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PROFESSIONAL RISKS IN THE SYSTEM OF SOCIAL RISKS: THE CAUSAL ASPECT

The paper investigates the causal relationships of professional risks. The cost of injury risk at work is defined. The model for coordination of professional and social risks criteria is offered.
Keywords: *professional risks; social risks; cost assessment methods.*

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ПРОФЕСІЙНІ РИЗИКИ В СИСТЕМІ СОЦІАЛЬНИХ РИЗИКІВ: ПРИЧИННО-НАСЛІДКОВИЙ АСПЕКТ

У статті досліджено причинно-наслідкові зв'язки професійних ризиків. Визначено ціну ризику травмування на виробництві та запропоновано модель узгодження критеріїв професійного і соціального ризиків.
Ключові слова: *професійні ризики; соціальні ризики; методи оцінки.*
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ПРОФЕССИОНАЛЬНЫЕ РИСКИ В СИСТЕМЕ СОЦИАЛЬНЫХ РИСКОВ: ПРИЧИННО-СЛЕДСТВЕННЫЙ АСПЕКТ

В статье исследованы причинно-следственные связи профессиональных рисков. Определена цена риска производственной травмы, а также предложена модель согласования критериев профессионального и социального рисков.
Ключевые слова: *профессиональные риски; социальные риски; методы оценки.*

Introduction. Scientific and technological progress, with its clear advantages also causes such negative social consequences as risky professions, their complexity and quantitative growth of risks. The occupational employment risk can be considered one of the key elements in the theory of social risks: if a person loses his/her working capacity for various reasons of industrial nature, the compensation involves not only the payment of lost income but also the reimbursement of medical, vocational and social rehabilitation of the victim. Moreover, a sharp drop in income results in a change of his/her social status.

The category of professional risks is caused by a synergetic effect of the factors acting within industrial society and market economy. It is expressed in a weak economic protection of employees in their workplaces, regardless the main cause of job loss – unemployment or loss of physical capacity to work due to illness, disability or retirement age.

E. Gidens (2001) states that the problem of occupational safety as a global component of social life is not just an abstract intellectual field of activity, it has great practical application prospects in the life of every individual. The group of professional risks associated with injury danger of industrial factors implementation has an important role in the aggregate of risks. Thus, according to the ILO around 6 ths people die daily due to occupational diseases and accidents at work.

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In recent years, the role of risks management as a tool to minimize losses and improve production efficiency is constantly increasing, because risks are actualized themselves as a result of complications of most manufacturing processes.

Professional risk is associated with uncertainty and probabilistic characteristics of object-subject relationships: the impact of man-caused environment on human, the subjective perception of risk, labor safety, mechanisms of social insurance and rehabilitation.

The urgency of professional risks problem is increasing due to the introduction of new mechanisms for compulsory social insurance against industrial accidents and occupational diseases. Therefore, scientists have the task to develop theoretical and methodological tools for the evaluation of the resulting effects from interaction of available levels and types of professional risks, subjects of risk and implementation of management decisions.

Recent research and publications analysis. In January, 2013 the World Economic Forum published the report "Global Risks in 2013" in which 50 global risks were analyzed and grouped (Global Risks, 2013). All risks were summarized in 2 groups:

- healthcare and overconfidence of mankind;
- economic and environmental problems;
- the so-called "digital fires".

Having analyzed domestic and international experience, N. Romas' (2010) offers a method of calculating the risk of accidents at enterprises according to the statistics based on severity, including deaths and permanent disability.

T. Tairova (2012) presents the analysis of age-specific distribution seriously and fatally injured at work employees. It revealed significant differences in age among severely and fatally injured employees and identified the age group with the highest injury rate.

A. Cyna (2012), who explores the problems of social partnership of labor protection in Ukraine, offers several levels of implementation of social dialogue on labor protection at enterprises, in organizations and institutions.

R. Tinto (2011), analyzing the possibilities of social risks actualization, emphasizes their non-economic consequences, and provides a risk assessment algorithm, which is based on the assessment of likelihood and consequences of identified risks and comparing them with the known threshold value.

Unresolved issues. Analysis of scientific publications has proved the insufficiency in the research on the causality issue for social and professional risks and the need to clarify the cost assessment methods for professional risks.

Key research findings. Considering the social aspect of professional risk, it should be noted that its essential characteristics is the probability of insurance cases occurrence for a particular professional group, which results in income loss (it can be either an accident at work, or an occupational disease).

Occupational health is a significant criterion of economic development of a country, a prerequisite of its population social wellbeing. Health status of workers is a direct reflection of the degree of effects of unfavorable factors of endogenous and exogenous nature, heredity, excess and quality of medical care, in the first place.

