

APPROACHING THE ECONOMIC COSTS ASSESSMENT OF OCCUPATIONAL INJURIES AND DISEASES: PRINCIPLES, CONCEPTS AND STRUCTURE

ROLAND IOSIF MORARU, CODRUȚA DURA *

ABSTRACT: *Occupational Health and Safety management is more and more strongly related to the costs of occupational injuries and illnesses, as a top priority in most companies. The present article presents a synthesis of authors' attempts to identify the elements which should be taken into account in determining the cost of occupational injuries and diseases at the national level, with a focus on basic influence factors. Our aim is to help companies managers to emphasize the economic costs of not improving workplace safety and health – to employers, to workers and to society as a whole – and to inform decision-makers on further developments to be considered in the occupational risk management processes.*

KEY WORDS: *Occupational Health and Safety (OHS), economic cost, injury, disease, loss prevention.*

JEL CLASSIFICATION: *D21, J01, J17, J24, J28, O12.*

1. INTRODUCTION

An overview of the changes produced in Romanian society and economy over the past two decades entitles us to consider that the dictum "*change is the only constant*" has proven its validity within the contemporary economic life (Dura et al., 2014).

This declaration maintains its validity in the way of dealing with issues relating to health and safety at work, both from the perspective of workers and, especially, of the management of companies, regardless of size, nature of activity and type of capital. In fact, even after the Second World War, the researches carried out for improving safety at work produced two orientations. The first is psychological: workers must be sensitized to the idea that an accident can be avoided, and it is not a fatality. In this

* *Assoc. Prof., Ph.D., University of Petrosani, Romania, roland_moraru@yahoo.com
Assoc. Prof., Ph.D., University of Petrosani, Romania, codrutadura@yahoo.com*

respect, accident prevention lies mainly in worker protection and avoiding potentially dangerous behaviors (Cioca & Moraru, 2010).

The second orientation is of economic origin, its pioneers being the American researchers. It is based on the idea that prevention of work accidents and occupational diseases, as any other resource consuming activity, should be treated in terms of its efficiency (Less, 1980).

At macro and microeconomic level, the decision maker has, in every moment, a limited volume of resources, which he must allocate to all areas of development. The question is how to distribute activities related to work accidents and occupational diseases? In ordinary conditions, the decision maker - regardless of his level - needs a rational, objective ranking criterion that allows him to distribute the efforts corresponding to the social optimum. Otherwise how could he handle situations like this: between making a product that would lead to improvements in health or in the living standards of thousands of people or a device which protects a single individual against the risk of death by occupational injury, the cost of production of both being identical, which one should be chosen? Or for which one should be allocated more funds? Between one person, considered to be particularly valuable to society and a lot of individuals who may be affected by the occurrence of a serious accident at work, to whom should be targeted preventive efforts, in whom should he invest more? (Darabont et al., 2002; EU – OSHA, 2002)

Both human lives and resources can be saved by a more rigorous handling of the issue of occupational safety and health. One of the methods that aim at a correct approach to eliminate/reduce occupational risks is evaluating them, which leads to a correct ranking for the adoption of the appropriate preventive measures (Moraru, 2012). But no company has sufficient economic strength to cover simultaneously all the risks in the same manner and, anyway, everyone wants security at the least possible cost. Therefore it would be particularly useful for the Manager to have economic arguments as well and, especially, financial one. Even at the level of society, things do not happen otherwise. Resources are limited and it is not possible to allocate all for saving life, valuable as it may be. Thus, the objective is that limited funds allocated for the implementation of safety at work would be used as effectively as possible, in the direction of maximum positive social and economic effects.

In conclusion, **the economic criterion** is one that allows the decision maker to establish, on the one hand, the role of occupational safety and health among other social activities, and on the other hand, the major areas in which more funds should be allocated. Compliance with the criterion of economic efficiency means to compare the results with the resources, an approach that cannot be completed unless they are quantified. With regard to resources, it is obvious that they are quantifiable, having concrete features - material and financial. Problems arise in connection with the assessment of the consequences of unwanted events.

