 'yes'. Sickness absenteeism is reduced, though not in all cases significantly, and in most cases the benefits exceeded the costs. A key question is whether this reduction may be interpreted as a direct consequence of the projects' interventions. Although it is very difficult to provide strong evidence for such a direct relationship, it does appear plausible. In each case a systematic assessment was made of constraints in the working situation that contributed to high absence figures. Next, 'tailor-made' interventions were introduced, sometimes after detailed pretesting. Considering this approach, it is plausible to assume that the measures taken have - at least partly - contributed to a reduction in absenteeism.

Summarizing, it may be hypothesized from our contribution that:

- a. the success of stress prevention merely depends on a subtle combination of two approaches, that is, 'bottom-up' (participation) and 'top-down' (top management support);
- b. stress prevention may be beneficial to both the employee and the organization.

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Rethinking the Nature and Evaluation of Workplace Health Promotion: Towards an European Model

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Abstract

This paper argues that the full potential of workplace health promotion can only be realised under two conditions: first, that it is recognised and practised as an applied science and evaluated, and, second, that both in concept and practice, it involves more than 'enhanced health education'. These two related conditions are discussed in this paper. This rethinking of workplace health promotion is set in the context of current European practice.

Introduction

Protecting and promoting health and the quality of life will be one of the greatest challenges facing societies in the next century. This challenge is true even for developed countries, where both standards and expectations are relatively high. For many years, the average citizen of the European Union has expected to enjoy a long, healthy and productive life compared both with previous generations and with citizens of less developed countries. However, two things have become clear. First, these expectations cannot be met simply by relying on the traditional provision of medical care, which has become increasingly technology-dependent, focused on the treatment of particular diseases rather than the whole person, and expensive. Whatever else, such care must be delivered more cost-effectively and remain available to large numbers of people: this will require a rethinking of its organization and delivery. However, at the same time, other lower cost and broader-based strategies also have to be actively promoted. Many of those that are available involve a move away from sole reliance on treatment-orientated medical care to the inclusion of some form of health promotion. Second, promoting health and the quality of life cannot be the responsibility of the state alone. With this realisation, the emphasis has moved towards defining and exploiting the role that can be played by other agencies, and, in particular, by the individual. Indeed, it has become part of the western credo of health that individuals have to take 'ownership' and exercise some degree of control over their health-related behaviour: health promotion has been defined as "the process of enabling people to increase control over, and to improve, their health" (WHO, 1984).

Many adults in Europe spend most of their waking time at work. The workplace therefore offers a convenient point of access to these individuals and, where organizations recruit locally, to their communities. The workplace would therefore seem an obvious stage for health promotion (Demmer, 1996) if not the most appropriate place to implement such programmes (IPM, 1989; Malzon and Lindsay, 1992). Furthermore, for those particularly concerned for occupational health, health promotion offers one of a number of strategies for protecting and improving worker health. It is cited as one of ten priority objectives as

part of the WHO's Global Strategy for Occupational Health For All (WHO, 1995); "development of healthy work practices and promotion of health at work".

The Evaluation of Workplace Health Promotion

Naturally, the question arises as to the effectiveness of health promotion as it is offered in the workplace, and there have been a number of reviews over the last 20 years which have addressed this issue. The major workplace programmes which have been described include those of the Control Data Corporation, AT&T Communications Division, and Johnson & Johnson. Despite some optimism expressed by Fielding (1991), the evaluation of workplace health promotion programmes still leaves much to be desired in terms of the conceptualisation of those programmes, the proportion evaluated, and the scientific quality of the evaluations that are conducted. A general lack of good science is apparent. This failure of evaluation challenges our ability to improve the effectiveness of workplace health promotion. One of the immediate problems is that there are no adequate models to guide applied researchers and practitioners in decisions about evaluation.

Instructive evaluation can only occur when the outcome measures used are conceptually related to the objectives of the programme. The starting point for an adequate evaluation model is therefore the provision of a definition from which the basic objectives of workplace health promotion can be derived and tailored for particular programmes in particular contexts. The question of evaluation therefore forces an examination of the very nature of workplace health promotion.

The Nature of Workplace Health Promotion: Traditional Views

The conceptualisation of workplace health promotion provides the basis for the identification, operationalisation and measurement of the key factors and outcomes. It has been frequently observed that there is a lack of clarity, little agreement and some confusion over the concept of health promotion:

"The literature regarding the nature of health promotion is at times vague and contradictory and no clear cut understanding emerges from a review." (Dines and Cribb, 1993).

However, even a cursory review of the literature reveals that the question of definition is addressed in at least two different ways (Dines and Cribb, 1993; Kelleher, 1996), giving rise to a broad and a narrow definition. The first approach attempts a definition in terms of the logical geography of health promotion and includes all activities which might influence the health of the individual. Tones (1985) provides an example of this type of approach and definition:

"At one level of analysis, the notion of health promotion must logically refer to any activity designed to foster health." (Tones, 1985).

Many of those who take this relatively broad, unconstrained and all-inclusive view tend to see it as super ordinate to all other health-related disciplines carried out in relation to work, such as occupational medicine, nursing, and hygiene, occupational health psychology, health

and safety management, and safety engineering. While this view may be attractive, it is not sustainable in practice. First, it immediately loses the distinctiveness of health promotion as a separate discipline. Second, it is not reflected in the nature of the majority of practices which are described as 'health promotion'¹. Third, it is not proving capable of generating sufficient clarity to support the effective design and evaluation of workplace health promotion programmes.

The all-inclusive approach contrasts markedly with the second, relatively narrow and more specific view of health promotion. This approach sees it as one of a number of health-related disciplines, quite distinct and different in what it offers from the others. This view allows the strengths and weaknesses of workplace health promotion to be usefully compared to those of the other disciplines such as occupational medicine and safety engineering. Furthermore, it easily maps on to the current practice of health promotion in most countries. Tannahill (1985), for example, defined health promotion in terms of the overlap between three spheres of activity focused on the individual:

“Health promotion comprises efforts to enhance positive health and reduce risk of ill-health, through the overlapping spheres of health education, prevention and health protection.” (Tannahill, 1985)

However, Downie, Tannahill and Tannahill (1996) and Kelleher (1996), and many others, argue that the cardinal principle of health promotion, thus defined, is the empowerment of the individual, and, it would seem from their argument, that much of this actually comes from health education (learning). This view treats health promotion largely as “enhanced health education” and can be criticised on this basis.

In their terms, health promotion is expressed through attempts to educate or otherwise persuade individuals to change the pattern of their behaviour by adopting or strengthening salutogenic behaviours, and avoiding hazardous situations and behaviours. It is concerned with the individual's knowledge, skills, attitudes and motivations as the final pathways for effecting improvements in their health. It is necessarily concerned with the effectiveness and transfer of that learning to changes in behaviour and health status.

As with the broad-based approach, there are problems with this version of the narrow view. First and foremost, it fails adequately to recognise the influence of the person's environment - the context and determinant of their behaviour - in its conceptualisation of health and health-related behaviour. It focuses very much on individuals in isolation from their environment. Second, in doing so, it attributes too much responsibility for health (and ill-health) to the individual. Third, it ties health promotion to a single set of educational strategies for influencing the individual, and ones, which when taken in isolation, have not proved particularly effective.

If both the broad and traditional narrow versions of health promotion are conceptually inadequate, a third and new way forward is required, and one which can inform evaluation.

A New View of Workplace Health Promotion: A European Perspective

The discipline of health promotion must recognise that health is a function of the interaction between people and their environment, and that the environment provides not only the context for but also determines their behaviour. Such models of behaviour are central to work and organizational psychology and to much of occupational health. (Cox, 1993). For workplace health promotion, this means several things. First, strategies for the promotion of health should consider changing key environmental factors, such as the design and management of work and the workplace, as well as changing the more individual factors which shape behaviour. Second, there must be some consideration of the organizational context of whatever change strategy is adopted, and of the impact of organizational factors on the processes involved in the management of change. Third, there should be some consideration of the effects of such workplace health prevention at the organizational level as well as at the individual level.

Even where workplace health promotion refuses to develop and continues as 'enhanced health education', attention has to be paid to work and organizational factors. Actions in the workplace focused on changing individuals' knowledge, attitudes, skills and motivations are usually initiated, managed or otherwise supported by the organization. Therefore, even the most traditional health promoter must show awareness of and interest in the context dependency of workplace health promotion, and in the role of organizational factors in determining the effectiveness of learning and transfer.

The new conceptualisation of workplace health promotion is typically European, and has found greater expression in European workplace interventions than it has in their North American counterparts (Bennett and Murphy, 1997). While the vast majority of worksite interventions in the USA have involved attempts to modify life style factors, in contrast, European worksite interventions have also considered modifying key aspects of the work environment in order to foster mental and physical well-being (for example, Maes al., 1997). Similarly, some European community-based projects have placed their emphasis on environmental manipulations (eg Salonen, 1987). What may therefore characterise a European approach is that it accepts the importance of modifying 'environmental factors' in promoting health, and thus of adopting a much broader set of intervention methodologies. To summarise, this European approach, a new model of workplace health promotion is offered. Workplace health promotion is:

“ ... concerned with improving the health of the individual by actions which change individual behaviour either directly, or indirectly through the design and management of their work and organizational environments. Essentially, it is the process of enabling working people to increase control over those environments, their health-related behaviour, and health. It is largely concerned with developing individual , social and organizational processes and systems which help individual workers, by a variety of strategies, to help themselves and others to influence their environments and take responsibility for their health”.

Such a definition clearly establishes the basis for a model of evaluation not only in terms of individual learning and the subsequent transfer of that learning to changes in health-related behaviour and health status, but also in terms of the individual, social and organizational

processes involved, in terms of the work and organizational development and the impact of such changes at that level.

Rethinking Evaluation

While the primary objectives of workplace health promotion relate to the health of individuals, work and organizational factors and its possible wider impact have to be considered in any evaluation. At least three other levels of effect can be posited: effects on public health, those on the function and performance (or health) of work organizations, and its impact on the wider socio-economic system. A model of the primary objectives and wider impact of workplace health promotion is presented below (see Figure 1). This model may be used to inform the design of evaluation studies.

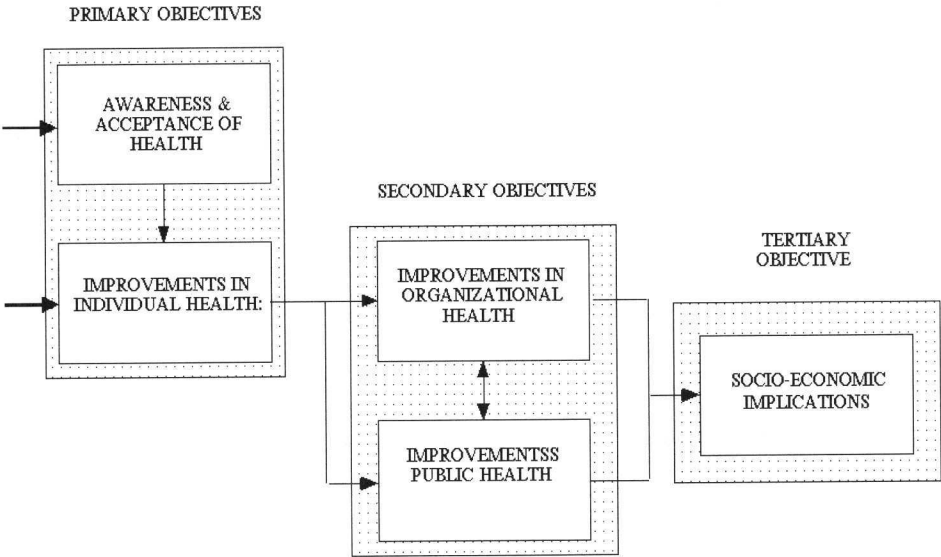


Figure 1 The Objectives and Wider Impact of Workplace Health Promotion

The model suggests three different levels at which an evaluation could take place. *Level 1* represents the effects of workplace health promotion on the individual; on their awareness of health, knowledge, skills and motivations, and subsequently on their health-related behaviour and health status. *Level 2* represents the wider impact and aggregated effects of workplace health promotion at the level of the community (public health) or the health of the working group as a whole, and particularly on those diseases and disorders which are made manifest in or particular to those environments. It also represents the impact of workplace health promotion on the function and performance (or health) of organizations, while *Level 3* represents its impact on the socio-economic systems and environment.

Workplace health promotion is an applied science, and evaluation is a critical part of that science. The evaluation of workplace health promotion is the systematic collection of data linking the presentation and design of such programmes to their success or failure. The demonstration of this linkage should be subject to scientific enquiry. Developing from the model suggested above, evaluation is conducted in order to answer two basic questions: (i) whether the programme's immediate objectives were achieved in improvements in health-related behaviour and health status, and, (ii) what is the wider impact of the health promotion activities. While evaluation is primarily concerned with whether workplace health promotion works or not, it is also necessary to explore *why* it does or does not work. This has to be accomplished by identifying and measuring the effects of the psychological, social and organizational factors which mediate and moderate its primary and under effects. This *extended form of evaluation* is concerned with testing out hypotheses and models of the mechanisms underpinning workplace health promotion. This issue of understanding the mechanisms involved is necessarily broader than that of evaluating actions.

Conclusions

There is no adequate alternative to scientific evaluation if the effectiveness of workplace health promotion programmes is to be improved, and only methodologically sound evaluations are worth doing. Such evaluations derive from an adequate evaluation model, and, in turn, an adequate conceptualisation of workplace health promotion.

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Notes

1. A nation-wide survey of workplace health promotion programmes in the USA (Office of Disease Prevention and Health Promotion, 1987; Fielding, 1989; Fielding and Piserchia, 1989) was undertaken in 1985 by the Health Promotion Division of US Corporate Health Management (later merged into Johnson & Johnson Health Management Inc.). Data were collected from some 1038 workplaces with 100 or more employees and from 320 workplaces with 50 to 90 employees. The most prevalent activities were smoking cessation (35.6%), health risk assessment (29.5%), back problems: prevention and care (28.6%), stress management (26.6%) and exercise and fitness (22.1%). Other activities included: off-the-job accident prevention (19.8%), nutrition education (16.8%), hypertension control (16.5%) and weight control (14.7%).

From research findings to the marketing of workplace health promotion - the issues in the European context

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Introduction

This paper explores the issue of how WHP is marketed. It asks questions of practitioners and researchers, and provides an agenda for improving research and practice over the coming years. These questions are:
methods and

What is WHP?

What can WHP do - what is it for?

How might the marketing of WHP be focused?

These questions focus on some major issues facing the development of WHP in Europe. It is clear that practitioners and policy makers do not always share the same concept of WHP. Moreover, there may be confusion over the objectives of WHP. Finally, while some strategies for marketing WHP do exist, the focus and success of these strategies is questionable. Before answering these questions however, it is necessary to outline some of the main features of the state of development of WHP on both sides of the Atlantic in order to situate the exploration of these questions.

The state of development of workplace health promotion

Two traditions of WHP practice have evolved which may be termed the US and the European models. In the US, a main driver of WHP has been the need to control health care costs. This has led to a streamlined and targeted approach to managing the health risk factors most amenable to cost effective control. In practice this has meant that most programmes focus on a small number of behavioural risk factors for disease and that they try to manage these risks through behaviour modification programmes. In Europe, the evolution of WHP has occurred later and has been more diverse. Much practice follows the US model, and this model is also used by some of national and voluntary HP agencies. Significantly, health care cost control is not a major factor in these activities in Europe. Other approaches have also been developed in Europe. For example, in Finland an approach which seeks to maintain workers at work (maintenance of work ability) has been developed as a national programme. In the UK, the four regional health education agencies have developed, inter alia, the Health at Work in the NHS programme and a range of other HP programmes targeted at the workplace. In Germany, an approach based on analysing company health records has been developed by the Sickness Insurance Funds.

The European approach, while not as consistently applied as US models, has a number of distinctive elements. A major feature is the stress placed on workforce participation in

designing and implementing WHP programmes. In addition, the European approach focuses on work environment interventions to a greater extent than the US models. This emphasis means that there can be overlap with H&S practice. European programmes also tend to take a broader view of what constitutes the health needs of the workforce and tend to place far less emphasis on cost justification when compared to the US model.

It is useful to summarise the research in order to situate how WHP might best be marketed to its various target audiences. Firstly, the majority of research literature originates from the US - these have limited applicability to marketing WHP in Europe due to the differences in health care cost structures. There is a general lack of research on comprehensive and integrated WHP interventions. It would appear that such programmes do not take place in the US, while anecdotal evidence from Europe would suggest that integrated WHP programmes are a rarity in Europe also. In addition, there are relatively few long term evaluations of the effectiveness of WHP. Moreover, most research literature makes no mention of the relationship between health and safety structures WHP.

Within the literature, there is no consensus on what exactly constitutes WHP. Basically, there are two competing theoretical views on defining WHP. The first is concerned with HP in the workplace, i.e. where HP developed outside of the workplace is exported into the workplace with little consideration of the workplace as a setting. The second definition is a more embracing one, which recognises that the workplace is a unique setting, which already has a set of structures dealing with health issues (health and safety), has a set of relationships between stakeholders in the workplace (management and labour) and which recognises that the workplace is not a neutral setting for HP. This second approach is more integrated - it focuses on general health and implements any action which may improve health, thereby integrating both the H&S approach and the HP approach.

One final feature of current literature is that there is almost no treatment of the issue how WHP might best be marketed. Typically, efforts to market WHP are framed in terms of its effectiveness in health and financial terms. While the research is not fully conclusive on these issues, there is little doubt that at least the US approach to WHP can be justified on these grounds. A key issue here concerns whether or not they are perceived by the stakeholders within enterprises. A 1992 survey of over 1400 European organisations revealed that multiple benefits were perceived by companies engaging in a range of health activities, despite the fact that there was no evidence that companies had undertaken formal analysis of these perceived benefits.

Linking research and marketing

The link between research and developing an effective marketing strategy needs to be augmented by a realistic view of how companies make decisions about investment and of the business environment in which companies operate. Relevant issues here include the economic and legislative environment, trends in management practice and organisational development, the state of management-labour relationships and how investment decisions are arrived at within the enterprise. Also of relevance is the issue of who the principal stakeholders within and external to enterprises are in relation to WHP.

