

The Economic Efficiency of the Measures of Labour Safety

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Abstract – The aim of this paper is to perform an analysis of the occupational health and safety system in the enterprise, identifying factors, which affect the amount of occupational health and safety costs, as well as present proposals to reduce occupational health and safety costs and improve the occupational health and safety system.

Keywords – Direct and indirect costs, economic efficiency, labour safety.

I. INTRODUCTION

Work environment has a very significant role in the life of worker, because we spend approximately one third of our lives at work. Work environment is our workplace with all conditions and risk factors existing in and around it; which affects or could affect our safety and health at work [1].

Contemporary scientific developments, introduction of technologies, and modernising of production cannot guarantee avoiding impact of various risk factors, accidents, occupational diseases: in work environment, an employee is exposed to dangerous situations, harmful influence of physical, ergonomic, chemical and biological factors.

The basic purpose of labour protection is to determine legal basis for implementation of socio-economic, technical and organisational measures and, consequently, ensure introduction, coordination and control of law prescribed requirements.

Internal supervision of work environment is sufficiently dissuasive, and its purpose is to discover risk factors existing in the work environment as early as possible and prevent or reduce impact of such factors on safety and health of employees [1].

In their work environment, employees are exposed to dangerous situations, harmful influence of physical, ergonomic, chemical and biological factors, and modern scientific

developments do not guarantee avoiding impact of various risk factors, accidents, occupational diseases, therefore a **precise and effective system of labour protection both at governmental and business levels provides employees with safe and health-friendly working conditions** [2].

The following **hypothesis** has been suggested for the survey: preventive measures of labour safety provide for education of labour safety costs in the enterprise.

To prove the hypothesis, the following objective has been set: to identify and analyse costs of labour protection, as well as opportunities to reduce these costs.

To meet the objective and prove the hypothesis, the generally accepted **research methods** have been used: monographic and statistical methods of analysis and a semi-structured interview with the head of the laboratory of the enterprise.

II. ASSESSMENT OF COST EFFICIENCY

One of the basic principles of the labour protection system, in addition to securing closer cooperation between an employer and employees, is orientation of the labour protection system not towards consequences of accidents and impact of risk factors, but towards causes [3].

Entrepreneurs should take into account that their employees' safety and health may be put at risk not only by risk factors present in the work environment (chemical, electrical, traumatic and other factors), but also by work methods, work organisation, professional training of employees, and interaction of all aforementioned factors. Moreover, regardless of the fact that a work accident may occur due to various reasons, it affects the whole enterprise and, as a result, also the company's profit.

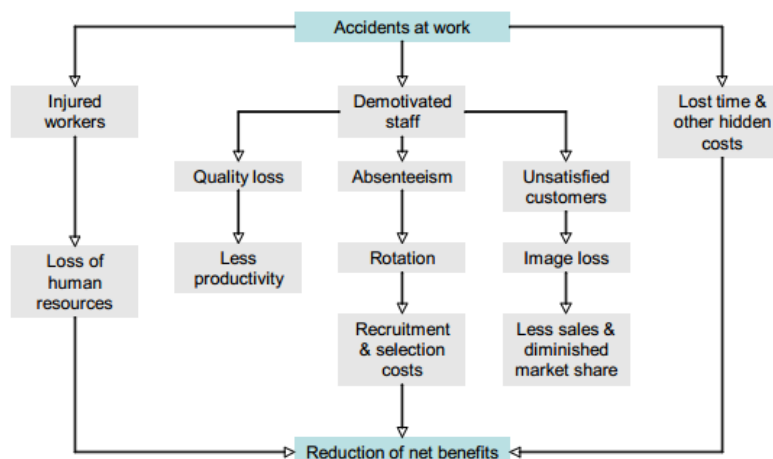


Fig. 1. From accidents at work via intangible outcomes to reduced benefits [5].