2. ECONOMIC DIMENSION OF WORK ACCIDENTS AND OCCUPATIONAL DISEASES

Any company is a unitary system whose components must be correlated and inter-conditioned by virtue of a common goal: getting profit. The activity of Work Safety and Health is an integral part of the production activity, as a place of events, of implementation of measures and of the manifestation of effects; therefore it is subject to the laws of economics. The question that arises is what impact has its implementation from economic and financial point of view.

In the centre of the capitalist economy is the firm, the operation of which is subject to the existence of profit. The main objective and concern of any manager is getting a such a profit from products/services as to afford not only the resumption the same cycle of activity, but also a permanent adaptation to the current challenging economic conditions: rapid changes on the market, the evolution of information technologies, globalization etc.

In the context described above, how can a manager be motivated to direct the company's resources towards an activity that has apparently only social purpose such as Safety and Health at Work? Moreover, the general idea is that preventive measures reduce labour productivity, or at least curtail unproductive expenditures of an economic unit. In order to answer this question, one must take into account firstly, a current objective phenomenon: the classical methods of increasing economic efficiency, based on the ability to boost profitability at the expense of raw materials and technologies, are no longer sufficient. Economists have turned their attention to intense intellectual tasks, respectively to the possibilities offered by the enhancement of managerial activities and activities of production and work organization, as well as to means of increasing the performance of human resources.

As far as the first method is concerned, one of the variants which aim at increasing profitability is to harmonize all the objectives of various activities within the company. If the economic or social unit is not seen as a unitary system, malfunctioning will occur, overlapping of tasks, leading to unnecessary expenses, there will be no cohesion and adhesion of the workforce required for the personnel to act in the interests of the company, etc.

As a result, the activity of occupational safety and health cannot be considered separately from the general activity of the company and from its purpose - obtaining financial benefits. Indeed, a solution to increase the use of work time (and thus profits) is reducing disruptions due to accidents at work and absenteeism due to occupational accidents and diseases. However, in order for this positive effect to occur, one needs to estimate the consumption of human, material, financial and time resources for labour protection so that the benefits should be greater than the efforts; this is not possible if one cannot estimate the cost of work injury and occupational disease. Economic efficiency becomes more and more an objective criterion for the justification of the decision to allocate resources for the implementation of occupational safety and health activities in Romania, under the terms of legislative harmonization with European Union requirements (EEC, 1989; Romanian Parliament, 2006; Romanian Government, 2006). Although the negative impact, including the profitability of companies that

don't carry out work safety and health activities seems obvious, the reality shows that it is insufficiently taken into consideration, despite the consequences. Statistics indicate, for example, that about 50-60% of all lost working days are generated only by occupational stress. Thus in Germany, the cost of psychological dysfunctions (where stress holds a share of about 37 %) was estimated at 3 billion Euros in 2012. Moreover, it has been estimated that in 2012 for a French working population of 23.53 million, between 220,500 and 335,000 (1% to 1.4%) people were affected by a stress-related illness. Depending on whether figures are taken from the lower or the upper end of the scale, for the company, the cost of occupational stress is somewhere between EUR 830 and EUR 1,656 million, the equivalent 10% - 20% of all expenditure with the Occupational Accident and Disease activity within the social security system. This represents a huge cost in terms of both human distress and impaired economic performance (<https://osha.europa.eu/en/publications/reports/TE-81-08-478-EN>).

The statistics of 2011 from the Netherlands represent a more general example, but equally informative. Figures indicate that the estimated total cost of poor working conditions in the Netherlands that year was up to EUR 6,000 million, equivalent to 2.96% of GNP. Most of the costs of poor working conditions came from work-related absence and disability, which were mainly (83% of the all diagnoses) caused by musculoskeletal disorders (43%) and psychological diseases (40%). Other diagnoses associated with high costs were heart and vascular diseases (5%), problems with the nervous system including the eyes and ears (4%), and occupational accidents (4%). The detailed analysis is presented in Table 1 (Koningsveld, 2013).