The major forces which shape company behaviour include the globalisation of business, the increasing pace of technological change and the need for companies to become more competitive in order to survive. However, these pressures do not operate on all enterprises equally. The public sector, though facing demands to become more efficient, is generally not facing a trend towards globalisation. Moreover, enterprises operating in non-internationally traded sectors do not face equal competitive pressures as those who face wider competition. Also, the impact of these economic trends on very small enterprises (which employ the majority of the workforce) differs from the impact on large business.

Health and safety legislation is also important when assessing the propensity of a company to undertake WHP. For example, in countries where health screening is obligatory, or which provide financial incentives for engaging in health actions provide a more supportive environment for WHP. This also changes the nature of the marketing strategy which might be developed.

Trends in management practice and organisational development influence the ways in which decisions are made about WHP. At the organisational level, trends towards decentralisation, concentration on core businesses, outsourcing and teleworking can loosen the contractual relationship between employer and employee thereby making it less likely that WHP might take place. At the management level trends towards quality management (QM) may offer potential for the integration of WHP, though the focus of QM on productivity and external customer orientation may compromise the health focus of WHP.

Studies of the process of how investment decisions within enterprises offer insight into the possibilities for marketing WHP. It is often assumed that such decisions are always subject to rigorous cost benefit analysis and strategic analysis. In practice, this tends only to be true for larger investments. In addition, human resource constraints play a part in these decisions. Also important here is the centrality of the investment to the success of the enterprise. When decisions on such critical success factors as plant and machinery are made, the process is more formal in all sizes of enterprise. However, return on investment is not the only criterion which is applied. Other dimensions include the availability of finance, the impact on production systems, and crucially (from the point of view of marketing WHP), the need to keep in step with or advance on the competition.

Approaches to the marketing of workplace health promotion

These observations have important implications for the marketing of WHP - they point to the need to recognise the context in which target enterprises exist, the fact that enterprises differ greatly in their propensity to undertake investment of any kind, and the fact cost benefits analysis is not necessarily the most important factor in making investment decisions. In relation to marketing WHP, it would be a mistake to confine marketing strategies to the issue of cost effectiveness and returns on investment, since enterprises rarely make investment decisions on this basis alone.

What is marketing ?

There are many definitions of marketing, all of which have their strengths and weaknesses. Here, marketing refers to the definition of a service and the strategic planning which is undertaken to ensure the delivery of the service to identified and defined market sectors. We are therefore concerned with the definition of the WHP service and the identification and definition of potential users of the service.

What is being marketed ?

Defining a service is not simple, especially in the case of WHP, where there is no widespread consensus on its meaning. A distinction can be drawn between the core and peripheral elements of a service. Both kinds of definition (academic and market oriented) are necessary, firstly to satisfy the scientific community from which of the basic information about WHP emerges, and secondly, to ensure that potential users of the service have a precise idea about the nature of the services they will use.

The concept of WHP is complex due to conflicts between theoretical definitions and modes of practice. Moreover, companies may de facto act to improve the health of the workforce, but they may not describe as being WHP. Both the US and European models of WHP (in theory and in practice) have strengths and weaknesses, especially in relation to using them for marketing purposes. The US approach is easily understandable by the professional and layman, is easily differentiated from H&S activities, but suffers from its implication that WHP is something different to H&S activities. In addition, there is major doubt about the cultural appropriateness of this approach in Europe. The European approach emphasises the workplace as a complex setting, and is therefore more complete from a conceptual perspective, but suffers from difficulties in distinguishing it from H&S activities. From a marketing perspective, the first type of definition is easier to encapsulate, since it is distinct from existing workplace health services and is easy to understand. However, the limitations of this approach in practice and the fact that it faces cultural difficulties in its widespread application in Europe, render it unsuitable as a basis for marketing.

The following definition of WHP is proposed, which incorporates the European and US approaches and which accommodates the practice of HA&S. In addition, it allows a distinction to be made from H&S, as it includes the element of health improvement, which from a marketing perspective is essential.

‘Workplace health promotion refers to any activity which may be taken to improve and protect the health of the worker which is based in the workplace’

Who are the target groups and what are their interests ?

For marketing purposes, it is important to analyse what groups are stakeholders in relation to WHP services and also to define the nature of their stake. Such an analysis acts as the basis for the developing a differentiated market strategy. There are at least three groups of potential stakeholders in WHP - service suppliers (e.g. WHP agencies, service implementors (e.g. professionals in the field, H&S agents) and service consumers (e.g. workers, managers).

Service consumers are situated within the workplace context, while service suppliers are external to the enterprise. Service implementors may be either.

When considering the interests of stakeholders, it is clear that they are not necessarily all positive. For example, employees may have an interest in personal health improvement, while at the same time having fears for the confidentiality of the process. Moreover, stakeholders interests may clash, e.g. an employers interests in improving productivity may be not be consistent with the interests of employees. It is essential to understand the nature of the interests of the various stakeholders in WHP in order to build a sensible and coherent marketing strategy, as these interests must be taken into account in order to ensure accurate targeting of messages and in order to prevent the dissemination of negative messages.

A process for developing a marketing strategy for workplace health promotion

The focus of this paper has been on the challenges to the marketing of WHP which must be faced if practice is to advance. A framework for developing an effective marketing strategy is needed. Such a framework needs two elements - a process dimension and a content dimension, both of which must be addressed simultaneously. A five step process for developing an effective marketing strategy are outlined below. The steps outlined are necessary both at a European level, which would help serve to define the future development of policy in the area, and at a national and local level, where not only would policy development be assisted, but the delivery of WHP activity would be enhanced.

Service definition

Market definition

Analysis of service providers

Market creation

Market consolidation, servicing and extension

There is still much work to be done at the early stages of marketing strategy development, especially in relation to the issue of service definition. Though this process can be based on theory, the mix of services and activities, the process of how WHP should be undertaken and the standards to which the activities of WHP should be performed are not yet fully defined. Moreover, it is still not clear what are the essential parts of the WHP service and what are merely desirable. An essential part of this work should concern the definition, in terms that are relevant to the target markets, of the purposes of WHP.

With regard to market definition, there is a tendency to treat all enterprises in the same way. Questions concerning the differences between enterprises in terms of size, resources, problems which WHP can address, interests in WHP, barriers to uptake of WHP and many others need to be asked in this stage.

A crucial element in developing a marketing strategy is to assess the capabilities of potential WHP service providers to address the problems of enterprises. It is doubtful that all HP agents are operating with an integrated model of WHP, and most do not possess the change

management skills which such an approach implies. The creation of a supply of the appropriate skills is therefore essential.

Despite the growing interest in WHP, there is still a need to create a market for WHP services. However, constraints on service delivery exist, and it would be wise to focus on specific market sectors, especially those with the highest propensity to uptake the WHP service. Moreover, as all market sectors do not share common problems, this focusing of effort becomes important. During this market creation phase, an essential part of the activities which take place concerns the development of marketing tools and techniques which should be differentiated according to the specific market sectors being addressed.

The final phase of developing a marketing strategy concerns the consolidation, servicing and extension of the market. The most important element here is to ensure that early successes of the strategy are built upon through the gathering of data on the effectiveness the marketing and implementation of WHP.

Conclusion

WHP is a relatively new phenomenon in Europe especially in relation to the more integrated models which are culturally appropriate. The WHP movement suffers from many of the teething problems associated with any new movement - unclear definitions, differences between theory and practice, having elements of being a 'solution in search of a problem', and having difficulties in establishing its attractiveness to its public.

The research base which might be used as a basis for improving the uptake of WHP has its limitations - much of it emanates from the US with attendant problems of transferability, many of the popular questions asked are unlikely to be capable of being answered by research and much of the research undertaken is of limited use for developing a meaningful marketing strategy from the perspective of potential users of the service.

If practice is to become more widespread, improved efforts will need to be made in relation to the marketing of WHP. These efforts will need to be more sophisticated and differentiated than heretofore, and will need to follow the principles of service marketing. In addition, it needs to be clearly recognised that WHP need not, and perhaps should not be sold solely on the basis of cost effectiveness arguments. WHP also meets social needs to the extent that the health of the workforce is improved.

6 Instruments and models to assess costs and benefits at the company level

Introduction

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There is a large number of instruments for estimating the costs and benefits of investments in occupational safety and health. However most of these instruments are variations on traditional economic evaluations of investment projects. The cost and benefit items are added to structures already in use by many (most larger) companies.

Some instruments were presented that seem to be opposites with respect to the approach adopted. Oxenburgh adheres a simple 5-step model that gives pay-back period as a result of a number of indicators, such as wage cost, extra overtime and lower production due to poor working conditions. The availability of software adds to the easy use of this model, that is especially useful when a quick estimation of the economic feasibility of an improvement is required, for instance when a professional wants to get management attention for workplace improvement.

The planning model of Zangemeister goes into much greater detail and a large number of performance criteria is included. The effects of measures to improve safety and health on competitiveness and economic performance are evaluated. This allows the company to choose the best solution in terms of cost-effectiveness. The complexity will be a drawback for professionals to use the model in their practice. The experiences with implementation in a larger company, the model can be adapted for use in small companies also.

The German method of Extended Profitability Analysis (*Erweiterde Wirtschaftlichkeitsanalyse*, EWA), as presented by Hornberger, also includes a large number of performance criteria in the evaluation. In the EWA a strict distinction is made between monetary criteria and non-monetary criteria. Hornberger shows that the EWA is not applicable for occupational safety and health measures only, but also for other changes in the organization of labour (*flex-work*). One of the strong points is the transparency of the process that facilitates better decision making. Since the change to a market-orientation in Poland, estimating the costs and benefits of medical prevention in enterprises has become more and more relevant as preventive should be based on economic appraisal. Rydlewska-Liskowska describes the instrument that is proposed in Poland. It shows that the costs and benefits taken into accounts are comparable to all other instruments, though effects on productivity are not taken into account. The practical experience in companies is that relevant data is often missing. A second Polish experience is described by Pawłowska. In Poland the Finnish method of cost benefit estimation is applied and tested in 25 companies.

The method is found suitable, though adjustments had to be made in the current registration system of occupational accidents.

In the framework of KOPAG (Collaborative Programme on Occupational Health), which is developed and implemented by the German Federation of Company Health Insurance Funds (BKK BV), a method for economic evaluation for OSH measures is drawn up. The scheme includes a number of steps that have as a goal to support the decision making process. Key elements are transparency, systematic elaboration of design alternatives, calculation of investments and the opportunities for better participation. In the assessments both economic indicators as social or humane values are included. The practicality of the method is demonstrated with the results of a case study.

Practical applications of calculation schemes help in the - most often evolutionary - development of widely accepted methodology. Two such examples of calculations, focusing at the costs of OSH interventions are presented by Grosskopf et al. The examples include a calculation format.

Conclusions

Part of the methodological issues that are discussed in chapter 3 and chapter 4, recur in instruments and methods to be used at the company level. Good data sources and adequate methods to attach a monetary value to the benefits to both the organization and the individual workers are problems.

The proposed method of calculating the cost of occupational accidents in the company

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Occupational accidents result in serious economic consequences for those involved: the injured person, the company and the society. The calculation of accident cost is of key importance at company level as direct measures can be taken there to reduce that cost. Suitable approach and accurate cost calculation method provide the ground for cost-benefit analysis, which is to facilitate the selection of adequate investment activities aimed at the improved safety of the working environment.

As elaborated at the Central Institute for Labour Protection, the simplified method of data collecting and calculating the cost of accidents at work features a new classification of occupational accident expenses grouped into controllable and uncontrollable cost at company level. The simplified method covers only the items classified as controllable cost, which is logically justified because it is necessary to create instruments for the employers to be better motivated and to more effectively improve safety management at company level.

The paper presents the method and the results of its practical verification performed in some large industrial plants.

Introduction

The calculation of work accident costs is a significant element of cost-benefit analysis. In most companies, the costs incurred due to accidents are not known. The method presented in the paper enables the calculation of such costs at company level.

Accident at work is defined as an unexpected event resulting in an injury of a person, loss or damage to property, plant equipment, materials or environment, which is the outcome of plant operations.

Accident cost borne by the company can be defined as a theoretical value increasing the company overheads which, at the same time, either reduces the profit, or increases the loss incurred in the company due to the accident.

In line with the most recent method of accident costs classification, the proposed method includes the grouping of costs into those controlled and uncontrolled by the company. The controlled costs include all the cost items that the company is able to control, which means that they can be limited thanks to appropriate prevention measures. The method for the calculation of work accident costs will consider only those of the cost items that are controlled by the company. This is a justified approach because of the need to provide the employers with incentives to effectively manage the issues related to occupational health and safety.

Identification of basic cost items incurred due to work accidents

When calculating the cost of accidents at work, appropriate identification of main cost items and their accurate measurement are key importance elements as they are decisive factors affecting the reliability of information on the cost of accidents at work in the company.

The accident costs include as follows:

- lost working time;
- current liabilities;
- lost fixed and current assets;
- lost revenues;
- income, for e.g. the compensation or indemnity payments.

Lost working time can be that of the injured person, or some other people (those assisting or accompanying the injured person on the way to the doctor's office or home, looking on etc.). It includes the time lost due to the replacement of the injured person, both on the day of the accident and during absence, time spent on the accident investigation, planning and the research and development work; it can also include other cost items, such as time for training or retraining, time lost due to reduced efficiency etc.

The accident can lead to many **current liabilities** such as the payment of a single compensation, compensation benefits, compensation benefits in virtue of occupational rehabilitation, because of transfer to other work positions or the need to provide for the funeral expenses in case of a fatal accident. Current liabilities are also incurred because of the need to rent machines, contract out the production or repairs, cover the cost of transporting the injured person, and the cost of medical treatment outside the plant.

The **losses incurred in the fixed or current assets** include the lost raw materials, intermediate and finished goods, or the damages to the plant equipment (machines, tools, vehicles), if any. The accident can also result in **direct or indirect loss due to contractual fines, stopped production, reduced productivity and deteriorated quality of production.**

Monetary consequences list indemnity **payments received from the insurance institutions** because of damage, destruction or theft of the company property that were covered by the insurance.

Some major cost items due to accident at work presents figure 1.

At the onset of the study, 48 cost items resulting from accident at work have been identified. These cost items were subject to direct evaluation in 25 companies of different production profiles. The evaluation was based on the results of a survey questionnaire filled by the company representatives.

The survey indicates to many considerable differences with regard to the scope and mode of registering specific accident cost item data as well as the diversification of the information sources used to the identification of cost items. In most companies, a lot of cost items highlighted in the proposed method are recorded in various company units. However, the costs are not consolidated or compared, and ultimately they are not recognised as costs related to work accidents.

The survey results enabled a verification of the preliminary identified cost items as well as the system devised to collect and register the data on the cost of accidents at the company level.

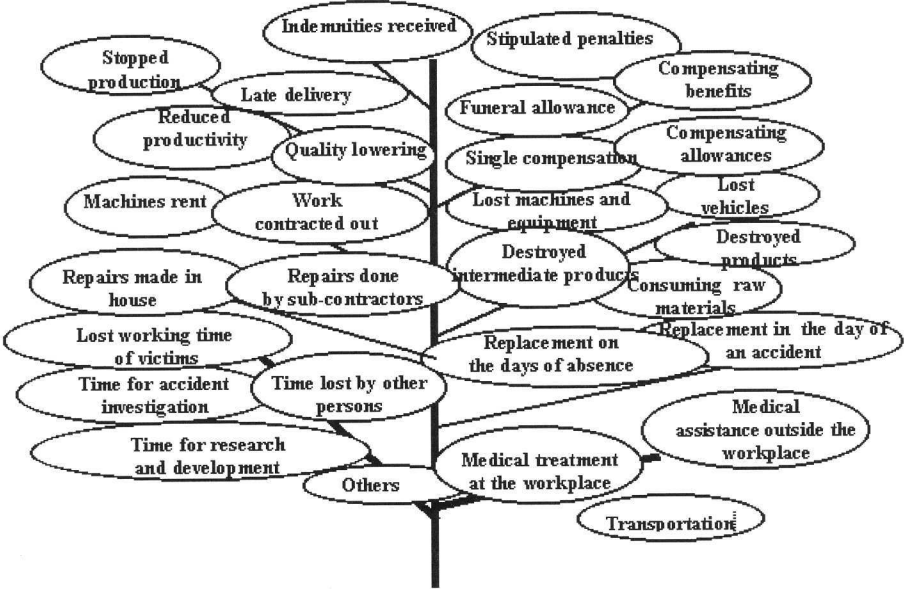


Figure 1 Main cost items due to accidents at work

The collection and recording of accident cost data

The calculation of the accident cost is linked to the need to collect and register the accident cost data in a structured way, which would guarantee that all the accident cost items are covered. If the existing records and accident documentation in a company are used for that purpose, the work is going to be difficult and time consuming. Moreover, not all significant cost items will be covered. Considering all this it seems, therefore, justified to suggest that the companies intending to calculate the accident costs should supplement the accident documentation with a “Form on the costs of accidents at work” which has been developed for accident cost data collection. The Form enables the recording of all information indispensable for the calculation of accident related costs as it has cells where all the data on basic cost items are going to be put as well as cells where calculated sums of cost items and the total accident cost will be shown.

Verification of the method for the data collection and accident cost calculation in selected companies

In order to practically verify the applicability of the method for the collection of data and accident cost calculation, some research has been done in two large industrial plants: steelworks employing about 6500 workers and motor car industry plant with about 6000 workers.

It has been assumed that the study would focus on the accidents in the years 1995 and 1996 and early months of the year 1997.

The existing system has been used to collect the 1995 and 1996 data. In the studied real time period (at the beginning of 1997), the system of data collecting and registering in line with the rules elaborated, were implemented in some selected plant divisions, which enabled also the study of costs of accidents followed only by property damage. The research is being continued, and the results obtained so far are presented below.

In the year 1996 a total of 84 injury-accidents were recorded in the steelworks. Costs resulting from these accidents amounted to 873 508 PLN and represented 37,4% of annual profits. In the motor car company a total of 193 injury-accident were recorded, which resulted in cost to the company of around 361 346 PLN (2,7% of annual profits).

The example of share of particular cost items in the total cost of work accident in the steelworks in 1996 is shown in figure 2.

The research output confirms that the existing system for data collection and registration does not cover many data indispensable to calculate the cost of accidents at work. Therefore many of cost items have to be rough estimates based on information included in the accident report or other available documents. Without changing the present system, it is impossible to calculate the cost of non-injury accidents as they are not covered in the presently applied data registering system.

During the study period (two month), a system to record the non-injury accidents was introduced. Based on the research, the extrapolation of estimates has been done as regards the cost of non-injury accidents in a whole year. It can be expected that the cost of non-injury accidents will be several times higher than that of accidents involving injuries.