Costs related to consequences of the accident can be irreversible and strongly affect both the company's profit and business viability (see Fig. 1). In recent years, the increased incentives of entrepreneurs to introduce and maintain labour protection systems are related to the entrepreneurs' awareness that competitiveness, quality and working conditions are closely related to each other.

A well-organised work environment can give a positive impact on product or service quality, customer satisfaction and company's reputation, and contribute to faster achievement of business goals (Fig. 2).

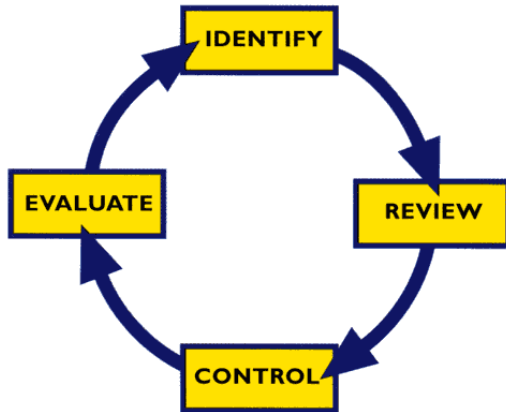


Fig. 2. Correlation between measures of cost efficiency.

Cost efficiency correlates with:

- Analysis of alternatives
- Risk analysis
- Cash flow of project life cycle
- Evaluation of cost effectiveness

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

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

where B_{ij} and C_{ij} are the j th type of policy benefits and costs, 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 [6].

Full economic evaluations, such as cost-effectiveness studies and cost-benefit analysis, are needed for optimal choices. The choice among the different types of full economic evaluation should be based on the objective of the intervention and the question addressed by the study (Fig. 3). Cost-effectiveness studies measure the outcome in "natural units" (i.e., health outcomes). This type of analysis is best suited for outcomes difficult to translate into monetary units, such as pain reduction. Cost-utility analyses are seldom used in workplace contexts [7].

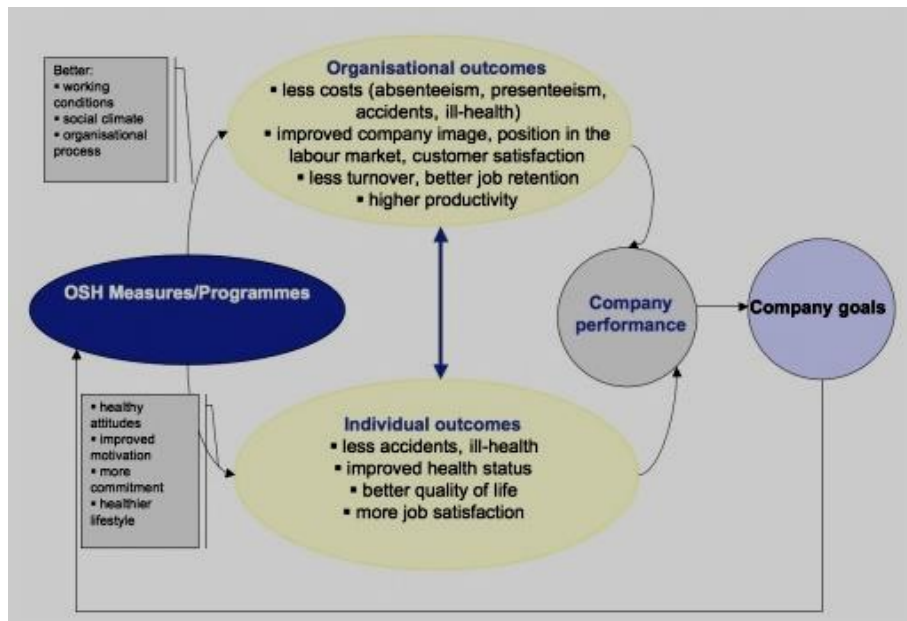


Fig. 3. Preventive measures of labour safety and health protection, and their influence on business goals [5].