Table 1. Estimated total costs of work-related illness per worker in 2011, in the Netherlands

CATEGORIES OF RELATED COSTS	EURO/WORKER	% OF THE TOTAL
Costs as a result of work-related illness	1,368	77.3
Cost of resulting absenteeism	527	29.8
Cost of occupational disability	609	34.4
Cost of reintegration grants	103	5.8
Cost of curative health care	129	7.3
Cost of prevention	400	22.7
Preventive occupational health and safety (OSH) measures	120	6.8
Company investment and expenses for prevention	157	8.9
OSH research and development	10	0.6
Judicial cost	2	0.1
Administration by companies	102	5.8
Legislation and inspection	6	0.3
Subventions and grants for improvement	3	0.2
Total costs per worker per year	1,768	100

Source: EU-OSHA, *European Risk Observatory Report, EN 9, 2013, pp. 113*

The public opinion, through its legislative, executive, non-governmental organizations, is asking for more protection of workers on their jobs. The latent conflict between the interests of the company and those of an individual entrepreneur requires arguments to persuade the latter that it turns up to his financial advantage to implement measures for occupational safety and health. For this one needs to find the answer to a series of fundamental questions for all of social partners within the economic circuit: does safety produce benefits for businesses? Do safety regulations adversely affect competitiveness? how to calculate the costs and how they can be used for establishing the political decision on the matter; how resources can be allocated and saved; safety regulations are too costly for the company, but do they also bring benefits?

Work accidents and occupational diseases are in an indestructible relation with work. They interrupt or impede the working process and affect at least one of the components of the work system. But the process and the system of work are fundamental elements of any micro-economy. It appears that the occupational accident or disease impairs the functioning of the latter, producing purely economic effects on its components and on the relations between them: misspending working hours, reduced labour productivity, reduced fixed capital, etc. By the nature of the system subsystem relationship between micro and macro-economy, the consequences of accidents and occupational diseases within the company extend up to the level of the national economy.

Thus, we can say that *"one part of the economic dimension of the phenomenon under consideration is the economic effects of work accidents and occupational diseases, and their consequences upon its elements and the functioning of micro and macro-economy respectively"* (EU-OSHA, 2005).

If we consider that man has a dual aspect in the work process – human being and task performer – it is clear that occurring accidents/illnesses will also have other consequences. Primarily, there are consequences that affect the individual as a biopsychosocial entity, and others: physical, mental, financial, political consequences, etc., some of which are quantifiable.

Accordingly, the economic dimension of the phenomenon of occupational accidents and diseases includes two components: the economic effects of these events and the implied cost of accidents and diseases, as economic indicator.

In modern economy, characterized by extremely dynamic market relations and especially by the globalization phenomenon, the resources for increasing the profit of companies are sought in the field of labour production and organization, which integrates the occupational safety and health, as well. Setting the size of the economic effects of undesirable events offers an important premise for finding new resources to increase the economic performance of the company. What can the determination of all quantifiable consequences of the occupational accident/disease be useful for?

It responds to the difficulties encountered in the application of the criterion of economic efficiency in the field, as it enables a cost of security, of non-security, respectively to be compared with the expenditure incurred for prevention. *"The cost of non-security represents in fact the cost of occupational accidents and diseases that occur, i.e. the value of all losses generated by the accident/illness. In other words, the*

realization of safety at work brings as benefits the equivalent of costs that would have been generated by occupational accidents and diseases that were prevented, reduced by the cost of preventive measures" (Dăscălescu, 2002).

Determining the cost of accidents and diseases cannot be possible unless their consequences are known and thus if these consequences cannot be measured by quantitative indicators: financial or economic.

4. CONSEQUENCES AND ECONOMIC EFFECTS OF OCCUPATIONAL ACCIDENTS AND DISEASES

A first level of reference for defining the consequences of occupational accidents and diseases is the elements of the work system. Due to the characteristics of the work system, any occurrence within it will affect each element, as well as the system as a whole (Moraru & Băbuț, 2010). Hence it follows:

a. *Effects upon the task performer*

The main consequence is impaired work capacity accompanied, most of the times by reduced individual productivity when resuming work, reduced professional skills, poor quality of the task performed.