Basing on the research output, it can be stated that the cost of absence of the injured person is the major accident cost item (over 40% of the total cost). Absence period is recorded in the company and it is regarded as the main cost element that has to be taken into account when calculating the accident cost. The cost of replacement is calculated in many different ways. In the steelworks, it was recognised to be one of major accident cost items and was estimated as high percentage (over 40%) of total cost. In the motor car industry, it was decided that the calculation of the injured person's replacement cost was very difficult, and therefore, no such cost item was considered. This happens in many companies, where the cost of injured person's

replacement is not regarded as the cost item incurred due to work accident. In reality, company may have hidden reserves that can be used to cover up costs of work - related accidents or ill health.

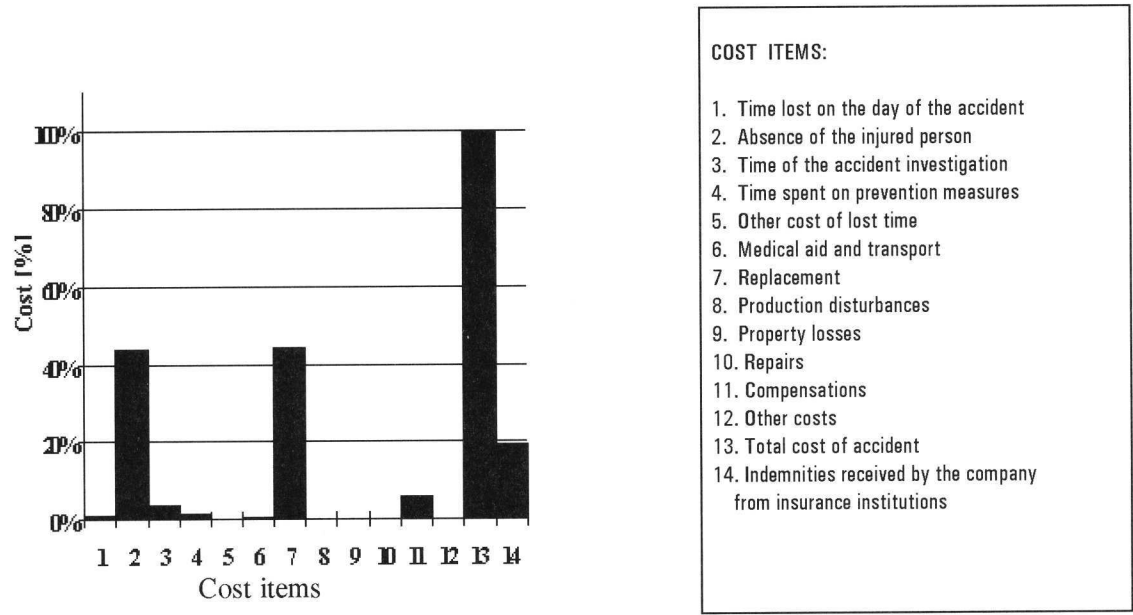


Figure 2 Particular cost items as percentage of the total cost of accidents in the steelworks in the year 1996.

In both studied companies, the cost of post accident investigation is a significant cost item (about 5% of the total accident cost). Depending on the presently effective branch labour agreement, the cost of compensation payments by the company may differ and can be quite high, and, at times, equal to the indemnity payments made by the insurance institutions (that cost item amounted to about 20% of the total accident cost in the studied metallurgy industry company).

Summary and conclusions

The research results indicate that the method is suitable for the calculation of accident cost in the company. In most companies with the traditional system of data recording in place, the practical implementation of proposed method would be difficult as a lot of data needed for the cost calculation are not available, or they have to be sought out in many different places, or given as estimates. For these reasons, the “Form of work accident costs” has been developed to supplement the accident documentation. The proposed method is relatively simple and can be used by the people in the companies.

Cost and Benefits of the medical prevention in Polish enterprises

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Introduction

The market reorientation of the Polish economy has forced the necessity of rationalization of resources management and begun the process of looking for more effective instruments of cost control in the enterprises. It is extremely important for each employer to control the costs with comparison to obtaining effects. This rule should be connected with the employer activities for occupational health also. One of the activities undertaken in enterprises is medical prevention at workplace. The medical prevention is understood as an inspecting the workplace and evaluation of work conditions, evaluation the health risks and workers health status as the result of the medical examinations. The consequence of the presented activities is certification of capability for work at particular work posts. Its costs, in its obligatory scope according to the law, are covered by employers who finance the preventive examinations and implementation of the physicians recommendations concerning the health status of employees and workplace conditions. These recommendations result from the physician examinations and workplace inspection. The projected changes of Occupational Health Services organizational and financial system in Poland concern the employers possibilities of choosing the organizational form of delivering preventive care for the employees. According to the Law Act the employer will be entitled to contract with independent health care unit, private practice or become the owner of health care unit.

The medical prevention is one of the wider preventive activities in enterprises. The physicians recommendations result in further activities as establishing special work safety services by or on behalf of the employer and monitoring of harmful or noxious agents at workplaces. Depending on plant size the employer can set up his own laboratory for monitoring the occupational environment or contract the monitoring to an outside laboratory.

It should be stressed that the prevention under research study is treated as the activities aiming at work conditions and their influence on health status only (accidents at work, occupational and work related diseases, poisoning, disability).

On the other hand, it should be underlined that the market-oriented approach to the whole health care system in Poland has changed the approach to the role of the health care units (MOH Instruction as regards general conditions making contracts and dissolution of contracts concerning health services). Under market conditions there have been define new role of health care units, not only as the producers of the health services but as the financial and organizational independent subjects also (MOH Regulation as regards disposal of public funds to health care units; Project of the MOH Instruction as regards the flows of financial means within health care units and cross - boundary flows within provinces). A major shift in the units attitude to their responsibility for

the resources use has been made. It is expected that competition among health care units will develop efficiency and quality of health services. These changes give the employers the additional incentive to find, choose and contract services.

The fundamental problem in the field under consideration concerns the ratio between the current costs of prophylaxis and the future costs which could be avoided or put off owing to prophylaxis. These future avoided costs are identified with benefits. Decisions on undertaking and organizing preventive activities by employer should be based on economic appraisal. Such appraisal could support the decision process aiming at choosing the option of realizing the prevention in enterprises. Proposed economic tool of decision making should be adapted to occupational health services under Polish conditions.

The proposed method

The research study has been undertaken in order to adapt and implement cost benefit analysis of prevention in Polish enterprises. The aims of this study have been: first, to estimate the economic consequences of medical prevention for employers in order to convince them of the role of such activities; second, to provide the employers the method for estimating the value in financial terms of the prevention which may be used in making decision on the form and scope of such activities in enterprises. The principles of costs and benefits analysis in Polish enterprises, the algorithm of conducting it and instruction of implementation have been prepared. Additionally, the software for implementing the analysis has been prepared. The prepared software guides in accurate registration and calculation of both investment and outputs of the prevention. The software provides a technical tool for cost benefit analysis also create awareness on usability and advantages of occupational health to the company productivity.

The method has been developed in conjunction with the number of occupational health practitioners and economists. It has been implemented in 12 enterprises to verify the method and collect the relevant data in order to eliminate the elements (theoretical only) impossible to implement and to recognize the real conditions of conducting analysis in practise.

Enterprise costs and benefits

For the needs of the research study it must be possible to identify costs and benefits from engaging in preventive activities in enterprises. It must be clear who incurs what costs and who receives what benefits. It is particularly important to distinguish between costs incurred by enterprise and by other institutions and benefits received by it and other institutions. Such separation enables to identify enterprises engagement in prevention.

The list of costs includes the following costs:

1. cost of the time taken by preventive examinations during the paid work time; these costs can be calculated in several ways depending on data at the disposal;
2. cost of the work time lost by employees as a result of preventive actions (employees send to the health care units as a result of the physician examinations or disability for working)
3. cost of accident prevention (costs of maintaining in readiness the special equipment and relevant staff in the enterprise - cost independent on the number and severity of accidents)

4. cost of individual protective measures (glasses, shoes etc.) covered according to physician recommendations; that is employer obligation;
5. cost of modernization in the enterprise (ventilation, lighting etc.) as the consequence of recommendations after the medical examinations or inspection the work posts by physician responsible for medical prevention or by the State Inspection;
6. cost of workers education on the hygiene and safety at workplace organizing by employer and conducting by outside bodies;
7. costs of the work factors monitoring by laboratories and systematic carrying out an analysis of sickness absenteeism, accidents at work, occupational and work related diseases, developing relevant documentation on occupational exposure as the law obligation;
8. cost of reallocation the workers to the new work posts due to physician recommendation;
9. cost of workers travelling to OHS units;
10. cost of preventive examinations paid by employer to the OHS unit;
11. cost of accommodation, heating, lighting, electricity of OHS unit (if organized by employer)
12. cost of medical equipment in OHS unit organized by employer;
13. cost of consumable medical materials for OHS unit organized by employer;
14. cost of additional medical examinations made outside (laboratories, consultants etc.);
15. cost of medical staff travelling to workers being outside the enterprise;
16. cost of administration referring to prevention (making reports, calculating the salaries, compensations etc.);
17. cost of medical personnel salaries employed by enterprise;
18. cost of the other units of enterprise cooperating in the prevention area;
19. compensation claims as the result of prevention activities.

The list of benefits includes the following benefits:

1. avoided the sickness absence as the result of preventive activities (calculation takes into account probability of occupational diseases, accidents, or work related diseases, pre - symptomatic detections and physician recommendations);
2. avoided loss of work time at time of treatment as the result of giving up the prevention by employer;
3. avoided cost of accidents at work (avoided material loss, loss of the paid work time, salaries for working in overtime, loss of production); it could be useful the method of accident costs calculation which was elaborated in Institute of Occupational Medicine in Lodz;.
4. avoided loss through reallocating workers to the new work post, through returning to job under supervision or other organizational changes resulting from the physician recommendations;
5. savings in staff time in different departments of the enterprise due to OHS actions;
6. savings in compensations paid to the employees.

The considering benefits of prevention delivering for employees go to the enterprises in terms of avoided financial losses or savings in financial outlays or production costs. Although the authors enumerated much more benefits that listed the difficulties in estimation some benefits influenced on excluding them from the analysis.

The information on costs and the information needed for benefits quantification have been collected directly from the enterprises documentation (cost accounts, lists of individual salaries, bills, investments, reports on production) and medical documentation (individual information on worker, characterization of work post, reports on inspecting the work posts, reports on monitoring the working factors, reports on absenteeism). Some of them have been created especially for the analysis using the relevant formulas. The main source of the information to estimate the benefits has been the direct discussions with physicians, inspectors of hygiene and safety and managers of the production departments. The authors considered benefits in financial terms at the minimum expected level in order not to overestimate them.

Results

Authors quantified the costs and benefits to include them to the cost and benefits ratio. For a given activities the sum of the costs has been compared with the sum of benefits in financial terms. The benefits exceeded the costs in 8 from 12 enterprises. The other enterprises obtain the contrary. Authors suggestion is that the employer should analyze this cases once again including unmeasurable in financial terms benefits or expand the period of analysis. It may happen that some specific for a given enterprise benefits have not been included. Although the authors limited the analysis to the enterprise scale they are conscious of the possibilities of generalizing the method to evaluate prevention in wider scale. Economic appraisal of health problems may be used to justify the prevention, for identifying their priorities and targets from the economic point of view. The cost analysis shows that the costs of preventive examinations, individual protection means, administration costs, costs of accident prevention and monitoring conditions at workplace are incurred by all enterprises. But there are some costs which differs among the institutions. They included the costs of paid work time spent on medical examinations, the costs of absenteeism as the result of the preventive examinations, the costs of OHS units, the costs of reallocation the workers. Among the benefits estimated the most often benefits has been avoided costs of sickness absence, avoided costs of accidents and work - related diseases and savings in paid work time of the administration. The reallocation of the workers due to health reasons has been uncommonly cases giving the benefits in enterprises under study.

The implementation of the analysis made it possible to analyze data and identify the barriers in practice. Among them, are: medical data registration in different organizational units in enterprise, aggregation of the financial data, the lack of some financial and medical data. Due to the poor registration of cost and health problems and their impact on production the accurate estimation is difficult to do.

The following barriers have been Confirmed as the result of the implementation:

- dispersion of enterprises documentation among different departments (hygiene and safety department, social department, accountancy department, employment department, technical department, managers of department)
- collection parts of the same documentation in different departments in enterprises and in OHS units (individual information on workers health and periodical preventive examinations)
- aggregation of financial data in enterprises (registering some cost on syntetic accounts)
- aggregation of information on prevention at workplace (the lack of information on absenteeism due to occupational or work - related diseases)
- the lack of information on unit costs of preventive examinations if the employer is the owner of OHS unit
- lack of information on accidents costs for employer and costs of reallocation the workers in enterprises documentation.

Profitability Analysis in the Collaborative Programme Occupation and Health

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Abstract

In the context of the analysis of work related health hazards, Collaborative Programme Occupation and Health (KOPAG: Kooperationsprogramm Arbeit und Gesundheit) also focuses on the economic efficiency of measures for occupational safety and health (OSH measures).

Although of increasing importance in terms of competitiveness and social policy, direct OSH measures (measures that are exclusively aimed at occupational safety and health) generally elude systematic economic analysis, as their effects on health are difficult to assess and their monetary benefits can usually not be determined at all.

KOPAG is therefore studying whether investment in OSH measures will yield a benefit and what contribution OSH can make towards achieving corporate objectives.

This article describes a method to determine priorities for OHS measures in accordance with economic principles for rational resource allocation. Qualitative effects, such as the following

- ◆ Flexibilization of production
- ◆ Raising of the quality standard
- ◆ Reduction in time lost due to absenteeism and fluctuation
- ◆ Improvement of the corporate social system (job satisfaction, work climate, willingness to work)
- ◆ Improvement of qualification and performance
- ◆ More prestige on the labour market, supply market and demand market.

are important elements to be taken into account.

The instrument of Comprehensive Profitability Analysis (CPA) serves as an aid to planning. With this instrument, the direct and indirect monetary effects, as well as the non-monetary criteria or benefits are included in the decision-making process.

The Collaborative Programme Occupation and Health

The Collaborative Programme Occupation and Health (KOPAG) is developed and implemented by the Federation of Company Health Insurance Funds (BKK BV) and the or Central Federation of the German Berufsgenossenschaften (HVBG) (Figure 1).

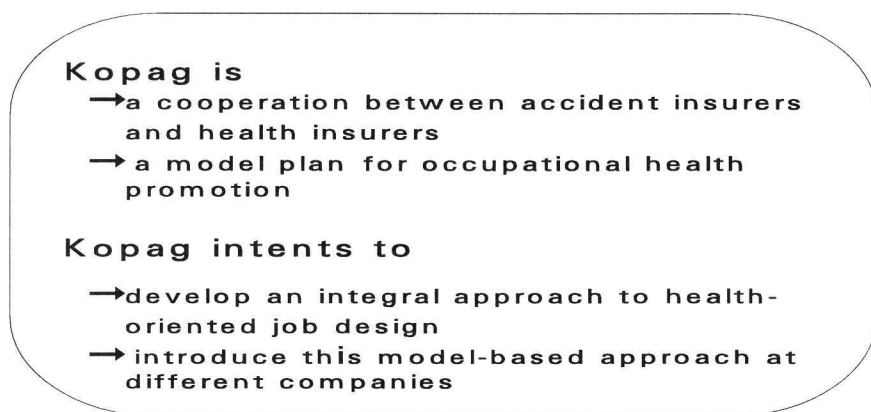


Figure 1

It is currently the most comprehensive form of cooperation between health insurers and accident insurers in the prevention of work-related diseases. KOPAG's objective is the generation of methods for healthy job design on the basis of analyses of work-related stress and strain, and their application (Figure 2).

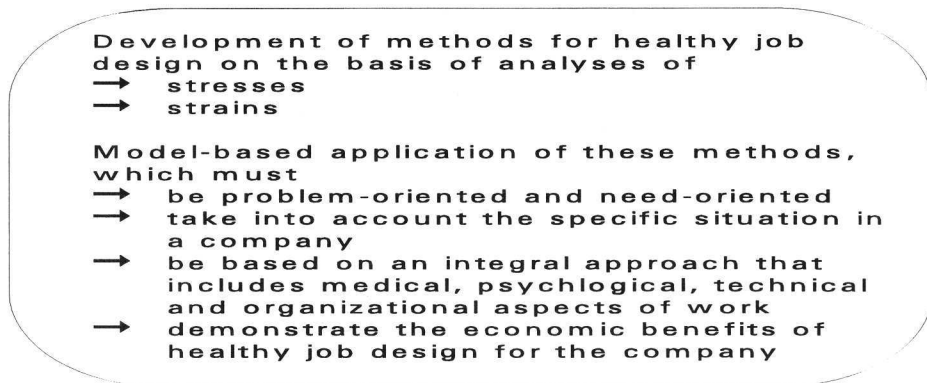


Figure 2

Perspectives of ergonomics, industrial medicine, social science, work and occupational psychology and business economics are combined to allow new, more accurate analyses of the interconnections between working conditions and employee health. Based upon detailed data analyses company- and branch specific stress and strain factors can be identified. These insights are then used to formulate proposals for a health-oriented redesign of technical and organizational working conditions and for the qualification of management and other personnel. Subsequently, various working models are evaluated in business economics terms to clarify the costs and benefits of the health-related measures for the companies.

Measures in Occupational Safety and Health (OSH measures)

Being investments the profitability of OHS measures should be stated by means of ex post and ex ante net returns calculation in order to utilize scarce resources as efficiently as possible. Furthermore, such measures in a broader scope - in so far as they exceed the framework of legal stipulations - are only viable if they offer companies the possibility of greater efficiency with regard to performance or if they are at least economically feasible.

It is usually more efficient to prevent health risks and stresses in the working environment than to eliminate them after the fact. Such prevention is possible through early inclusion in the planning process and corporate objectives.

The KOPAG method for the evaluation of OSH measures in terms of business economics

KOPAG uses the principle of comprehensive profitability analysis (CPA). Based on traditional investment appraisal, CPA also serves to evaluate the effects of investment alternatives in business economics terms. It is basically assumed that, in addition to direct and indirect monetary effects, non-monetary criteria or benefits must also be taken into account to correctly assess an investment.