Costs that have effect on price of the product or service are related to such categories as costs for providing equipment and premises, personnel costs, costs for purchase of production materials, and others, but, in addition to that, one group of business costs is related to ensuring labour protection in the company.

When deciding upon organisation of labour protection, one should remember that labour protection measures must be included in planning of the company's operation, because they

are often related to expenses (for example, mandatory health checks, laboratory testing of work environment, provision of personal protective equipment) or time which an employee will have to use not for performing his/her direct duties, but for implementing labour protection measures (for example, training of personnel operating dangerous equipment). Structure of company's labour protection costs in the process of internal supervision of work environment is the following (see Table I).

TABLE I
STRUCTURE OF LABOUR PROTECTION COSTS

| No. | Costs |
|-----|---------------------------------------------------------------------------------------------|
| 1. | First aid training |
| 2. | Improvement of everyday conditions at work (for example, locker rooms, showers, rest areas) |
| 3. | Training of labour protection specialists and trustees |
| 4. | Working clothes and personal protective equipment |
| 5. | Laboratory testing of work environment |
| 6. | Assessment of risk factors in work environment |
| 7. | Improvement of work environment (for example, installation of ventilation) |
| 8. | Employee instruction and special training (for example, in fire safety) |
| 9. | Mandatory health checks for employees |
| 10. | Sport opportunities for employees |
| 11. | Vaccination of employees |
| 12. | Installation of safety signs |
| 13. | Purchase of first aid sets |
| 14. | Purchase, maintenance of firefighting devices |
| 15. | Health insurance policies |

In addition, consequences of work accidents can also be attributed to costs, for example:

- Paid sick list A;
- Material compensation to the injured employee;
- Suspension of manufacture and down-time;
- Elimination of possible consequences of the accident;
- Repair or replacement of the damaged equipment;
- Fines charged by state regulating and controlling authorities;
- Partial or total cessation of business operations;
- Court expenses, if any harm is caused to private persons, legal persons, or environment.

In enterprises, costs of labour protection measures can be very high (especially, in large enterprises), and this is one of the main factors, which prevents maintenance of an effective system of labour protection. To reduce the company's total costs (and labour protection costs), attention must be paid to identification of factors, which cause extra costs and losses.

Many people do not realise how much accidents really cost. In fact, many expenses are not always obvious. Attention to accident prevention can and will improve a company's overall success [8]. Safety helps the bottom line, and it is the right thing to do! [9]. Where does the money come from to pay for the results of accidents? Some people believe that organisations have money set aside to pay for accident costs. However, employers know that the money must come from profits [8].

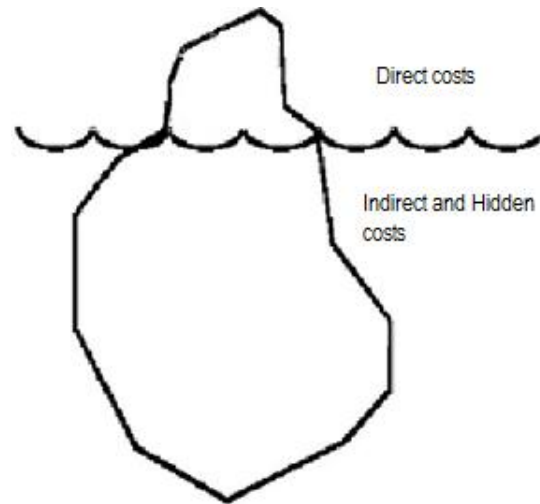


Fig. 4. Hidden cost of accidents [8].

In 1920, researcher H. W. Heinrich developed the so-called "Iceberg Theory" under which he divided business costs, related to accidents at work place, in two categories: **direct** and **indirect** [11].

In **direct costs** he included wages for the non-working period or medical costs (for example, transportation of injured persons to hospital, medical remedies etc.). **Indirect costs**, according to him, are employee replacement costs, falling work productivity, fine costs, loss of company's reputation etc. [5].