Considering only accidents, other participants in the working process are also affected, in terms of misspending working hours following the accident (first aid administered to the victim, commenting the situation, preparing the workplace to resume activity, participating as witnesses to the accident, etc.), and also in terms of reducing productivity over time as a result of distrust in the safety of the workplace.

b. *Effects upon the work*

A direct consequence is failure to carry out the task on time or improper performance (at the resumption of work by the victim of an accident/illness or his replacement with a person with less experience).

c. *Effects upon means of production*

As a result of industrial accidents there may be damages or destruction of capital goods, raw materials, materials, etc. (in case of explosions, fires, propelled objects, etc.). Damaged machinery has a negative impact on the effectiveness of the use of the fixed capital; it changes the degree of technical efficiency etc.

d. *Environmental consequences*

The effects upon the social environment materialize in the stress borne by those working near the victim that suffered an occupational accident or disease, in the lack of trust in the security policy promoted by the company, etc.

The second reference level to identify the consequences of occupational accidents and diseases is ***the society***, with its interrelated subsystems - ***the individual and the company*** (Figure 1).

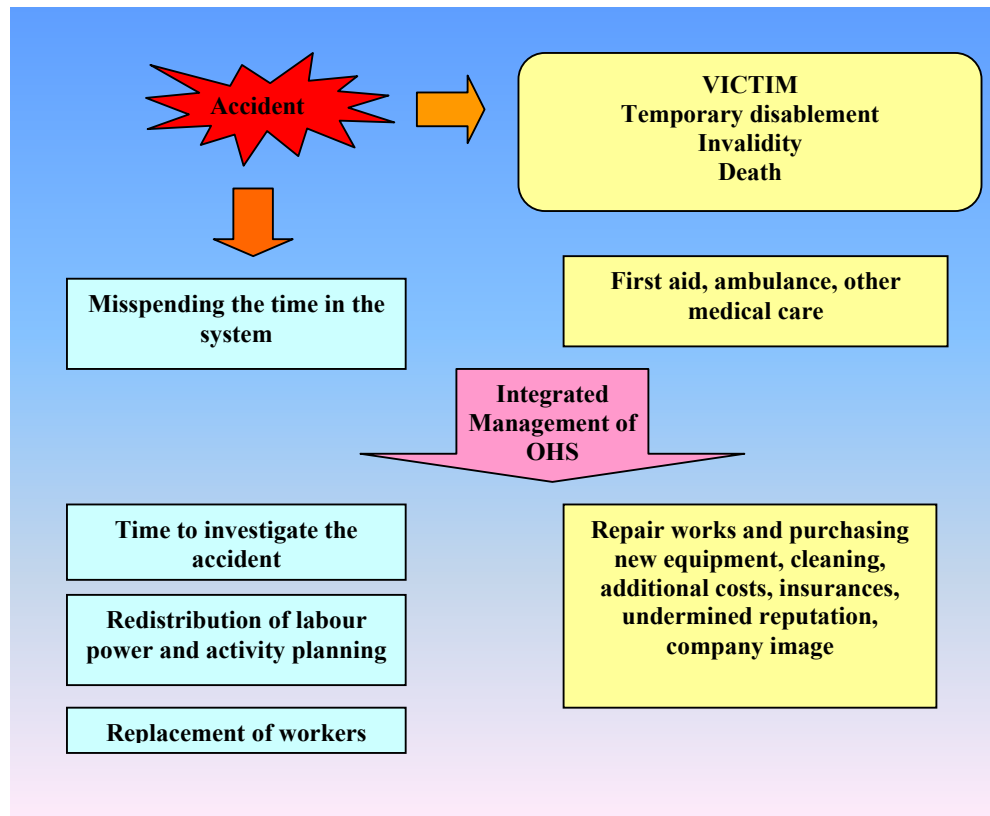


Figure 1. Consequences of occupational accidents, due to wasting time on the victim and its work system

Taking into account the main manifestation scheme of human life, in general, physical, mental, spiritual, economic, financial, demographic, political, one can get an insight of the possible consequences of an occupational accident, no matter how distant in space and time they may be. The reality does not allow a static and very rigorous delimitation of the manifestation scheme of various effects. It is important that this classification results in quantifiable losses - economic and financial – which are produced by occupational accidents and diseases. They represent the fundamental argument for using **the cost-benefit analysis** in relation to work safety.