To that end, the analysis is extended with a - generally multidimensional - targets/criteria system. Whereas monetary criteria are recorded in financial analytical terms, non-monetary criteria should basically be analysed in terms of utility value. Utility value analysis allows the comparison of different solutions through weighted point values, i.e. through the outcome of formalized expert opinions and classifications.

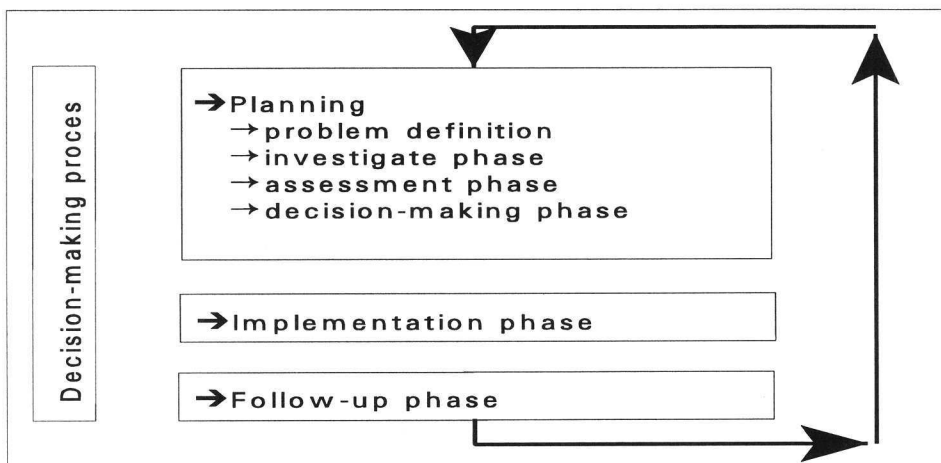


Figure 3

As a comprehensive calculation requires a higher expenditure in terms of work and planning, it seems important within the framework of KOPAG to limit the method to the specific requirement and gear it to the user's personnel and time possibilities without it losing its essential character. KOPAG provides the required assistance for application with respect to branch-specific planning guidelines, checklists and other instruments as part of projects.

The decision-making process

Given the limited project duration, KOPAG can only help the participating companies with the decision-making process (Figure 3) during the planning phase. The implementation and follow-up phase are beyond the scope of the project.

Problem definition phase

During this first phase, the idea of introducing a measure/investment is born. A prerequisite for such a concept is that the investor recognize the existence of a situation that needs improvement and believe that this situation can indeed be remedied. To that end, the investor will have to carefully analyse the basic situation (health task force, risk assessments, etc.). Moreover, he will have to identify the objectives of his investment activity so that decision criteria can be formulated that will enable him to decide on one investment alternative or a set of measures as the most efficient (or optimal) course of action.

Creation of a target system (target structure, target tree, target framework)

Companies not only pursue one exclusive objective (that is, their profit motive), but at the same time they have a whole set of objectives (e.g. the pursuit of income, image, economic influence and market shares, independence, or the realization of socio-ethical claims). This set of objectives is called a target system.

Given the comprehensive (dual) approach to measures, KOPAG proposes a structure of targets in accordance with the pattern in Figure 4.

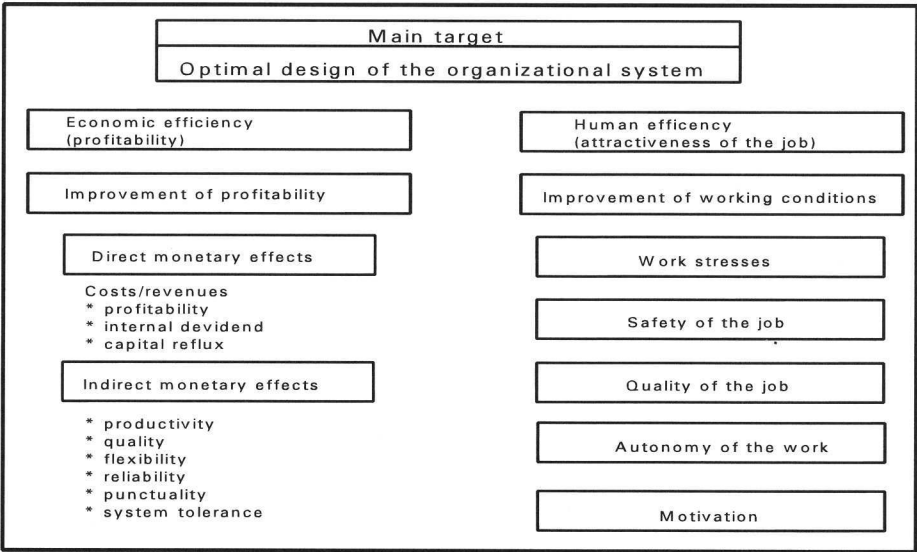


Figure 4

The two main targets with respect to the economic and human efficiency of investment measures are further divided in order to be able to generate a sufficiently differentiated description of operational target criteria that everyone can understand.

Actual state analysis

Corporate weaknesses in terms of the target system can be discovered by means of data surveys and data evaluations as well as risk assessment (= previous project phases). This serves to delineate the workplaces/organizational systems that require design/redesign, as well as to define relevant interfaces with the environment.

Investigative phase

In this phase, the investor's potential courses of action are to be formulated and their consequences determined.

Prerequisites for profitability analysis and the most effective course of action are, above all, accurate knowledge of the research subjects (actual state, design alternatives), and of the targets and interests on the basis of which the consequences of investments are assessed.

Design alternatives

On the basis of data analyses and work studies expertise, the actual state and the design alternatives recommended for realization are described in detail in terms of:

- ◆ purchase costs, amortization, interest
- ◆ current operating expenses
- ◆ technical efficiency
- ◆ social functional and organizational characteristics
- ◆ interaction with other workplaces/organizational systems
- ◆ weaknesses, risks for safety and health
- ◆ impact of future developments

Situation-relevant target criteria

This phase is related to 3.1.1.1. and focuses on the formulation of operational evaluation standards based on the target system (Cf. Figures 5 and 6).

Classification range		0 to 3 points improvement needed	4 to 6 points sufficient to satisfactory	7 to 10 points good to excelent
Range of criteria	Target criteria	Target criteria are not or only occasionally met	Target criteria are partly or mostly met	Target criteria are mostly or completely met
1.1.1 Direct cost savings	1.1.1.1 Planning expenditure	> 10% of investment sum	5-10% of investment sum	< 5-10% of investment sum
	1.1.1.2 Capital expenditure for purchases	> 100 DM thousand p.a.	50-100 DM thousand p.a.	< 50-100 DM thousand p.a.
	1.1.1.3 Costs of retraining and initial training	> 15% of investment sum	5-15% of investment sum	< 5-15% of investment sum
	1.1.1.4 Current personnel costs	> 80% of HK	70-80% of HK	< 70-80% of HK
	1.1.1.5 Contract services	> 10% of HK	5-10% of HK	< 5-10% of HK

Figure 5

Classification range		0 to 3 points improvement needed	4 to 6 points sufficient to satisfactory	7 to 10 points good to excelent
Range of criteria	Target criteria	Target criteria are not or only occasionally met	Target criteria are partly or mostly met	Target criteria are mostly or completely met
1.1.2 Environ mental stress	2.1.1.1 Noise	Limit values of hearing damage exceeded; health protection only possible with individual protective gear	Recommended guidelines for non-harmful but stressful noise exceeded. Capacity to work and well-being of employees likely to be affected.	Recommended guidelines are met; optimal conditions for capacity to work and well-being of employees
	2.1.1.2 Hazardous substances	Limit value for airborne harmful substances in the workplace exceeded. Health risks due to inhaling or contact with the skin not unlikely. Health protection only possible with individual protective gear	Despite the fact that limit values are not exceeded, there is a risk of health damage	No health risks according to current state of knowledge

Figure 6

The objective is to find criteria by which attainment of the targets of design alternatives can be measured; this is to be done in accordance with the research assignment and the predefined target structure. The criteria are to be formulated in terms of both economic and human efficiency.

The degree of target attainment can be expressed by a system of points from 0 to 10, in which 0 equals non-attainment and 10 stands for 100% attainment. The arrangement of alternatives on this points system should be facilitated by the fact that for each criterion three characteristics are described and - to help orientation - the range of points allocated is limited. This rationalizes the points system and renders it transparent.

Assessment phase

Aimed at preparation of the decision-making process, this phase involves the evaluation of the consequences of the potential courses of action with respect to the investor's objectives. Where the objectives and data are quantifiable,

the instruments of traditional investment appraisal are used. Non-quantifiable objectives and data are evaluated by means of utility value analysis (Cf. Figures 7 to 9).

Target defenition		Target weight		Target values for		
Target area		Weight of tar- get area	Total weight	Altenative 1	Altenative 2	Altenative 3
	Total targer/utility value: Optimal job design	100.0 %	100.0 %	422.0	610.7	545.1
In term of:						
1.Improvement of economic efficiency (profitability)		60 %	60 %	242.7	347.7	291.0
2.Improvement of human efficiency (attractiveness of the job)		40 %	40 %	179.3	263.0	254.1
		100 %	100 %	422.0	610.7	545.1
1. Economic efficiency						
1.1 Improve profitability		50 %	30 %	139.5	165.9	113.8
1.2 Increase capacity to work		50 %	30 %	103.2	181.8	177.2
		100 %	60 %	242.7	347.7	291.0

Figure 7

Target/criteria weighting

Target/criteria weights are provided to determine the significance of individual targets and criteria within the target structure as a whole. For the sake of efficiency, weighting is done in percentages and, more specifically, phased in accordance with the underlying target tree structure. This guarantees cohesion between all targets and target criteria.

Attainment of targets/criteria

The degree of attainment of each alternative is defined for each criterion at the lowest level of the target tree structure using the criteria evaluation diagram (Figures 5 and 6). Thus, both the absolute arrangement of alternatives with a view to the target system and the interrelationships of the alternatives have been determined.

Target area	Defenition of the target criteria to be evaluated	Weighting		Altenative 1		Altenative 2		Altenative 3	
		Weight of target area	Total weight	Attainment	Target value	Attainment	Target value	Attainment	Target value
2.1.1	Reduce environmental stresses								
2.1.1.1	noise	25.0%	1.6%	2	3.2	6	9.6	6	9.6
2.1.1.2	harmful substances	20.0%	1.3%	5	6.5	6	7.8	7	9.1
2.1.1.3	climate	25.0%	1.6%	2	8.0	6	9.6	8	12.8
2.1.1.4	lighting	30.0%	1.9%	2	3.8	8	15.2	8	15.2
		100.0%	6.4%		21.5		42.2		46.7
2.1.2	Reduce physical stresses								
2.1.2.1	Work load	20.0%	1.3%	2	2.6	6	7.8	8	10.4
2.1.2.2	Work area/station	30.0%	1.9%	3	5.7	5	9.5	6	11.4
2.1.2.3	Equipment	30.0%	1.9%	2	3.8	6	11.4	8	15.2
2.1.2.4	Protective gear (techn./orgn.)	10.0%	0.6%	2	1.2	6	3.6	8	4.8
2.1.2.5	Signals (optical/acoustic)	10.0%	0.6%	3	1.8	7	4.2	7	4.2
		100.0%	6.3%		15.1		36.5		46.0
2.1.3	Phycological stresses								
2.1.3.1	Information assimilation	40.0%	1.3%	3	3.9	6	7.8	4	5.2
2.1.3.2	Demands on thinking capacity	20.0%	0.6%	4	2.4	5	3.0	4	2.4
2.1.3.3	Monotony, repetitive work	20.0%	0.6%	5	3.0	6	3.6	4	2.4

Figure 9

Target values per target/criterion and design alternative

The target value of a target/criterion indicates the benefit of the design alternative for a target/criterion, taking into account the respective criterion's weight and target attainment. The target value is expressed in points and conveys both its absolute value and its comparative value; as such, it is a suitable decision-making tool for selection of an alternative. The target values are the products of the weighting factor (3.1.3.1) and the degree of attainment (3.1.3.2). The evaluation diagram automatically calculates the target values for all superordinate targets in the target tree structure.

Utility values of the design alternatives

The final phase of CPA concerns the definition of utility values. The utility values for the alternatives can simply be obtained by adding up their target values (3.1.3.3), i.e. through value synthesis (aggregation) of the concomitant attainment degrees multiplied by the target/criterion weights (Figure 6).

Decision-making phase

In this phase, the possible courses of action are determined by comparison of the evaluated alternatives and the investor's taking a decision. The rule of thumb for decision-making is that preference should be given to the design alternative with the highest utility value.

If it becomes clear at this point that none of the measures/investments considered so far sufficiently satisfy the target system, it is also possible to return to the investigative phase (Cf. Figure 3).

Acceptance of an evaluation outcome and its successful introduction in the company requires clear processing of results in addition to organization of the evaluation process. The sample diagrams show some possibilities of graphic representation of results (Figure 10).

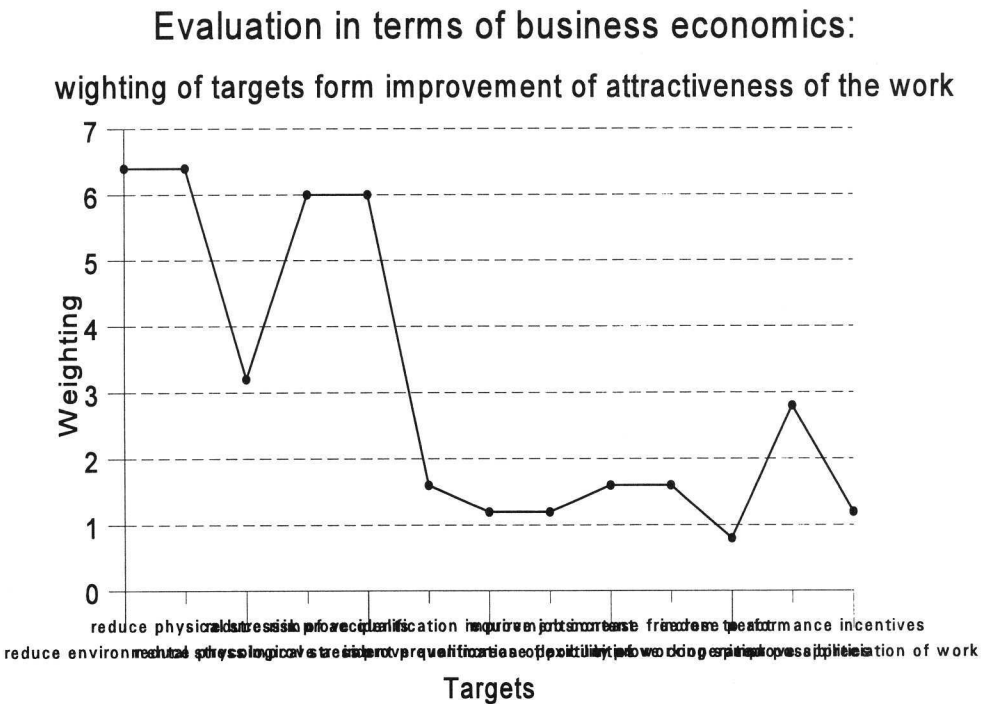


Figure 10

Implementation phase

In this phase, the measure/investment decided on (3.1.4) is implemented. Organization and financing of the implementation are the company's sole responsibility. KOPAG's task has ended with the investigation, evaluation and interpretation of data and the preparation of the decision-making process.

Follow-up phase

KOPAG recommends that the expected consequences that resulted in the decision in favour of a certain alternative be compared with the actual consequences that occur. This way, appropriate corrective measures can be promptly taken if deviations from the planning values occur.

Concluding remarks

The expansion of purely traditional investment appraisal with utility value analysis and a subsequent synthesis of results primarily has the following positive aspects:

- ◆ Increased transparency and comprehensibility of decision-making motivations and processes.
- ◆ Systematic elaboration and evaluation of investment alternatives.
- ◆ Explanation of the fact that investment decisions can only be calculated to a limited extent according to the logic of business economics, and that, moreover, it takes decisions and negotiation processes to produce results.
- ◆ Inclusion of (and encouragement of cooperation between) various corporate operations and disciplines and, consequently of responsibilities and persons involved.
- ◆ The possibility of a higher degree of participation of all employees by means of planning teams.
- ◆ The need to justify all decisions with respect to deviating targets and evaluations.

The evaluation of alternatives is just one building block in the decision-making process as a whole. It helps use all the available information on possible consequences of courses of action with a view to predefined quantitative and qualitative targets.

Health Management. Efficient planning, evaluation and implementation of occupational safety and health using multi-level cost-effectiveness analyses

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Problem definition

The management of corporate occupational safety and health activities is becoming increasingly important in the context of TQM and the employee orientation this requires (Cf. also [5]).

Occupational safety and health (OSH) comprises a wide range of measures. These measures can often be characterized as *investments in potential* which - like corporate research and development - are aimed first of all at the immaterial improvement of performance and, secondly, at the betterment of the competitive position in the medium and long term, e.g. through cost savings and/or increases in turnover. The scope of these OSH measures could range from primarily *technical* measures - such as sound control and ergonomic workplace adjustments - to *organizational* and *qualifying* measures, and extend to general, company-wide *health promotion* in the form of company sports programmes, dietary advice, physiotherapy involving back exercises, and rehabilitation programmes.

Although of increasing importance in terms of competitiveness and social policy, OSH investments generally elude systematic economic analysis, as their effects on health are difficult to assess and their monetary benefits can usually not be determined at all. There currently are no appropriate methods for well-founded *health management* that could also be used to draw up a justified OSH budget and prioritize OSH measures in accordance with economic principles for rational resource allocation.

Because of this, Z&P Management Consultancy of Hamburg, Germany, and the IGES Institute of Berlin together developed and tested a prototypical planning and evaluation method for corporate occupational safety and health measures in an R&D project commissioned by the Federal Institute for Occupational Safety and Health and Industrial Medicine (Dortmund, Germany). The health care and corporate foundations as well as an introduction to the use of the method and a case study have been published in [4].