Heinrich focused on the fact that indirect costs are hidden costs, and during his research he calculated proportion of direct costs vs indirect costs: **each Euro of direct costs will result in extra 4 Euros in indirect costs about which the company does not even know** [11].

This division offered by Heinrich can be successfully used also today.

B. Brody has found the proportion 1:0.83 and concluded that result of this proportion is affected by nature of the company, qualities of the injured, severity and consequences of injuries, cost definitions and applied research methods.

In addition to the aforementioned Brody's opinion, Heinrich also believes that proportion of cost groups is not constant and changes depending on each specific situation.

The ratio that Heinrich proposed in his study between direct and indirect costs led to the overall use of the iceberg metaphor (Fig. 4). Only the top of the iceberg, being the direct costs, is visible. All the rest – the indirect costs are hidden beneath the surface.

In the tradition of Heinrich, several authors have performed studies to determine the ratio between direct and indirect costs. Numerous ratios have been found and most of them have not corroborated Heinrich's findings of 1:4. The relationship between direct/insured and indirect/uninsured costs has been shown to vary considerably. Brody has found a ratio of 1:0.83 between insured and uninsured costs [10]. Factors influencing this ratio seem to be the industry studied, the characteristics of

the firm, the characteristics of the victim, the severity of injury consequence, the definitions of cost and the research methods used and the structure of the revailing system of workers' compensation of health insurance [10]–[12]. Heinrich himself has already indicated that the ratio of 1:4 does not hold true for every industrial accident or every individual plant [13], [14].

Paez et al. argue that the linear ratios, as introduced by Heinrich, cannot be maintained due to the low correlation between the incidence rate of accidents and the cumulative accident costs. Insured costs are determined by the cost of medical treatment and the extent of the employee's absence. Uninsured costs are determined by the impact that personnel absences have on the rest of the organisation.

Instead the authors propose a logarithmic relationship between uninsured and insured costs [15].

III. RESULTS AND DISCUSSIONS

Many enterprises lack skills to harmonise safety questions and aspects of occupational health with existing legislation; as a result, there are often situations when more attention is paid to short-term economic advantage, instead of long-term investment in introduction of preventive measures and maintenance of personnel resources to ensure healthy work environment.

In addition to direct functions – production or provision of services – a company is forced to work in the environment, which in various ways affects its operation and results (see Fig. 5 – a diagram made by the authors in Vensim PLE).