We shall draw the line at work accidents, because they are the ones that mainly produce such consequences.

Economic effects occur at the level of micro and macro-economy, at the level of companies where the accident takes place and of the national economy, respectively.

i) At the level of the company

The first category of economic effects of work accidents is in relation with inputs and consumption of production factors, of labour and capital, respectively, in the

form of destruction, alteration of structure, quality, of their use for purposes other than had been settled, etc. (Dăscălescu, 2003):

- *Work*: interruption of the production process because of a professional accident causes two types of consequences for the “*labour*” factor of the company:
 - the impossibility to implement changes, meaning neutralizing labour power or using it for purpose other than those established, both in the case of the victim and of the other employees, which leads to *wasting working hours*;
 - *changing the "human capital"*- the ability of people to effectively produce goods and services.
- *Working time* is the common element of all social activities carried out in a society. Regardless of the way of organization of material production, of services, of the public and private sector, the results of work carried out can be expressed as a consumption of working time. Accidents at work always cause waste of working time, under different forms:
 - interruption of the work process;
 - the absence of the victim for a certain period of time;
 - dedicating part of the productive time of the victim's colleagues for: first aid administered to the victim; transportation of the victim to the medical unit; informing about the accident; commenting the accident; preparation of the workplace in order to resume work; participating (as witnesses) in the investigation regarding the accident;
 - interruption of the current tasks carried out by:
 - the personnel selected to be part of the accident investigating;
 - individuals who inform of, and keep records of accidents;
 - the personnel in charge with hiring substitutes;
 - managers, who must decide on the actions to be taken (if and how the victim is replaced, if a new equipment or different materials must be purchased, repair works etc.).
- *The human capital* indicates the volume of professional knowledge, skills, abilities and health of a person and it is weakened by the work accident:
 - his health is weakened temporarily (for the period of temporary disablement) or permanently (invalidity);
 - professional skills and abilities are slowed down or they are lost completely, due to physical problems (disablement), to fears or lack of experience in the event of changing the job, the profession;
 - in case of fatal accidents, the human capital is lost entirely.

The economic indicators which reflect the effects on the labour factor are: the actual dynamics of the personnel; the stability of the personnel; the qualification of the personnel; the use of working time; work productivity.

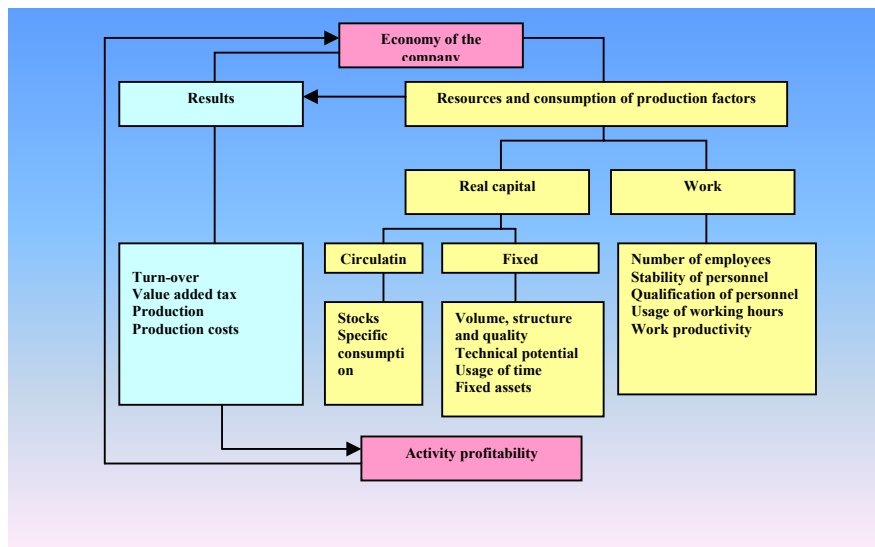
- *The capital*, called *technical* or real, includes goods resulting from production processes and they are used for the production of other economic goods; it is made up of fixed capital and circulating capital.