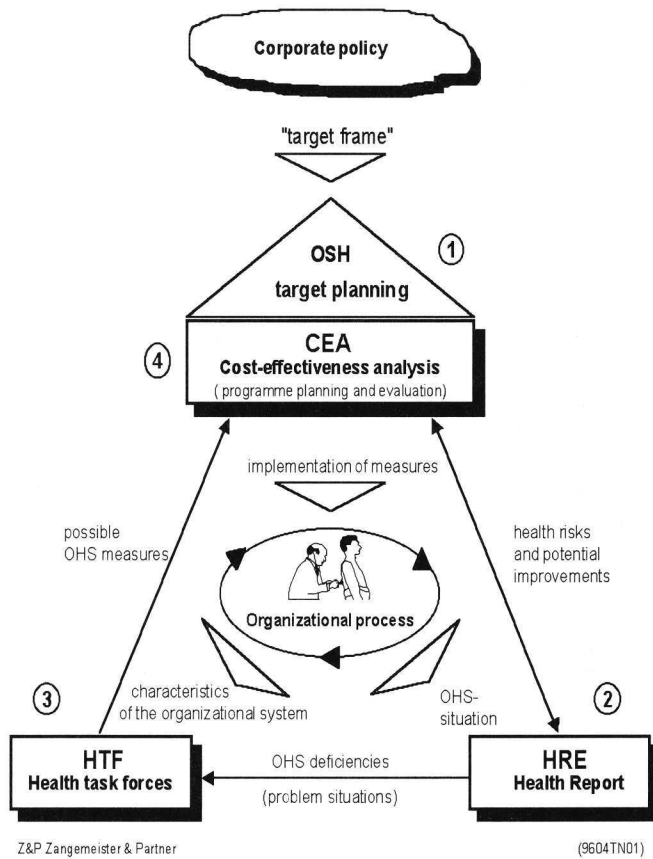


Figure 1 Health management: "OSH planning and controlling in the corporate closed-loop process of continuous improvement of the OSH situation" [4]

Possible solutions

The commonly used *one-dimensional* methods of purely *monetary* profitability analysis are not sufficient to systematically assess the diverse effects of OSH measures in planning and decision-making [3]. Instead, a *multidimensional* and *system-analytical* solution is used as a basis for the *integral* assessment of the *efficiency* and *effectiveness* of OSH investments. This solution has been conceptionally integrated into the closed-loop process of continuous improvement of the corporate OSH situation (figure 1).

Methodical instruments for the practical implementation of this approach are *cost-effectiveness analysis* (CEA) combined with a *relevance tree*. In *cost-effectiveness analysis*, the various desired effects of the measures are evaluated as to their utility value by means of a points system. Summarized as *benefits* (= effectiveness or utility value), they are then compared with the *costs* of measurements in the context of an *efficiency comparison* (figure 2). In order to be able to perform such an efficiency comparison, the corporate OSH targets - i.e. the desired OSH situation improvements (situational changes) - are to be defined and the concomitant effects of the measures (effectiveness criteria) determined in advance. This is, however, associated with two methodical difficulties that need to be solved separately:

- On the one hand, current knowledge of the target-related effectiveness of corporate OSH measures is usually insufficient to perform an *analysis of effects* in the form of *absolute* effectiveness criteria due to the fact that the cause-effect relations are far from clear. The results obtained from numerous ex post evaluation studies of corporate health programmes in general only suffice to make a more or less substantiated assessment of the expected *relative* effectiveness criteria of OSH measures.
- On the other hand, experience has shown that the *effective range* of the target-relevant effects of OSH measures requires a phased analysis at several levels to clarify the cause-effect relations between the health-relevant direct effects in the workplace and the resultant indirect effects on the superordinate targets at company level.

Principle of efficiency analysis

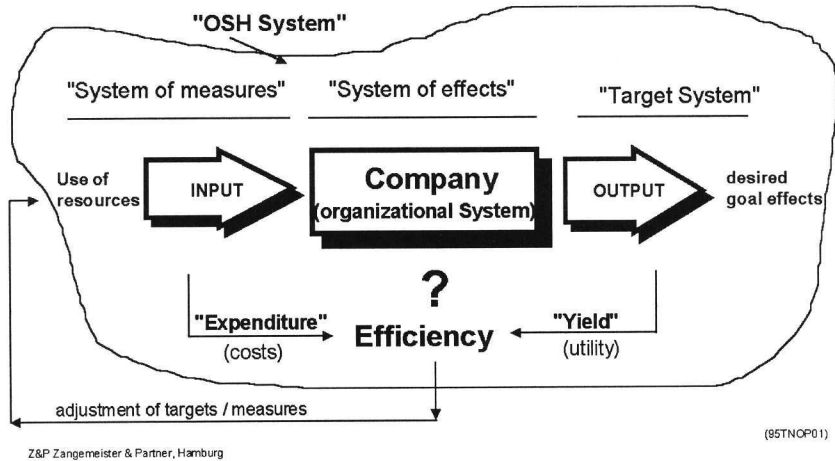


Figure 2 Principle of efficiency analysis

These problems, then, can be solved by means of the *relevance tree principle* (Cf. also the detailed description in [4]). The underpinning of this principle is the formulation of a hierarchical model of cause-effect chains on the basis of *theoretically comprehensible means-and-ends relations* for the OSH system as a whole. The chains describe the supposed connection between the evaluation of measures to be taken at micro-level (organizational system), their possible range of effects (*target fields*) and the valuation standards (*target value criteria*) that appear to be appropriate for assessment of the effects at macro-level (company). Based on the resultant *target tree structure* (targets-measures system) cause-effect relations can be analysed *heuristically* and, using experience (expert assessment), *relatively* classified (evaluated) as to their criteria-specific effective relevance (*effectiveness criteria*).

- Questions with respect to a system-oriented, effect-related definition of targets -

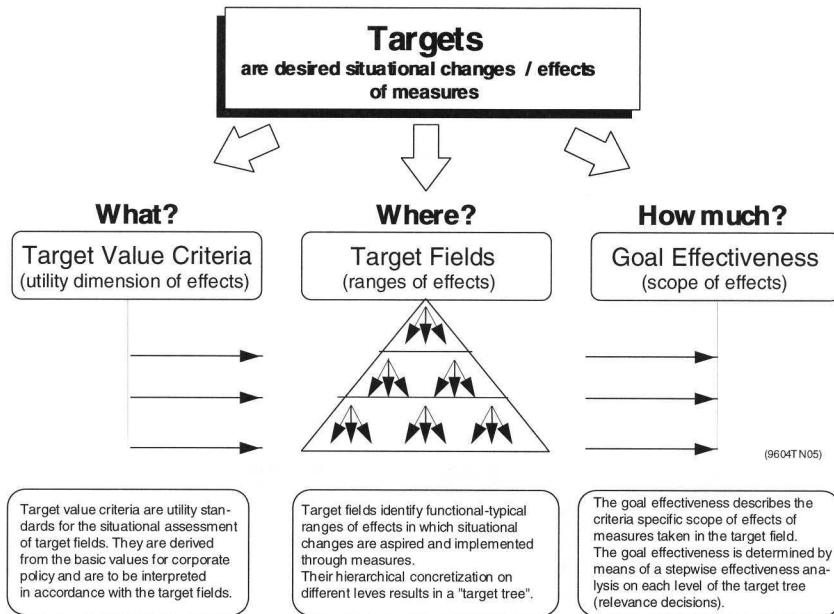


Figure 3 Basic model of a multi-level, multidimensional target structure (relevance tree)

This heuristic approach is unique in several ways:

- The effectiveness analysis is *not* based on the organizational level (micro-level), nor focuses on the *absolute* effectiveness criteria of a *single OSH measure*, as corresponding data cannot be produced - or at least not in the corporate target categories.
- Instead, the *combined target* of the company or the OSH range at macro-level, i.e. at the top of the target tree, is used as a theoretical basis. This target defines a *standardized utility potential* to be described in multidimensional terms by *target value criteria*. This potential of, for instance, 100 or 1000 points should be realized as comprehensively as possible during the planning stage by means of *the goal effectiveness of measures*.

This utility potential is then gradually broken down to the lowest target tree level (that of the organizational system) by means of a comparative classification of the *relative* goal effectiveness of the possible effects of measures in constituent target fields at subordinate target tree levels. Given the proportional utility potentials to be realized there - in the sense of targets - the OSH

measures to be evaluated can immediately be classified as to the *relative goal effectiveness* they can affect (measure relevance or effectiveness).

Towards development of the CEA method

The *qualification* of effectiveness assessment required for the method means that it is not aimed at evaluation of *individual measures*, but rather concerns the comparative appraisal of several different measures - i.e. programme planning. This is generally not a drawback, because it is often *combinations* of separate OSH measures rather than individual measures that are to be evaluated and budgeted in everyday business practice (for evaluation of alternative individual measures, Cf. also [3]).

For the development of the *contents* of the CEA method, it is first of all necessary to generate a system of *target value criteria* and *target fields* in accordance with the approach outlined in figure 3.

- The "*target value criteria*" serve as evaluation standards and are to be developed specifically for OSH using the *basic values* that are normative for corporate policy. A corresponding system founded on four basic values is represented in figure 4. As tested in the context of a corporate case study, it is usually possible to include in such a system all targets discussed in connection with OSH in daily practice. In the planning stage, these four basic values must always be tested as target goal criteria and interpreted (operationalized) in a situation-specific manner in the relevance classification of target fields. The criteria given in Fig. 4 can be used as a checklist.
- The "*target fields*", on the other hand, characterize the range of effects in which criteria-specific situational changes can be aspired and implemented through OSH measures. They define the *target tree* and, together with the operational levels of the OSH measures, form the *targets-measures system* represented in **Figure 5**.

Target Value Criteria in the "OSH" target field

- Target field-related operationalization of basic values for corporate policy -

TVC1	TVC2	TVC3	TVC4
Profitability	Competitive-ness	Social obligation	Prestige / Image
<ul style="list-style-type: none"> + sick days + costs of sickness + absenteeism + fluctuation + willingness to work 	<ul style="list-style-type: none"> + performance + span of concentration + ability to take stress + creativity + quality of work + flexibility + productivity + motivation + loyalty to the company 	<ul style="list-style-type: none"> + frequency of accidents + frequency of diseases + frequency of health complaints + health risks + job satisfaction + expectation of life + attractiveness of work + environmental awareness 	<ul style="list-style-type: none"> + social image (internal / external) + work climate + attractiveness of work
Z&P Zangemeister & Partner			(9604TN04)

Figure 4 System of target value criteria in the "OSH" target field [4]

"OSH" Targets-Measures System

- Target fields and categories of measures of OSH programme planning -

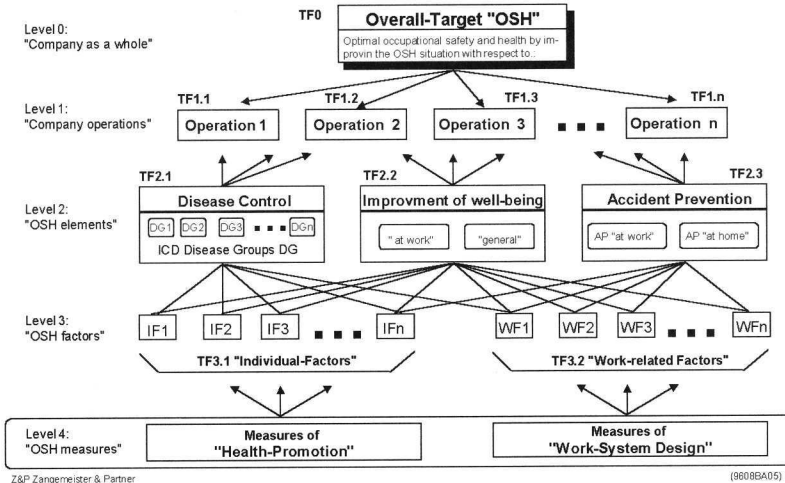


Figure 5 "OSH" targets-measures system [4]

The levels of the *targets-measures system* are aimed at the health care "concept of risk factors" on the one hand, and at the organizational structural characteristics normally used for corporate health reports, on the other (departments, cost centres, etc.). The logic used here to interpret the connections between effects should be understood as follows: the optimal control of health-related work interruptions (diseases, accidents, complaints concerning general well-being) and the related negative economic consequences for a company should be effected with

- | | |
|--|--|
| <ul style="list-style-type: none"> → OSH measures
(level 4) → risk factors
(level 3) → health-related work interruptions
(level 2) → consequential effects
(level 1) | <p>that are appropriate to preferably minimize such health-relevant as extensively as possible, or even eliminate them, in so far as they are responsible for the identified in the company, and whose supposed in the form of sick days, diminished performance, etc., should first and foremost be prevented</p> |
|--|--|

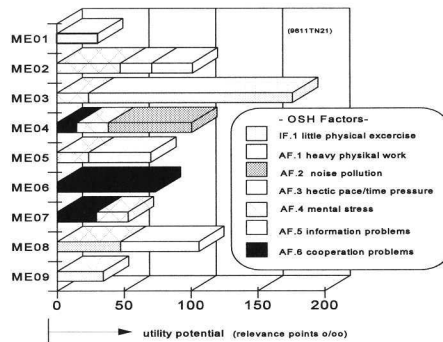
This stepwise view of the effects of measures on different levels forms the foundation for the *heuristic effect analysis* of the CEA instrument that has been developed. The effectiveness estimates related particularly to the levels of *risk factors* and *health-related work interruptions* can only be logically implemented if relevant know-how and experience with respect to health-relevant interconnections are available. This information - in so far as available - is worked out below for the CEA method in so-called *risk-relevance tables*.

The *targets-measures system* and the *target value criteria* form the logical framework for the planning and evaluation process as a whole. The steps that need to be taken in that process have been described in detail in a practical introduction [4]. In summary, these steps comprise the following three sets of tasks (Cf also Figure 1 above):

- (1) *OSH strategy*: A strategic guideline in accordance with corporate policy is formulated on the basis of the *health report* and the *health risks* and *potential improvements* identified there for individual company operations. Subsequently, the relative significance of the four *target value criteria* referred to in Figure 4 for the desired OSH situational changes during the planning stage is weighted on the basis of, for instance, 1000 weighted points (*OSH target weighting*). Thus, the criteria-specific *utility potential* is proportionally laid down as a *combined target* for the planning stage. If necessary, costs can also be *budgeted* at this stage.

- Case study "Muster Firm" -

Utility potential of OSH measures with respect to
OSH risk factors (Level 4 --> Level 3)



Programme plan "OSH measures"

"OSH" Measures	priority listing	Costs		Utility		U/C ratio	
		[TDM] DM thousand	[TDM] cumulative	[TDM]	[TDM] cumulative	[-]	[-] cumulative
ME09 purchase lifting equipment	1	16,00	16,00	231,86	231,86	14,49	14,49
ME07 training for supervisory personnel	1	24,00	40,00	353,55	585,41	14,73	14,64
ME05 job rotation	2	40,00	80,00	467,19	1.052,60	11,68	13,16
ME01 instruction on how to lift + carry loads	3	35,00	115,00	202,91	1.255,51	5,80	10,92
ME06 organizational "round table"	4	53,40	168,40	488,82	1.744,33	9,15	10,36
ME08 safety and work training	4	62,40	230,80	705,24	2.449,57	11,30	10,61
ME04 noise control	5	450,00	680,80	670,89	3.120,46	1,49	4,58
ME03 improved company sports	5	470,00	1.150,80	1.172,50	4.292,96	2,49	3,73
ME02 physical exercise at work	6	1.098,00	2.248,80	674,62	4.967,58	0,61	2,21

(9611TN28)

Figure 6 Example of the structure of utility potentials (effectiveness of measures) of evaluated OSH measures and the resultant priorities for the programme plan derived from cost/benefit ratios and costs [4]

- (2) *Target planning*: Based on the combined target, this second set of tasks aims at determining, by means of the evaluated effectiveness estimate, the criteria-specific *utility potential* for the various target fields for level 1 through level 3 (Cf. Fig. 5). Once again, the health report and the risks relevance tables referred to above are used as underlying information. This results in the *utility potential* (relevance) of *risk factors* on level 3, which may be completely achievable as a target by taking OSH risk-reducing measures
- (3) *Planning and evaluation of measures*: in this third set of tasks, the OSH measures with respect to the risk factors of level 3, taking into account the specific situation in the workplace, are defined and subsequently evaluated as to their *relative* effectiveness for risk reduction (*classification of measures*). Here, too, the risk relevance tables referred to above may be used as a tool.

This planning and evaluation process results in *relative utility potentials* (efficiencies) for the OSH measures in question. If an OSH budget were to be formulated, it is also possible to give these measures a *monetary utility* based on their potential. A comparison of the extent of utility and the accompanying costs of the measures yields the required cost-benefit relations, which, together with the absolute costs of the individual measures, can be used to formulate a prioritized OSH programme of measures. An example is given in figure 6.

Conclusions and prospect

The multi-level CEA method is conceptionally embedded in strategic corporate planning and provides a basis for efficiency-related budgeting and prioritization of OSH measures, which basis is justified in terms of both evaluation methodology and health care. It particularly answers the following questions:

- What OSH targets should be given priority?
- How high can or should the OSH budget be?
- What OSH measures promise to yield the highest level of effectiveness?
- What combination of measures will allow as efficient a use of the budget as possible?

If the method is regularly used in the context of company planning and health reporting, it can serve as the basis for systematic OSH controlling. The first practical experience gained in a health care project in a large company in the cosmetics branch has already demonstrated the flexibility and efficiency of the CEA method [1]. Other implementation plans for different branches are currently being elaborated with a view to further standardization of the method and preparation of computer-aided instruments.

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Summary

The management of occupational safety and health (OSH) becomes increasingly important in the context of total quality management (TQM). Because of this, a method for the planning and evaluation of OSH investments was developed, which takes into account not only the monetary effects (costs and revenues), but also all target-relevant effects, which are non-monetary measures of utility. The method is based upon multidimensional cost-effectiveness analysis (CEA) combined with a multilevel relevance tree. The results are economically determined priorities for rational allocation of resources to different OSH projects. Beside that, the evaluation method can also be used for controlling OSH in a process of continuous improvement.

Method of Extended Profitability Analysis in the Supervision of Organizational Pilot Projects

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This discourse presents the application of a method for cost/benefit analysis in the supervision of organizational pilot projects that has so far not been used yet: Extended Profitability Analysis (EPA). By analysing both the monetary and non-monetary effects of, for instance, organizational changes, the EPA method enables an integral assessment of alternative solutions. Contrary to current applications in which theoretical, untested alternative solutions are evaluated and compared, the EPA was used to analyse two "actual states" of an organization: the original organizational system prior to the pilot phase and the organizational system as tested and assessed in the pilot phase. This approach allows evaluation of the reorganization measures that have been introduced and contributes to the decision-making process by minimizing uncertainties during the selection of alternatives at the end of the pilot phase.