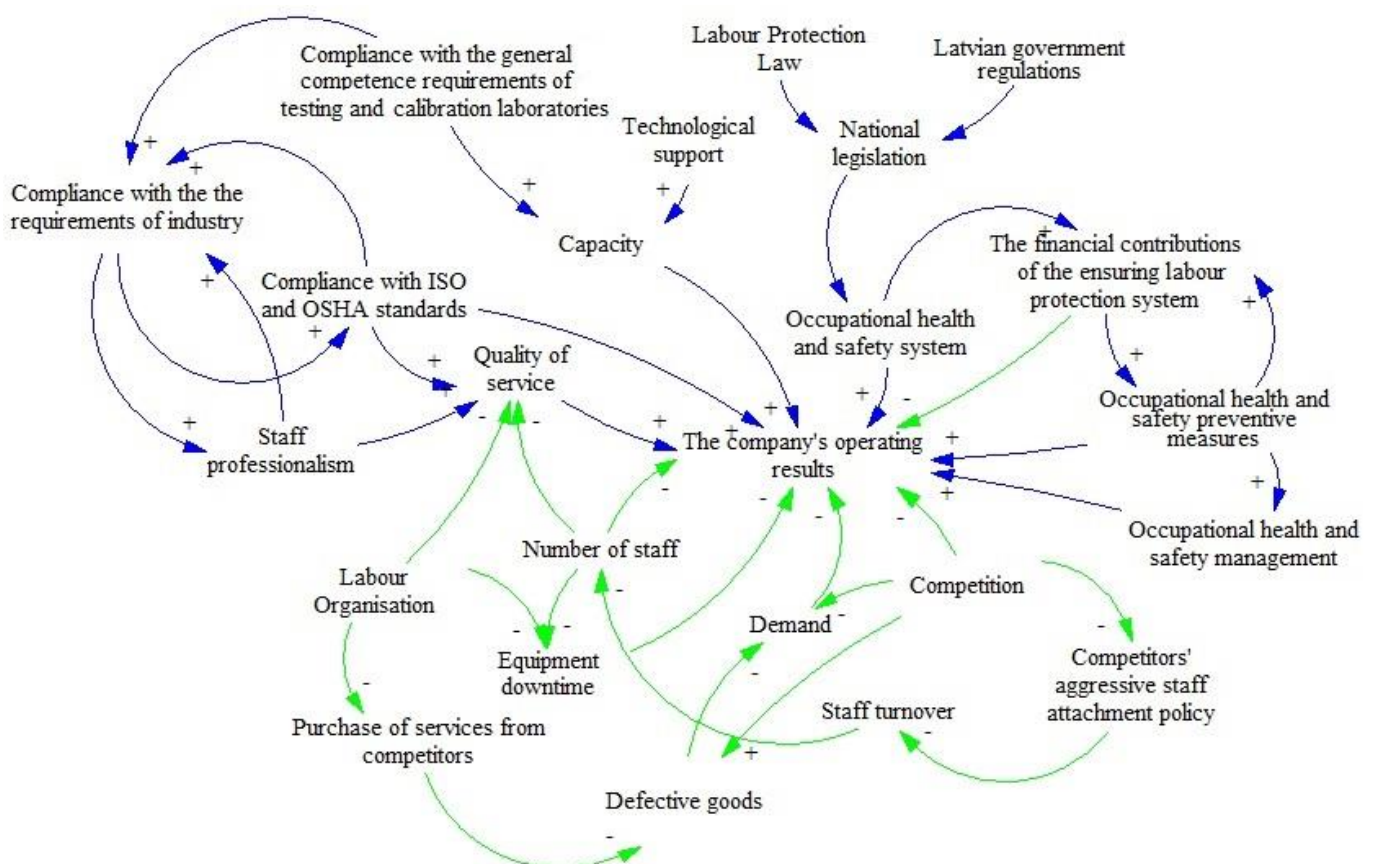


Fig. 5. Causal loop diagram "Business Influencing Factors and Operation Results" [16].

Labour inspection and monitoring are major elements of any institution and labour administration system for enduring the implementation of labour policies, providing feedback and allowing for a readjustment of these policies as necessary. In recent years, the importance of labour inspection in promoting decent work has been widely recognised. Yet in many countries, the changing world of work with its new employment patterns has been accompanied by reduced government interventions in the workplace [17].

At the moment, entrepreneurs still fail to understand that business success is only possible if employees are in good health. It should be noted that accidents, incidents, employee's

illness in many companies affect not only one employee's health, but the company as a whole.

IV. CONCLUSION

1. Labour protection is sufficiently dissuasive, and its purpose is to discover risk factors existing in the work environment as early as possible and prevent or reduce impact of such factors.
2. Employees' safety and health may be put at risk not only by risk factors present in the work environment, but also work methods, work organisation, professional training of employees, and interaction of all aforementioned factors.

3. Costs or losses that may occur to the company due to inappropriate working conditions can be divided into two large groups: potential losses due to various accidents and incidents, and potential losses due to incorrect work organisation, ineffective equipment, insufficient training, workplace planning, and other reasons – they affect the employee and, consequently, productivity of the whole company.
4. In addition to annual costs of labour protection measures, which increase gradually year by year as the company grows, there are various other costs that are directly or indirectly related to incorrect work organisation.

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