A fixed capital is affected in case of industrial accidents accompanied by damages and/or destruction of technical equipment. The effect is both quantitative - it

reduced the technical potential (when the damaged equipment is not replaced or until its replacement) and qualitative (the structure and the quality of the technical potential changes). Therefore, it can be concluded that the damage/destruction of the fixed capital determines:

- a change of the volume, quality and of the technical potential;
- the non-usage of fixed funds.

The circulating capital can be affected by the destruction of the raw materials processed during work, of the finished products which had not yet been removed, of other materials. All this is reflected by the modification of stocks and specific consumption of raw and auxiliary materials and consumables. Elements from microeconomic level affected by occupational accidents are summarized in Figure 2.



Source: Darabont, Al, Pece, Șt., Dăscălescu, A. (2002) *Occupational Health and Safety Management*, vol. 2, Editura Agir, Bucharest, Romania, p. 314

Figure 2. Elements from microeconomic level affected by professional accidents

Due to the relationship between the elements of the economic cycle, occupational accidents influence even the allocation and the consumption of resources. Since it affects the volume, the structure and the usage of production factors, this will lead to influences upon the economic performance of the company. Therefore, the second category of economic effects of the accident consists in changing (usually negatively) the result indicators: the turnover; the value added tax; the physical production; production costs.

All these consequences – regarding the inputs, outputs and consumption - may be reflected synthetically in the modification of the profitability of the company activity. Since the direction of the change is negative and given the feed-back relationship, *reducing its profitability will affect the conditions for resuming the economic cycle* – it will also reduce the possibility of attracting resources at the same

level as before (the next cycle will generally have fewer resources than the cycle in which the accident occurred).

ii) At macro-economic level

Occupational accidents produce economic effects at this level, as well, and they can occur under the following forms:

- *changing the employed population structure* by branches and training levels – in case of accidents resulting in permanent disability and those followed by any necessary vocational retraining and relocation;
- *diminishing the volume of employed population* – in case of accidents resulting in 1st grade and 2nd grade disability and in death;
- *reduction of industrial and agricultural production*, on the one hand due to cases in which the injured worker's task is not recovered through other forms, and on the other hand, due to reducing the ability of companies to resume the production cycle at the same level;
- *changing the volume and structure of foreign trade components* (import-export): export opportunities may be decreased; imports of additional technical equipment, raw materials, etc. that were destroyed in accident.

The economic indicator that expresses the macroeconomic changes is *the gross national product*.

5. CONCLUSIONS

The overall objective of the evaluation of the economic dimension of undesirable events occurring within work systems is to establish a way of quantitative determination of quantifiable consequences. But what is the outcome of the assessment good for? There are several answers depending on the estimated economic dimension and on the consequences expressed quantitatively.

Considering the economic effects produced by accidents, the assessment can be used primarily for the establishment of self-financing measures of the company's activity. Moreover, it can be an element for underlying sectorial programs of macroeconomic development. On condition the meaning of the "cost" of accidents is taken into account, usage possibilities are manifold:

- quantifying the economic effects of occupational accidents at the level of:
 - the company where the accident occurred (may occur) (including the possibility to identify and assess the influences upon the generic potential of the profit);
 - a macro-economic sector;
 - macro-economy;
- calculating the cost of the professional accident for:
 - the victim (actual or potential);;
 - the company in which the accident occurred;;
 - the insurance company for the risk of the occupational accident;
 - a structural or economic sector (budgetary, public, private);
 - the society (socio-economic cost);

- quantifying all kinds of consequences, so that the calculated final cost includes both direct costs and indirect ones;
- calculating exactly certain data, both for the actual events and pre-events, on the basis of potential effects of a possible accident;
- symbolizing the outcome of the evaluation in:
 - monetary units (currencies);
 - "economic" or "economic and financial" measure units
- determining any kind of cost related to work accidents:
 - followed by temporary disablement;
 - resulting in disability, of whatever degree;
 - deadly, regardless whether death occurs immediately or subsequently;
- the possibility to use the results of the evaluation for:
 - analyses that make the activities of companies efficient;
 - justification of the prevention program;
 - optimal choice of investments in the field of labour protection;
 - justification of national legal provisions of occupational safety.