One problem occurring with planned changes in the organization is the assessment of alternative solutions to be selected. As a rule, every alternative necessarily has monetary as well as non-monetary consequences, which are always studied separately, if at all. When used separately, conventional methods in business economics (e.g. traditional cost accounting) and social sciences (e.g. questionnaires) appear to be inadequate for the integral assessment of alternative solutions. Methods are needed that compare the required monetary and non-monetary expenditure with the monetary and non-monetary benefits.

One method for cost/benefit analysis, Extended Profitability Analysis (EPA), was introduced in the mid-70s in the context of the planning and introduction of innovative techniques and organizational forms in job design (Metzger, 1977; Grob, 1984; Elias et al, 1984; Zangemeister, 1993; Sengotta and Schweres, 1994). An essential characteristic of EPA is that the choice of alternative is based not only on the results of investment appraisal and consequential costs but also includes criteria that are difficult to value in monetary terms, if at all. There currently are voluminous publications in which a modified and elaborated EPA method is also used for the decision-oriented valuation of alternative solutions in personnel affairs (Ackermann and Hofmann, 1988). To date, however, costs and benefits are still determined by means of various future and therefore theoretical alternative solutions, which means that a certain element of uncertainty must always be taken into account.

Our research group uses the EPA method to quantify the monetary and non-monetary ramifications of organizational changes during the pilot project, such as the introduction of a new working hours model, flexitime or teleworking (Figure 1). Contrary to the common applications of EPA, we do not compare theoretical alternative solutions for the organizational changes we supervise during the pilot phase, but rather "actual states". First of all, the data for the original organizational system prior to the pilot phase ("Old Work System") are determined. One year later, these are compared with the data for the organizational system tested during the pilot phase ("New Work System"). At the end of the pilot phase, a decision has to be made as to whether the new organizational system is to be maintained (if necessary in a modified form), or the old organizational system is to be reinstated (see also Knauth and Hornberger, 1994). The results of EPA can help make this decision and contribute to the transparency of the decision-making process.

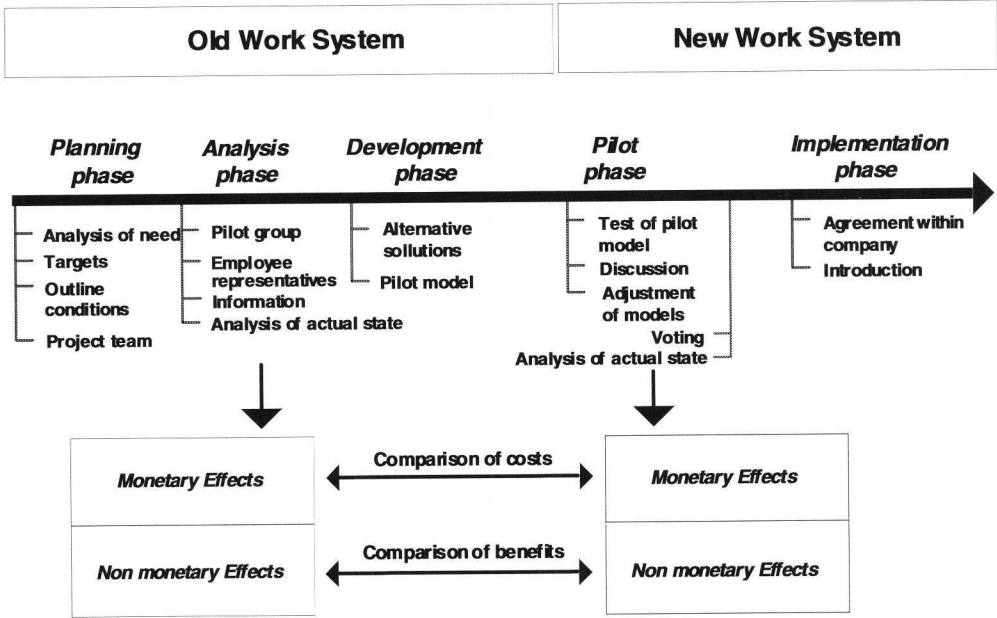


Figure 1 EPA integrated in the pilot project procedure

Our course of action with EPA is represented in figure 2. First of all, constituent targets are derived from the project targets, and relevant monetary and non-monetary criteria formulated with which it is possible to verify attainment of the targets. These are compiled in a catalogue of criteria and their content specified. Subsequently, the non-monetary target criteria are assessed by the project participants and decision-makers, i.e., management, works council and the supervising researchers, as to the weight to be attributed to them in the decision-making process at the end of the pilot phase. Due to this partly divergent weighting it is possible to make the individual interests of the project partners transparent and determine the utility value margins in terms of the different target weights. Attainment of the individual monetary and non-monetary criteria in the old organizational system is determined prior to the pilot phase. It is based on economic data on the company in question, interviews with the employees involved, and so-called "expert consultations" for determining criteria that cannot be recorded by other means. For the original state of the organizational system, the non-monetary effect of the so-called "organizational system value" is determined and compared with the monetary effects. At the end of the pilot phase, it is determined to what extent all criteria in the new organizational system are met. Also, the organizational system value is calculated and compared with the corresponding monetary effects. Investments necessary for the introduction of an organizational measure are evaluated separately.

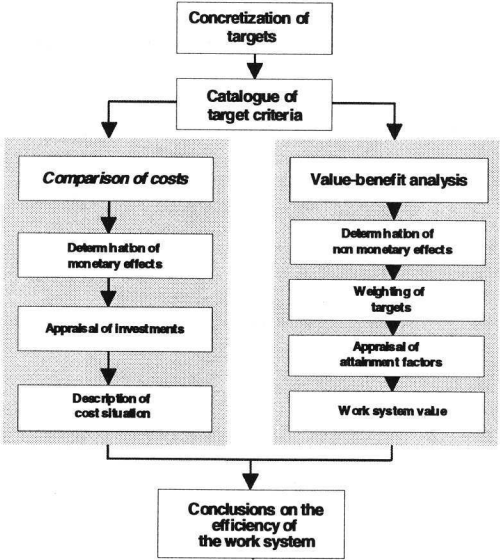


Figure 2 Structure of the Extended Profitability Analysis method

An integrated structure of target criteria is to be created on the basis of an example for introduction of flexitime (figure. 3).

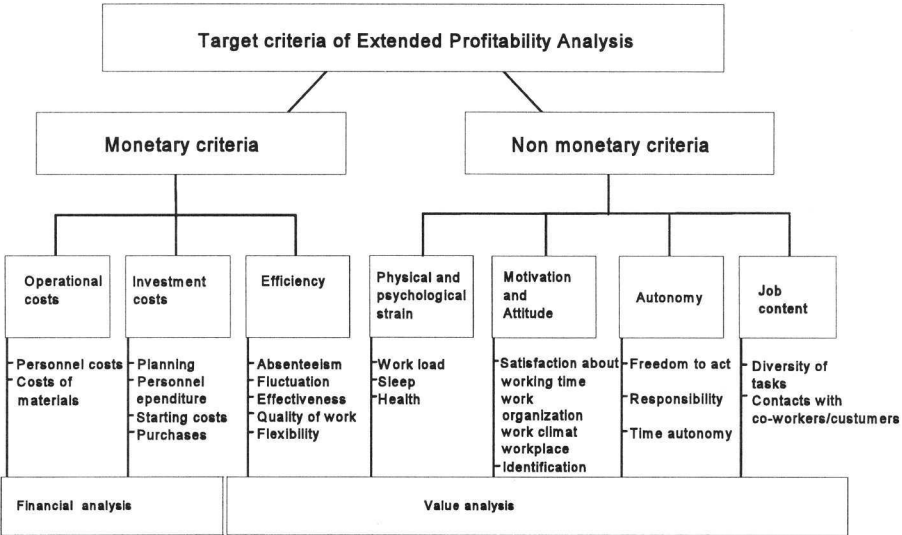


Figure 3 Basic structure of target criteria of Extended Profitability Analysis for introduction of time-autonomous groups.

Parallel to its use in the pilot group, EPA is also applied in a control group, which is not subject to organizational change. This measure reduces the risk of misinterpretation of the results in the pilot group. If, for instance, a reduction of health complaints is found at the end of the pilot phase after introduction of more salutary shift rota, this positive development can only be attributed to the new shift rota if a similar development is not observed in the control group. Moreover, the corporate key figures from the pre-pilot phase are compared with the key figures from the two last preparatory phases to eliminate "strays" in data development.

The use of EPA as detailed here for quantification of the monetary and non-monetary effects of organizational changes offers additional potential for the use of cost/benefit analyses. Alternative evaluation is based on practical tests and proven effects, minimizing uncertainties. Moreover, this approach allows formulation of the preferences of individual decision-makers, while contributing to the transparency of the decision-making process.

Literature

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The productivity model: a cost-benefit computer model for implementing health and safety at the workplace

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Summary

The Productivity Model is a cost-benefit computer software model that can be used for:

- pure productivity measurement (simplest use of the Productivity Model),
- alternative solutions to OH&S/human resources problems (which solution is the most cost-effective?),
- sensitivity analysis (determination of the important labour parameters and their overall effect on productivity),
- rehabilitation (single worker use of the Productivity Model).

A case study is presented which illustrates the use of the Model to measure the benefits (productivity) gained through an occupational health and safety program.

Introduction

To implement an occupational and safety program one needs resources (people and/or money). To obtain those resources the program may be couched in terms of the benefits to the enterprise - the profit motive. It is not that the profit motive is a substitute for our social concepts but simply may be used as a tool. It sometimes happens that safety improvements to a particular workplace are needed that do not correspond to a financial benefit and so the profit motive needs using with discretion.

Health and safety practitioners are not usually very good at handling concepts in productivity and profit and cost-benefit models are not familiar. The Productivity Model is a cost-benefit economic model designed specifically for workplace health and safety programs. It is not a substitute for good health and safety programs as it does not address health and safety issues; it addresses the economic benefits that come from implementing good health and safety programs. The Model has been used in workplaces of one or two people to large workshops. It is presently being used across a spectrum of workplaces including self-employed people and a large industry sector.

There is not time in this session to describe in detail the Productivity Model. I will describe some of the main concepts behind the Model and use just one example taken from my book "Increasing Productivity and Profit through Health & Safety". The Productivity Model was developed from the original work of Dr Paula Liukkonen, from Stockholm University.

The productivity model

The Productivity Model is designed to *ask the pertinent questions* and to handle the data. It is a "Windows"-based computer program.

The advantages with a computer-based Model is that different solutions may be tested to derive the optimum solution based on health, safety and economics. Thus the Model can be used for sensitivity analysis to determine which of several alternative solutions may be the most cost effective as well as determining the pay-back period for any one program.

Firstly the information pertaining to the present or original situation is entered and then the projected information at the completion of the program is entered. If the Model is used retrospectively, after the completion of the health and safety program, then the information can be measured rather than estimated.

The Model is a difference model in that the cost parameters of the implemented health and safety program is subtracted from cost parameters of the original work place.

The Productivity Model comprises about 28 working tables grouped together in four steps or cost groupings. However, only information pertinent to the particular health and safety program is required and most often only five to ten working tables are required.

STEP 1. Calculation of the Productive Hours Worked

It is only when the employee is gainfully employed that he is paying his way and providing income and profit for the company. Thus absences (holidays, illness, injury leave and so on) which are paid for by the employer are a *loss* of income to the company and add to the cost of the product or service.

STEP 2. Calculating the Wage or Salary Cost

To the wages paid directly to the workers must be *added* obligatory charges such as workers' compensation, payroll and other taxes.

As well as direct management (supervisory) costs there are administration charges (including the personnel department) and the company overheads (eg. head office services).

STEP 3. Employee Turnover and Training Costs

To employ a new person, whether full- or part-time, requires considerable time and effort to ensure that a suitable person is engaged. There is the time required for training - which includes the time required by the supervisor and fellow workers to show him or her "the ropes" and the consequent loss in productivity for these people. For a manager, for instance, it may require a year or more to be fully functional. No matter what people expect, full effectiveness does not happen on day one!

To transfer people to new jobs within a company also carries a price tag in reduced production/quality until they know the new work.

STEP 4. Productivity and Quality Short-fall

When people are away due to illness or injury, production is usually maintained through overtime. Many of the factors included in this Step relate not solely to lost time injuries, but to poor working conditions (ergonomics).

Poor working conditions may not always lead to absence; they may result in tiredness and lead to employees working at a slower pace than otherwise or result in employees leaving their work station more frequently than needed for their work. Poor working conditions which include, for example, excessive manual handling, incorrect or poor quality tools, glare leading to difficult-to-see computer screens, awkward working postures, etc., are frequently "corrected" by over-staffing.

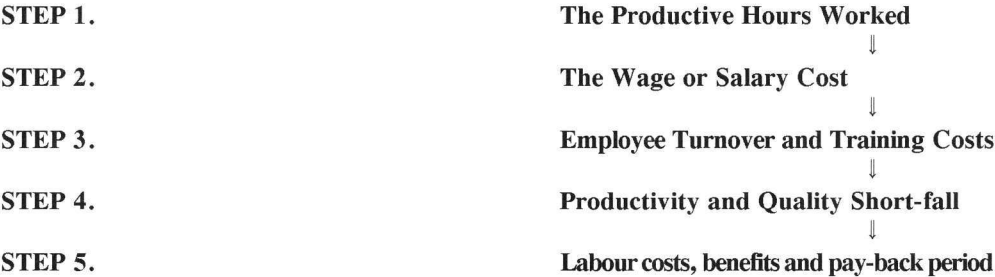
It is through poor working conditions that quality is likely to suffer although quality reduction is often not recognised as it becomes ingrained in the customary system of work. Such poor working conditions will lead to a loss (or lack) of quality in the product or service and to loss of customers through increased variability, errors, slow delivery and loss of reputation.

STEP 5. Pay Back Period

Plans for improving the situation may be made and its costs calculated ("the investment"). These are added to the Model as company costs. The benefits gained due to changes at the workplace (the health and safety program) are calculated by the program and shown in Step 5. The pay-back period is used as a measure of cost-effectiveness and is the time required to pay back the investment.

The pay-back period is usually very good, frequently under six months, which is a rate of return greater than most other types of investment.

Flow diagram of the Productivity Model



Pay-Back Period = ----- $\frac{\text{Cost for improved working conditions}}{\text{Benefits due to improved working conditions}}$

Example of the use of the Productivity Model

The example used to illustrate the Productivity Model comes from a large, engine maintenance workshop.

The workshop productivity was very low due to poor workshop layout, old-fashioned methods, poor management and a demoralised work force. The injuries were varied but mostly musculoskeletal to the low back and the upper limbs.

A newly appointed management, with the assistance of an ergonomist, identified the causes of the low productivity and from that determined the solutions. These lay in getting the work force involved in management decisions and involving them in better working methods and in new equipment design. The methodology of these solutions, amongst other factors, lay in improving safety and reducing musculoskeletal stress. Although health and safety was crucial to the solutions they were not identified as separate issues but as part of the workshop restructuring.

Data for the calculation of the pay-back period included faster throughput of the engines, higher quality of finish and a more productive work force. The latter allowed an overall reduction in the staffing levels. Lowered injury costs were also included in the calculation. Even though the overall costs of the changes were large the pay-back period was only four months.

Table 1 Some of the cost factors in the changes from the old to the new system

Step	Item	Old	New	Dimensions
1	Employees	105	90 *	number in workshop
	Time off for illness	111	87	hours/employee/year
	Productive time	1732	1756	hours/employee/year
2	Wages paid to the employee	21 840	21 840	\$(AUD)/employee/year
	Other cost to wages	8 623	9 169	\$(AUD)/employee/year
	Wage cost to the employer	30 463	31 009	\$(AUD)/employee/year
4	Overtime due to poor working conditions	68 906	5 400 *	total \$(AUD)/year
	Lowered production due to poor working conditions	319 863	92 095 *	total \$(AUD)/year
5	Wage cost to the employer	19.98	18.40	\$(AUD)/employee/hour
	Program cost		248 000	total \$(AUD)
Pay-back period			4	months

* the most important items that led to the rapid pay-back period.

Acknowledgments

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Both book and computer program are obtainable from:

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Time and Money for Workplace Evaluation

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Evaluation comprises the establishment and assessment of dangers, the documentation of results, and the formulation of measures for improvement. Two practical examples are presented below to give an impression of the time and money needed for such an evaluation.

After an introductory briefing by our experts, the evaluations were performed by the manager and employees of the company themselves, using a branch concept.

The advice given by our experts was free, but for the examples below it is assumed that a consultation fee of ATS 1,500 per hour was charged. No costs were charged for the branch-specific documentation, as our institute and others provided their documents for free. Costs of copying forms and office supplies were included by adding a surcharge to the overhead costs.

Full use was made of the legal possibilities, i.e., records on similar workplaces, occupations and dangers could be compiled. As the study concerned small-scale businesses, the use of software for these tasks was not deemed necessary. Records were immediately produced on the spot by having specially prepared forms filled in by hand.

The costs of any measures that may be needed to improve the situation are not included in the costs of evaluation and are therefore not represented in the examples.

Example: Supermarket

Sales area: approx. 1,120 m², 30 employees, opened in October 1996. All furnishings such as racks, machines, refrigerating equipment, etc., are new. Hourly wages are in line with those in the branch and with local custom.

Introductory briefing

Duration: 0.5 hours

Persons:	Hourly wage	Costs
General manager	1,500	750
Branch manager	400	200
External consultant	1,500	750
Total:		1.700

Visual inspection and formulation of evaluation areas:

The supermarket was divided into a total of 10 evaluation areas.

Duration: 1.0 hours

Persons:	Hourly wages	Costs
Branch manager	400	400
External consultant	1,500	1,500
	Total:	1,900

Example evaluation of an area

The fruit and vegetables department was evaluated by the branch manager and the external consultant with the help of the sales assistant responsible for the department.

Duration: 0.6 hours

Persons:	Hourly wages	Costs
Branch manager	400	240
External consultant	1,500	900
Sales assistant	200	120
	Total:	1,260

Concluding session

Clearing up any problems with the external consultant. Discussing follow-up procedure.

Duration: 0.4 hours

Personen:	Hourly wages	Costs
General Manager	1,500	600
Branch manager	400	160
External consultant	1,500	600
	Total:	1,360

Independent evaluation of all other areas:

The other nine areas were evaluated by the branch manager together with the sales assistants responsible for each individual area. If necessary, the general manager was also involved (assumption: 1/3 of the time).

Duration: an average of 0.75 hours per evaluation area

Persons:	Hourly wages	Costs
General Manager	1,500	375
Branch manager	400	300
Sales assistant	200	150
	Total pro Bereich:	825
	825 x 9 =	7,425

Total costs

A 10% overhead surcharge for other activities (copying forms, filing, etc.) was assumed.

$$\text{Total costs} = \text{Totals} + \text{overhead surcharge} = 13,645 + 10\% = \mathbf{15,009.50}$$

Divided over the 30 employees in the supermarket, evaluation costs amount to approx. **ATS 500 per workplace**

Hours required

	General Manager	Branch manager	External consultant	Sales assistants
Introductory briefing	0.5	0.5	0.5	-
Visual Inspection	-	1.0	1.0	-
Example evaluation	-	0.6	0.6	0.6
Concluding session	0.4	0.4	0.4	-
Independent evaluation	2.25	6.75	-	6.75
Totals:	3.15	9.25	2.5	7.35

Remark

Given the organizational structure with several employees per area, similar dangers and pressures, and the completely new furnishings of the supermarket, the costs per workplace are at the low end of the scale.

Example: Joiner's Workshop

Surface area approx. 250 m², 2 employees, the manager also works as a joiner. The firm has been in operation at this location since 1994; the machines are of different ages. Hourly wages are in line with those in the branch and with local custom.

Introductory briefing

Duration: 0.5 hours

Persons:	Hourly wages	Costs
Manager	500	250
External consultant	1,500	750
	Total:	1,000

Visual inspection and formulation of evaluation areas

The joiner's workshop was divided into a total of 10 evaluation areas.

Duration: 0.5 hours

Persons:	Hourly wages	Costs
Manager	500,--	250,--
External consultant	1.500,--	750,--
Total:		1.000,--

Example evaluation of an area

The panel saw was evaluated by the manager and the external consultant with the help of an employee working there.

Duration: 0.5 hours

Persons:	Hourly wages	Costs
Manager	500	250
External consultant	1,500	750
Employee	400	200
Total:		1,200

Concluding session

Clearing up any problems with the external consultant. Discussing follow-up procedure.

Duration: 0.5 hours

Persons	Hourly wages	Costs
Manager	500	250
External consultant	1,500	750
Total:		1,000

Independent evaluation of all other areas

The other nine areas were evaluated by the manager. Where necessary, an employee working in the area was also involved (assumption: 1/3 of the time).

Duration: an average of 0.4 hours per evaluation area

Persons	Hourly wages	Costs
Manager	500	200
Employee	400	53,33
Total per area:		253.33
253.33 x 9 =		2,280

Evaluation of the company as a whole

Evaluation by the manager of all dangers that could occur in the company (wood dust, varnish, fire and explosion, falls, noise, etc.) was possible only with branch-specific forms.

Duration: 2.0 hours

Persons:	Hourly wages	Costs
Manager	500	1,000
Total:		1,000

Total costs

A 5% overhead surcharge for other activities (copying forms, filing, etc.) was assumed.

Total costs = Totals + overhead surcharge = 7,480 + 5% = **7,854**

Divided over the 2 employees in the joiner's workshop, evaluation costs amount to approx. **ATS 3,930 per workplace**

Hours required

	Manager	External consultant	Employee
Introductory briefing	0.5	0.5	-
Visual inspection	0.5	0.5	-
Example evaluation	0.5	0.5	0.5
Concluding session	0.5	0.5	-
Independent evaluation of the areas	3.6	-	1.2
Individual evaluation of the company as a whole	2.0	-	-
Total:	7.6	2.0	1.7

Remark

Given the organizational structure with a full set of basic equipment for only two employees, the costs per workplace are at the upper end of the scale.

The discussion at the conference stressed the need of methods that are both easy to use, reliable and give a maximum of insight. In the current state of the art, these goals cannot be achieved within the same method. There is a number of options out of this dilemma:

- making ad-hoc choices about the method to be applied;
- striking a balance between ease of use and reliability.

It was argued also that complex systems can be made simple to the user by means of computer support. The evaluation becomes a black box, of which some data is the input and the output are some figures about the economic performance. The transparency of the evaluation process is of course reduced. It can be expected that accumulation of experiences, will eventually lead to methods and databases that allow quick evaluations at an improved accuracy.

7 Future developments in policy, practice and research

Introduction

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One of the goals of the conference was to give directions to further developments on policy, practice and research. In a number of discussions, a wide variety of recommendations have been forwarded.

The paper of Beatson summarises a number of the findings. Conclusive remarks from an economics perspective are made by Den Butter. In his summary he stresses the importance of cost internalisation. The conference was closed by speeches on behalf of the European Commission and the Ministry of Social Affairs and Employment of The Netherlands. These speeches give some clues for further policy development in the European Union.

Research

It has become clear that policy development, company practice and research on methodology are strongly interrelated. As can be observed from the findings of discussions, methodological issues are mentioned as problems in both policy development and in the improvement of the use of cost benefit analysis in decision making in companies.

With regard to research, it is concluded that researches should not be guided too much by public opinion and policy makers. Current methodology leaves an number of cost components open, not all that can be calculated is included. As yet, the scope of research has to be broadened. Future methods should include for example aspects of the working culture and aspects of legislation. Methods must not be simplified too much, it is better to have simple. Two focal points can be distinguished: basic and applied research. Basic research is needed to improve on methodology. Applied research should provide professionals, companies and policy makers with examples and instruments that facilitate the decision making process and communication.

The (international) organisation of research has to be strengthened, in which organisations like the WHO, ILO and European Foundation for the Improvement of Living and Working Conditions can play a role.

From the discussions a large number of findings were reported. With respect to research at the company level the following was noted:

- more data and knowledge about the benefits should be gathered and more case studies and good practices are required;
- there are many problems with respect to measuring the benefits, for instance how to account for accidents that do not happen;

- instruments and models should aim at direct application in the company or sector;
- there is a need for simple tools, but it is unclear how a large number of relevant variables can be integrated in a simple model, which is needed if it is to be used in companies;
- little is known about the effectiveness of cost-benefit analysis as a tool in decision making;
- communication with companies with respect to accountancy issues could be better; two perspectives can be adopted: accountancy standards must be changed to be able to take OSH matters into account and OSH professional must adapt their methods to current accountancy standards;

And for the macro level:

- so far, no research project (at the macro level) covers all relevant cost components;
- the quality of data used in methods leaves much to be desired: under reporting of accidents, availability, reliability and validation are common problems in many countries;
- international comparison of strong and weak points of national (occupational) insurance systems and co-operation of health and safety systems;
- development of international comparable measurements, development of measurements for absenteeism.

Policy

From the policy making point of view it is emphasised that cost benefit analysis must be integrated in the decision making process, but the role is an informative one and economic considerations must not dictate the decision. Social and humane values, which are difficult to express in monetary values, must not be discarded. It is recognised that political decisions can be affected by methodological problems, such as lack of data and the nature of many OSH problems, like the long latency time of some occupational illnesses.

Discussions yielded a number views:

- In the future, new risks will be identified; policy development must be open to a wide range of factors, for instance stress, which is likely to incur huge costs to individuals, companies and the society.
- The number of persons suffering from stress is high and will be rising, the related costs for individuals, companies and society are huge. Therefore stress should remain on the political agenda. Flexible workers are likely to become a risk group.
- There is a need for an integrated approach to work and health, policy should not be restricted to isolated factors.
- Clarification is needed in the trade off between the effects of OSH on competitiveness on the one hand and bureaucracy on the other.
- Key indicators of OSH systems (including enforcement, incentives and insurance) must be developed.
- Cost benefit analysis is a tool to support decision making but must not be used to decide on political issues. To influence policy makers simplified data can do a better job than sophisticated models.
- Too much fixation on the costs will lead to a fixation on the financial outcomes, whereas social implications should be considered.
- Stricter standards and stringent regulations induced technical innovations;.

- The value of life will be very difficult to agree upon, trade-off analysis may be an alternative to cost-benefit analysis.
- Trend analysis is likely to give better results than cost comparisons between countries.
- Existing systems of insurance give little incentives for preventive action and there is a need to change systems. Providing employers with greater economic motives by internalising the costs is not enough, however. One sided emphasis on costs and benefits leads to employers selecting employees on health and will force ill people to work. With the shift of responsibilities to companies, policy making will become a negotiation issue. One should also take public opinions into account.
- Governments should provide a balanced framework for co-operation of parties involved: employers, workers, insurance companies and expert services.

Practice

Cost benefit analysis is regarded as one of the most important tools to attract company managers to invest in safety and health. In various countries instruments are available to occupational safety and health services, but there certainly is a need to accumulate experiences. Though successful economic evaluations at the company are reported, it is often mentioned that company accounting systems are not compatible with the needs of economic analysis of OSH. Simplicity of the results and transparency of the method are features of good instruments. Only on this preconditions, cost benefit analysis is of help in SMEs, where specific knowledge is often missing.

A summary with regard to the findings on costs and benefits of OSH practice:

- Professionals and decision makers should not rely too much on cost benefit analysis.
- Improved methods will help to build credibility of economic assessments. Accounting principles in cost-benefit analysis have to be in line with company accounting methods.
- Not everything should be expressed in financial terms.
- Do not focus too much on costs only, managers orient themselves to customer satisfaction. The language of managers should be adopted by OSH specialists.
- Research is no base for marketing OSH and workplace health promotion to companies. marketing should be based on the needs in the organisation and the stakeholders within organisations. But dissemination of the results of cost-benefit analysis is thought to stimulate application in SMEs.
- Important conditions for adapting systems for economic OSH systems are the size of the incentives, direct relations between improvements and the (financial) effects, effective targeting, usability for SMEs and moderate administrative overhead.
- Innovative companies need good occupational safety and health. Furthermore, productive and innovative companies appear to have better OSH management and better working conditions.

Costs and Benefits of Occupational Safety and Health: future strategies for policy, practice and research

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The purpose of this paper is to identify key points for discussion, based on issues that have emerged during the conference. These points are structured as a set of propositions, or remarks.

First, though, are a few general points that are worth making. This is a conference concerned with cost benefit issues; naturally, the economics of health and safety is therefore important. However, we should not forget that the primary goal of occupational health and safety policy, and occupational health and safety professionals, is the prevention of the human costs of pain, grief and suffering.

Policy, practice and research are all multi-disciplinary activities. The economic perspective is insufficient on its own - we should not overlook the contributions that the social and natural sciences, and the technological disciplines can make. And we should not forget the ethical dimension, and the different values that people may hold.

Policy

Policy in this context is not just legislation. It is the entire set of regulatory instruments. It therefore includes insurance and social security regimes, fiscal measures, and the setting of national or European standards.

Remark No 1: Policy should take account of new risks, and new groups affected by risk.

The external environment is changing, and changing rapidly. Economic conditions are increasingly competitive. Technological change continues to increase in speed and working patterns are changing too.

All these changes have implications for health and safety. These are not pursued in detail here; they are identified and discussed in various contributions elsewhere. But their combined effect may well be to focus attention on relatively new risks - rather than 'classical' health and safety risks - and provoke further thought about the types of people at risk.

There is one immediate lesson. Policies need to be able to adapt to a changing world. Regular review may be one way of testing if a policy remains fit for purpose.

Remark No 2: One should define objectives and goals first

Contributions have emphasised the goal setting philosophy; one specifies the ends, not the means.

These first two remarks cover the parts of the policy-making process where effort is likely to concentrate on risk assessment, and examination of scientific and technical literature.

Remark No 3: Policy-makers need to think creatively about practical options, and look at their costs and benefits.

There are a number of subsidiary issues here.

- Policy is more than legislation, so practical options should at least consider the viability of a range of options. The European Foundation proposals for an economic incentives model are an example of fresh thinking on policy issues.
- Different countries have different national health and safety 'systems'. This means that, for examples, policies designed to 'internalise' costs will need to take account of national characteristics, e.g. financing of compensation payments and health services.
- Cost benefit analysis (CBA) is appropriate when there are practical options to consider. To be an effective aid to decision-making, CBAs should be based on good practice, and in particular should aim to meet the following criteria. They should be:
 - structured;
 - comprehensive, including social impacts, environmental effects, and other material effects (e.g. trade implications);
 - timely;
 - transparent, identifying, quantified and non-quantified, impacts, as well as relevant assumptions and the inevitable uncertainties;
 - based on the best information available;
 - cost-effective, in that resources should be proportionate to predicted impacts;
 - fit for purpose, so that decision-makers and stakeholders feel a reasonable job has been done given time and resource constraints.

Remark No 4: CBA should be integrated into the decision-making process.

The role of CBA should be clearly identified and well understood. It needs to be part of an on-going policy process, with the CBA refined as the policy is refined.

Consultation is an important feature of the whole policy process. It is also important for the CBA. Initial results should provide an opportunity for people to respond before a decision is taken.

CBA techniques can also be used as part of a continuous process of monitoring, review and improvement. Evaluation studies of this kind can provide useful insights and possibly suggest changes that may be necessary to increase effectiveness.

Remark No 5: CBA informs but does not dictate the decision.

It is important to say this explicitly. Whether or not to implement a particular health and safety policy is a political judgement. The cost-benefit balance will be only one factor

affecting this decision although, if the analysis is thorough and widely accepted, it may be an influential factor.

Practice

Practice is taken to mean what actually happens at the workplace, through action taken by business to improve health and safety. Practice will, of course, be affected by the need to comply with legislation and meet other standards, such as those set by insurers. Nevertheless, both strategic and day-to-day decisions taken by industry have implications for the health and safety of employees, and the general public. So attempts to influence the climate in which business and other interested parties in the health and safety 'system' operate should have an impact on the numbers of work accidents and occupational ill health.

Remark No 6: Managers need better information system to understand the effects of occupational safety and health on their business.

The Framework Directive's requirement for risk assessments provides a platform for raising health and safety standards in enterprises. Information on costs and benefits can usefully be brought into this process, e.g. one of the consequences of a hazard being realised may be financial loss.

This requires reliable information on the full costs to the business of poor health and safety and the benefits from prevention. In practice, this information is not usually available from standard accounting or management information systems - or, rather, only certain costs and benefit items are 'visible', the remainder being 'invisible'. Hence, changes and improvements in information systems are likely to be a pre-condition for improved health and safety management.

Remark No 7: A range of good techniques is available to managers.

Work carried out by HSE and the Danish Working Environment Service for DG V looked at existing studies of how firms improved their information on the full costs of accident and ill health. It identified two approaches to measurement: one based on the use of personal information, the other based on direct measurement of the consequences.

Papers presented at this conference have also identified a number of practical ways in which firms can improve health and safety, yet reduce their costs. Models of this kind vary in their complexity, and in their information requirements, and managers would need to use techniques that were appropriate for their company.

It is also vital to involve employees in the process. They are often the people who know most about the causes and consequences of accidents and illness, and can advise on simple means of preventing them.

However, one common feature of all these techniques is that they take time and money to collect the supporting information and to apply it. Managers will need to be convinced that this is a good use of company money.

Remark No 8: OSH professionals, public authorities, and others need to energise business, and talk to them in their own language.

OSH professionals and public authorities will need to 'sell' the benefits of a preventive approach to industry. This is a major communications task, and it requires careful attention to style. For example, arguments about the benefits of reduced compensation payments arising from preventive measures may resonate with the Finance Director, but may be less influential to a manager who placed greater weight on market share or customer satisfaction.

Publicity campaigns are an important part of this communications process. Two examples of campaigns with a strong cost-benefit theme are OSHA's Safety Pays Initiative and the HSE's Good Health is Good Business campaign. To say a little about the latter:

- it was launched May 1995, and takes place over several years, including several phases;
- it features a number of media, in partnership with external organisations;
- the costs of ill health is one key message; others include: managing health risks need not be difficult or expensive; most things can be tackled by the enterprise itself; action must match risk; and the regulator is there to help.

Research

Finally, some key themes for the future research agenda. This is not a complete set of headings - no doubt research could uncover useful information in many areas; rather, it provides an indication of areas where research may be of particular value.

Remark No 9: We need more enterprise-level studies.

Many of the cost-benefit issues surrounding the benefits of improved health and safety can only be tested at the enterprise level; for example, impacts on business disruption, quality and productivity.

There are already a number of enterprise-level studies around. Future studies may need to cover a wider set of issues, such as 'before and after' studies of health and safety interventions. The SME dimension also needs to be considered, even though information is limited

It is worth mentioning here the SHAPE project, funded by the European Commission, which will include a number of enterprises in each Member State. A cross-national study of this kind should be particularly illuminating.

It is also important that the potential synergies from these studies are realised. As the 'database' of studies of this kind expands, it would be helpful if findings are synthesised and disseminated. This may be an area where the European Agency has a role to play.

Remark No 10: Researchers should look beyond the direct effects of OSH measures.

Much of the research into costs and benefits, as well as practical applications of CBA, has focused on the direct effects - the costs of compliance and the reductions in risk achieved. This is understandable, and indeed an appropriate priority when information is limited, but our understanding of the cost-benefit issues would be enriched by research looking at wider effects:

- looking at how costs and benefits change over time; i.e. dynamic efficiency effects of the kind hypothesised in the environment literature, (although there is little concrete evidence as yet);
- assessing the cumulative impact of OSH measures, e.g. their impact on entrepreneurial time and small firm formation;
- testing for the existence of 'spin-off' effects, e.g. on overall management quality.

Remark No 11: To do a good CBA, we need to know more about public and individual values.

'Values' here is a reference to the ethical dimension, not to monetary valuation alone. Research into people's attitudes and behaviour can help formalise, identify and clarify the points where different subjective values become important in influencing the debate. Issues might include:

- research into the ethical principles the public wish to see adopted in managing and controlling risk;
- the acceptability of cost-benefit based approaches to management and control: and
- how the (well documented) research on risk perception can be used to inform practical decisions on management and control.

The European Union perspective

*Presented on behalf of P. Flynn by G. Aresini.
European Commission*

I am delighted to be here at this conference on occupational safety and health. I regard health and safety at work as a high priority, and I intend to go on the offensive to keep it high on the political agenda.

The new strategy on health and safety at work

That is why I have asked my services to prepare a strategy for the development of health and safety policy which will be presented to the tripartite Advisory Committee on safety, hygiene and health protection at work in September.

Let me sketch in briefly some of the issues that our health and safety strategy must address. Major economic and industrial changes are taking place across the EU. The service sector continues to grow. Increasingly, it is offering opportunities to part time and casual workers. Much of the work is being done through contracts.