In order to assess the economic dimension of occupational accidents there are nationally available two methods developed by I.N.C.D.P.M. Bucharest, which meet all the specified objectives: *the modular* method for calculating the cost of work accidents; *the analytical* method for the quantification of the economic effects and their influences upon the economic and financial performance indicators at micro and macroeconomic level. Requiring extensive knowledge of economic and financial analysis and being more laborious, the analytical method is not recommended except in analyses that make the activities of the company more efficient, performed by specialized personnel.

Though it addresses different categories of users, the two methods complement each other, and their simultaneous application offers a global picture of the economic and financial impact of work accidents, throughout the duration of their effects, upon all the parties involved.

REFERENCES:

- [1]. Cioca, L.I.; Moraru, R.I. (2010) *The importance of occupational health and safety in the framework of corporate social responsibility*, Management of Sustainable Development, volume 2, no. 2, pp. 71-77.
- [2]. Darabont, Al.; Pece, Șt.; Dăscălescu, A. (2002) *Occupational Health and Safety Management*, vol. 1 și 2, Editura Agir, Bucharest, România, 2002.
- [3]. Dăscălescu, A. (2003) *Costs of occupational injuries* (in Romanian), ATLAS Press, Bucharest.
- [4]. Dăscălescu A. (2002) Contributions regarding the assessment of economic dimension of the occupational injury phenomenon”, Ph. D. Thesis, University of Petroșani.
- [5]. Dura, C.; Isac, C.; Răscolean, I. (2014) *Enterprise Economy and Management* (in Romanian), SITECH Publishing House, Craiova, Romania
- [6]. Koningsveld, E. (2013) *The costs incurred by poor working conditions: a burden to society, a prospect to companies*. TNO, Hoofddorp, http://www.eanpc.org/pdfs/EPC/Thu_Soc_1330_Koningsveld.pdf

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- [7]. **Less, F.P.** (1980) *Loss Prevention in Process Industries* (vol. I, II), Butterworths, London, U.K..
- [8]. **Moraru, R.; Băbuț, G.** (2010) *Participatory Risk Assessment and Management: A Practical Guide (in Romanian)*, Editura Focus, Petroșani, Romania
- [9]. **Moraru, R.I.** (2012) *Current Trends and Future Developments in Occupational Health and Safety Risk Management*, In: Emblemsvag, J. (Ed.), *Risk Management for the Future - Theory and Cases*, InTech, Rijeka, Croatia
- [10]. **Moraru, R.I.; Băbuț G.B.; Băbuț, C.M.** (2011) *Occupational health and safety integration in business management: a meta-analysis*, *Quality - Access to success*, vol.12, no.125, December, pp. 72-79
- [11]. **EEC** (1989) *Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work*, Official Journal L 183, 29/06/1989, p. 0001-0008.
- [12]. **EU-OSHA** (2002) *New Trends in Accident Prevention due to the Changing World of Work*, European Agency for Safety and Health at Work (EU-OSHA), Topic Center on Research - Work and Health, Office for Official Publications of the European Communities, Luxembourg (<https://osha.europa.eu/en/publications/reports/208>)
- [13]. **EU-OSHA** (2005) *Priorities for occupational safety and health research in the EU-25*, European Agency for Safety and Health at Work (EU-OSHA), Working Environment Information - Working Paper, Office for Official Publications of the European Communities, Luxembourg (<https://osha.europa.eu/en/publications/reports/6805648>)
- [14]. **Romanian Government**, *Government Decision no. 1425 for approval of Methodological Norms for applying Occupational Safety and Health Law no. 319/2006*, Official Journal of Romania, part I, no. 882/30.10.2006, Bucharest, Romania
- [15]. **Romanian Parliament**, *Law no. 319 regarding Occupational Safety and Health*, Official Journal of Romania, part I, no. 646/26.07.2006, Bucharest, Romania