There are new hazards. With the decline of traditional industries, heavy industry risks are fewer. But they have been replaced by new computer controlled processes, new chemical substances and new work practices in firms that have down-sized or resorted to more sub-contracting.

There are new concerns and expectations among the public about long-term forms of ill health and about stress.

We need to ensure that all workers benefit from the same guarantees of health and safety. When establishing new priorities, we need to draw on the best sources of knowledge about existing and emerging risks at work.

We need to make the best use of the resources and knowledge available to the Commission, to the Member States and to the Social Partners and acquired since the establishing of the 1995 Community Programme on safety, hygiene and health at work.

Costs and Benefits

An important part of our strategy will be to drive home a message and that message is on two fronts. That health and safety is a basic right and that the costs of badly managed health and safety are unacceptable.

This conference will provide an important contribution to that message. You have been analysing and exchanging information on the benefits gained when firms integrate health and safety standards within good management.

You have looked at studies which have estimated the socio-economic costs of work-related illness to be between 1 and 3% of countries' GNP.

Studies that also show that occupational accidents and diseases result in direct loss of added value for companies through loss of productivity, loss of quality and increased production

costs. This is almost certainly draining off around 0.5% of the GDP of the whole European Union.

The problem is not the measures to prevent accidents and diseases, but the problem is that enterprises have not been successful in the implementation of the existing standards. Managers are expected to be tough on costs, but they should also be tough on the causes of accidents and diseases, as these give rise to costs both for enterprises and for Governments. It is a sign of bad management to have high rates of accidents and diseases in an enterprises.

When I travel, I often take the opportunity to visit businesses, factories and plants. I know from these visits that well run, successful businesses never hesitate to make health and safety a priority for their workers. They see it as an integral part of good management. They certainly do not believe that taking account of health and safety factors makes their company less effective.

Europe, like the United States, is a relatively autonomous economic entity. Production within Europe covers 92% of our needs - the remaining 8% being imports which are balanced of course, against our exports. Trade within the Union has doubled in the last thirty years and is set to increase as trade barriers come down and companies start waking up to the size and potential of the European market. We do not need to fear social progress in Europe.

Employment

At present, there is much emphasis on job creation. Obviously, this is important. But Article 2 of the Treaty of the European Union places equal emphasis on raising the standard of working and living. The emphasis on employment rates in the Union should not be a pretext to reduce safety and health at the workplace quite the opposite. Putting the health of workers at risk is not a way to compete successfully.

It is equally true that the emphasis on good working conditions reveals the EU as being aware of the real needs of its citizens. There is a message to be put across here, a message that is more than a question of moral values. It is also about competitiveness. And as we move towards the further integration of rope and to the enlargement of the Union, that dual message is increasingly important.

Information and the strategy

Information is always an important element of any strategy. It is particularly so in health and safety. To inform about best practice so that enterprises can improve their health and safety standards and so workers can demand better health conditions.

The Commission receives valuable help in this regard from the new European Agency for safety and health at work in Bilbao and from the Dublin Foundation. The Bilbao Agency has started to develop a health and safety information network with Member States; we will have the first results later this year. Next year I also expect to receive an overview of the current state of occupational health and safety in Europe, to be followed by a series of reports on specific areas of activity.

The process of getting information and material on best practice in health and safety to all sectors of industry - including small and medium sized firms - has been much enhanced by the introduction of information and communication technologies. The development of this process will be an important part of the new strategy.

The role of safe

It will also contribute to SAFE, the programme on Safety Actions for Europe, which the Commission has proposed, at the European Parliament's invitation. Its general aim is to make existing legislation accessible, visible and usable to small and medium-sized companies, for example through the exchange of experience. It will be an important part of our strategy to get information to where it is needed and to spread the message about the benefits of well managed health and safety.

Much of the programme will consist of publicity-generating events organised within individual companies. They will offer practical demonstrations of effective ways of meeting the requirements of health and safety directives.

There will also be a database of good practice which will be put together and managed by the European Agency. It will show why and how particular approaches are to be preferred and what the economic implications of the various options are. It will seek to spread examples of sound experience throughout the Union.

The European Week on health and safety at work in October and the Film and Multimedia Festival in Edinburgh next year will help encourage new forms of communication and publicise the message of health and safety.

Legislation

We have a strong body of legislation in place and our strategy will be to up-date and add to it where necessary. I believe most of the current activities, such as the proposal for a directive on carcinogens, are on the right track. I certainly anticipate progress on the proposed directive on scaffolding, which I believe will be a significant contribution to safety in the construction industry.

Implementation and enforcement of legislation

It is equally important that the existing legislation is properly enforced. Now is the time to ensure the full transposition, implementation and equivalent enforcement of that legislation. Without this, there will be no "level playing field" between Member States.

In the light of the assessment made last January, some Member States seem to be slow in fulfilling their commitments. This, ladies and gentlemen, is not acceptable. The Commission has already referred a number of Member States to the Court of Justice and we will not hesitate to pursue these matters further, although our aim is to improve implementation so that this action is not necessary. A clearly successful approach, since the rate of implementation has gone from 30% at the end of 1994 to 91 % at the current time.

In order to promote equivalent enforcement in the Member States and to avoid penalising groups of workers and distortion of competition between firms, the Commission set up the Senior Labour Inspectors' Committee in 1995. This body deals with questions related to labour inspect orates and the enforcement of legislation and ensures a useful exchange of experience.

We intend to launch a wide debate on implementation following receipt later this year of Member State's implementation reports, as required by the directives. These should give us a complete picture of the status, problems of implementation and enforcement, and efficiency of the adopted legislation and enable us to launch a debate in the different for a, such as the Advisory Committee, ECOSOC and the European Parliament. We also expect that the Council will debate the issue following its own Resolution of 27 March 1995 on transposition and application of Community social legislation.

The issue of enlargement

On one last point, let me say a word or two about the question of health and safety in the enlargement process and in the area of international relations. You will appreciate that the whole question of enlargement is a matter of considerable importance for the Commission and one which involves a great deal of effort for everyone involved.

As I have indicated, our strategy is that companies in the European Union should compete on quality, productivity, innovation, not by putting workers health at risk. Applicant countries will be obliged to ensure that, by the date of accession, their legislation is in line with European Union legislation.

Our perception is that the majority of the applicant countries are clearly moving towards, not only the incorporation of the legislation but also adapting their social dialogue and inspection activities so as to be able to reach effective application and enforcement.

Conclusion

Ladies and gentlemen, I have today talked about why health and safety should be made a high profile issue and the strategy that we propose for achieving this. I would like to invite you to contribute to the development of our strategy. To send me your best ideas and suggestions.

But let me in conclusion request your support. I urge you to leave this conference with the intention of spreading the message that health and safety does not reduce competitiveness or productivity. On the contrary, social policy is a productive factor.

To reduce risk is to reduce disruption. It improves production and makes for a more secure and more motivated work force. That is what social policy is all about.

And that is what the European social model is all about. It seeks to combine productivity and solidarity, a process in which health and safety plays a crucial role.

You have had a very successful conference. I am confident that this event will contribute much to helping us to raise the profile of health and safety in the European Union.

Thank you

Prospects for Research on the Costs of Occupational Safety and Health, a Macroeconomic Perspective.

*F. den Butter
Free University
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It may be useful at the end of the panel discussion to consider the costs of occupational safety and health from the perspective of macroeconomics and labour economics. In doing so I realize that my remarks may fall somewhat outside the scope of the previous discussions of the panel and of most papers presented at this conference. Therefore I may be at risk to be seen as the person from another planet. However, I believe that this macro perspective can shed light on questions which are relevant for future research on the costs of occupational safety and health. As each member of the panel was asked to concentrate on two points in this discussion, I will raise in the following two research questions which I think are crucial at the macro level. I will concentrate on the costs rather than on the benefits of working conditions and hence drift away from the concept of cost-benefit analysis which has been a major theme of this conference.

To start with it should be emphasized that the costs of working conditions are **part of labour costs** and come on top of other payments that employers have to make for utilizing labour as production factor. These costs of working conditions should be considered as **production costs** and should, in principle, be reflected in the product price. Two types of costs of working conditions can be distinguished. On the one hand, there are what I will call the **incidence costs**: these are the costs associated with occupational diseases and accidents. On the other hand, there are the **prevention costs**, which e.g. include the investments in better working conditions. Total costs are then equal to incidence costs plus prevention costs.

The first major research question relates to the **trade-off between prevention costs and incidence costs** at the macro level. Or to put it more bluntly: the question whether more safety still pays. Obviously prevention costs are made in order to induce a decrease in incidence costs, but investments in prevention are only economically worthwhile if the decrease in incidence costs is larger than the increase in prevention costs. So it is a question of calculating a trade-off rather than of making a cost-benefit analysis. This distinction is indeed more than a mere vocabulary issue as was remarked previously in the panel discussion. According to the central paradigm of economics a rational agent will minimize costs. In that case the optimal combination of prevention costs and incidence costs will be reached when the marginal increase in prevention costs equals the marginal decrease in incidence costs. In other words: the optimum is reached when one additional Euro invested in prevention leads to one Euro less incidence costs. Within this line of argumentation one can only speak of "benefits" in case the ratio of incidence costs and prevention costs is not in its optimum and when benefits can be achieved by moving towards the optimum. Of course, a cost-benefit analysis is useful at the micro level to select those investments in better working conditions,

which have the highest rates of return. This best choice is implicit in the assumption of rational agents. Hence the trade-off regards the question about **how much** investments and the cost-benefit analysis about **what** investments.

It should be emphasized that the incidence costs do not only comprise direct economic costs which have a money value, such as the costs of foregone production due to illness or disability, or damage costs due to accidents. These incidence costs also include non-monetized costs, or indirect costs, of occupational diseases and accidents. We can think of human costs and of the ethical dimension of insufficient occupational safety and health. This has been mentioned several times during this conference. Economists are very well aware of the fact that there is more than the money value of a worker and economic welfare theory takes that into account. Hence, these costs should be included when calculating the overall costs of working conditions.

Moreover, the existence of **externalities** at the macro level may cause the optimal ratio of incidence and prevention to be different at the macro level than at the micro level. It strikes me that such externalities of occupational safety and health were only occasionally mentioned during the conference. On the one hand there can be positive externalities from investments in better working conditions due to spill-overs and accumulation of technology knowledge. On the other hand, occupational diseases and accidents may bring about negative externalities, that firms do not take into account when making their decisions on working conditions. Admittedly, I know of little theoretical research on optimal prevention in labour economics but it seems that there can be an analogy with the optimal maintenance schemes of machines from the operation research literature¹. However, it is clear that this methodology for the production factor capital cannot just be transposed to a methodology for the production factor labour: it is the human factor which stays between men and machines.

A major impediment for investigating this first research question on the trade-off between prevention and incidence is a lack of data. Firstly there is a need for **time series data** on the macroeconomic incidence and prevention costs. The study by Koningsveld en Mossink which has estimated gross macroeconomic costs of working conditions in the Netherlands for one year, namely for 1995, is a first step into this direction². Secondly, in order to get a good picture of the micro/macro linkages also **panel data** are needed on incidence and prevention costs at the firm level. These panel data should relate to a representative sample of firms which is much more relevant from the scientific point of view than a set of case studies or cost-benefit analyses. Moreover, in order to make research comparable for various countries, it is essential that these data should be collected in a uniform manner. This aspect has also been stressed during the conference.

The second major research question regards, in my opinion, the **reason for governments to intervene** in matters of occupational safety and health. Why doesn't the government leave it to social partners, the employers and employees, to come to an agreement on working conditions? In that case investments in occupational safety and health and labour conditions could be part of collective labour agreements and its costs could be directly included into the product price. Now, with government intervention a major part of these costs are paid

by the government and hence by the taxpayers. According to the study of Koningsveld and Mossink this amounts to about 60% in the Netherlands, albeit that this amount may be overestimated due to the estimation method of the incidence costs.

It appears that for government intervention the same argument holds as in the case of social security, compulsory old age pensions and compulsory insurances, namely the argument of **asymmetric and imperfect information** of workers and employers. It is for this reason that publicity on the necessity and gains of good working conditions is essential, as was remarked earlier in the conference. Again there is a **trade-off** associated with government intervention. No government intervention would evoke negative externalities with respect to incidence. In that case a part of the costs would as yet be carried by the government, e.g. foregone tax income, social costs and loss of human capital. With no government intervention it would be very difficult to internalize those externalities; may be these externalities are difficult to internalize anyhow. On the other hand, with government intervention we have, like with social security, the moral hazard problem. Moreover, government intervention may lead to an unwarranted redistribution of costs: high risk production methods may bear too low costs whereas low risk production methods will bear high costs and become relatively too expensive. So there will be no definite answer to the question whether, or if so, in what way the government should intervene. But at least this question seems relevant in times when the government is reconsidering its role and influence in many parts of the economy.

Notes

1. See e.g. R.E. Barlow and F. Proschan, 1965, *Mathematical Theory of Reliability* (Wiley & Sons, New York), Chapter 4.
2. E.A.P. Koningsveld and J.C.M. Mossink (ed.), 1997, *Kerncijfers Maatschappelijke Kosten Arbeidsomstandigheden* (Key figures on the macroeconomic costs of working conditions), NIA-TNO Report 95-110.

Concluding remarks to the conference

F. de Grave
State Secretary for Social Affairs and Employment
The Hague, The Netherlands

Final speech by State Secretary for Social Affairs and Employment Mr. De Grave at the conference Costs and Benefits of the Policy on Working Conditions on 30 May 1997 in Scheveningen.

Now that we have arrived at the end of our conference I would like to summarize the outcome and convey a very important message to the European Commission.

We agree that we will have to work on substantial improvements on working conditions in Europe. Because our aim is to make working in Europe healthier and safer. Our aim is that employees are content with the conditions under which they have to work. Our aim is that they reach the age of retirement in good health. And our aim is that the costs related to hazardous and unhealthy work are drastically cut down.

In order to establish whether we are on the right track in the different countries and whether the pace that we are keeping is high enough, we will have to try to accurately define the objectives of a policy on working conditions on short notice. These objectives must be realistic, but also ambitious. Just as we have established target figures for environmental policies regarding the emission of toxic material, we may determine in a policy on working conditions how far we want to reduce occupational illness and accidents and sick leave. In concrete and verifiable figures.

This requires a European monitoring system that provides us with comparable data on the development of occupational risks and sick leave among employees in the member states. Should a member state make insufficient progress in combatting occupational risks and sick leave, the commission should sound the alarm. That will keep the member states alert. It will be an incentive for them to increase their efforts to improve their policy on working conditions.

During this conference we have extensively discussed the question of how a policy on working conditions can be structured most effectively, who will have to take on the responsibility for such policy, how the enhancement of working conditions can best be monitored. And of course, the matter of costs and benefits. These discussions were most enlightening.

But I don't think we have reached our goal yet. It will take more research to answer the question which policy will be most effective to improve working conditions. It is very important that we should always try to find measures that will gain the trust of the people involved. Employees must literally feel the improvement of their working conditions, employers must feel this improvement financially.

Only after this balance has been reached, a policy on working conditions will be credible and convincing. And only a policy on working conditions that is credible and convincing will be put to practice. A policy that is regarded as hampering and inefficient will be evaded in many and resourceful ways.

In this context the appropriate measurement is equally important. Excessive burdens, too many administrative obligations, unnecessary detailing do not favour the credibility. Therefore I strongly promote the idea of a working conditions system that combines simplicity and effectiveness, that is flexible and that has the support of both employers and employees. Also a system that challenges the social partners to find the most feasible route for themselves. But always under the scrutiny of the government. For if the social partners do not perform satisfactorily, the government may not remain idle.

In the period to come we also have to carefully study the working condition policy in the smallest companies. Especially as to how we can find a reasonable balance between administrative obligations we impose and the benefits connected to them. We may ask ourselves whether it is wise to put too heavy a burden of regulations on the relation between for instance one employer and his sole employee.

However, this can in no way affect the importance of rules that provide a basic level of protection. These rules are indispensable, especially in an age of transnational labour and flexible work relations. We must avoid the flexible work force becoming a new high-risk group.

Many countries would like the European regulations to be simplified. Other countries prefer the regulations to be as detailed as possible. This has become evident from this conference. I think that when European objective regulations are structured in such a way that the member states have enough room for their own detailing, with regard to the objectives for the reduction of occupational hazards and sick leave, the various differing opinions in the individual member states should be met.

And I can well imagine that the emphasis will be on legislation that stipulates expert support and financial incentives. In that case the need for more detailed standards would objectively be less. Moreover, it would allow for more consideration with the different situations in the various member states with regard to the way in which legislation must be implemented.

One item I am particularly intent on in the context of working conditions legislation is enforcement. In all member states there should be sufficient supervision in order to guarantee that the rules are complied with and that the objectives are seriously pursued.

In this respect I totally agree with Commissioner Flynn. Later this year we will have to critically discuss the implementation and enforcement of guidelines. Apart from that evaluation, we must also conduct broader discussions about the effectiveness of regulations and about the best strategy for improving the policy on working conditions. In that broad discussion three items must feature.

Firstly and most importantly, our primary goal must be to formulate measurable objectives for the reduction of occupational hazards and sick leave. Also, we will have to discuss the broadening and professionalization of expert support by working condition services. Finally, this autumn we will again have to intensely discuss the enhancement of the effectiveness of regulations, where possible by making legislation more simple and flexible.

With regard to this last item, simplification and flexibility, I still sense some reluctance from the part of the Commission. I can understand that to a certain extent. Some member states may not yet be ready to deal with that. However, European regulations should not cramp member states who do not have a need for simplification and flexibility. This is the message I wish to convey to the European Commission at the conclusion of this conference.



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The issue of costs and benefits of occupational safety and health is becoming increasingly important for companies, professionals and policy makers at both a national and an international level.

Many complex questions are raised during discussions with regard to the effects of health and safety measures on absenteeism and productivity, methodologies at both a company and a national level, and about consequences for political decision making.

This book presents a number of papers on a variety of topics in this field:

- an overview of key issues and perspectives;
- the impact of safety and health at work on productivity and competitiveness;
- instruments and models to assess costs and benefits at the company level;
- methodology at the macro level;
- national policies on occupational safety and health;
- company policies;
- future developments in policy, practice and research.

All papers were presented at the 1997 European Conference on Costs and Benefits of Occupational Safety and Health, held on 28 - 30 May 1997 in The Hague, the Netherlands.