Occupational disease means the inability of human body to adapt to constantly changing conditions of work environment, occurring as a result of professional

human activity and specified by exceptional or primarily action of factors of work environment, typical for a definite profession. According to the International Labor Organization nearly 160 mln cases of occupational diseases are recorded in the world annually and economic negative profit for society, owing to this, makes 4–5% of the world GDP, i.e. more than 1251.3 bln USD (For the work safety, 2011).

The level of professional risk for a particular professional group can characterize:

- the probability of insurance cases occurrence;
- types and duration of disability;
- types of compensation, a set of medical and rehabilitation services.

The object of study of the professional risks is the workplace where risky situation can have place. The study subject for professional risks can be both the statistics of occupational injuries, occupational diseases and certain professional risk factors. The analyses determine the areas of infrastructure risk management and preventive measures to them.

In the first half of 2013 the member of the Executive Directorate of Social Insurance Fund against accidents at work and occupational diseases of Ukraine received 5601 reports on occupational accidents, in which 5740 people were injured, including 751 people who were fatally injured.

Organization causes of accidents dominate – 65.7% (2974) among all the accidents. The number of accidents due to technical reasons is 13.1% (594) of all the accidents, physiological – 21.2% (969) of all.

In 2012, the member of the executive management of the Fund recorded 10,822 (including 648 fatal) victims of industrial accidents. Comparing with the same period in 2011, the number of insurance accidents decreased by 7% (from 11640 to 10822). The number of fatally injured people decreased by 0.5% (from 651 to 648) (Table 1).

These data may show a general trend, but cannot serve as an objective basis for the formulation and implementation of state policy measures as to the prediction and minimizing professional risks.

Justification of the cost assessment methods for professional risks means first of all the expansion of possibilities to provide constitutional human rights to work under the conditions that meet safety requirements. Therefore, it is important to estimate losses from workplace injuries and occupational diseases, taking into account risk factors. It will help determine the significance of indices of occupational injuries and occupational diseases in the total loss of the company; evaluate the price of risk for company; use the indices of assessing damages by public oversight to motivate employers to increase the level of safety as well as to justify the improvement of regulatory and legal framework on labor safety in the country.

Two groups of cost assessment methods of professional risks are used internationally (Salvi, 2004; Wardak, 2008; IPCS Risk Assessment Terminology, 2004):

- direct (they use statistical information according to the selected risk indices or indices of damage with the probability of their occurrence) – these indices are calculated according to: the coefficient of accidents frequency per year per thousand workers; the coefficient of frequency of fatal accidents occurrence at work; the coefficient of industrial injuries severity; the index of occupational diseases; the index of injury; the integral index according to the type of economic activity;

- indirect methods use the indices of deflection of the current controlled conditions from normative values – in this case, risks depend on the proportion of unfulfilled diractively prescribed requirements.

Table 1. **Comparison of insurance accidents and the number occupational diseases at work in 2012 and in 2011**

No.	Regions	Number of accidents				Number of occupational diseases			
		Total (2012)	Total (2011)	including fatally 2012	including fatally 2011.	Number of required documents (2012)	Number of required documents (2011)	connection with the victim's death (2012)	connection with the victim's (2011)
	Total in Ukraine	**10822**	**11640**	**648**	**651**	**5612**	**5396**	**264**	**358**
1	**Crimea**	289	241	17	15	9	4	0	0
2	**Vinnytsia region**	269	304	22	22	10	8	0	0
3	**Volyn region**	197	233	10	8	263	112	12	9
4	**Dnipropetrovsk region**	933	897	55	44	989	971	15	22
5	**Donetsk region**	3712	4020	130	132	1810	1760	97	120
6	**Zhytomyr region**	174	202	12	12	23	24	0	1
7	**Transcarpathian region**	70	55	7	18	1	0	0	0
8	**Zaporizhzhya region**	386	428	29	19	89	101	1	1
9	**Ivano-Frankivsk region**	119	102	12	17	4	2	1	1
10	**Kyiv region**	267	273	25	21	2	2	0	0
11	**Kirovohrad region**	137	154	13	11	92	87	4	4
12	**Lugansk region**	1287	1641	63	84	1449	1412	98	177
13	**Lviv region**	342	314	24	16	588	568	28	19
14	**Mykolaiv region**	101	133	8	14	7	11	0	0
15	**Odesa region**	260	250	26	23	5	2	0	0
16	**Poltava region**	269	260	18	20	7	6	0	0
17	**Rivne region**	131	141	14	15	2	6	0	0
18	**Sumy region**	201	173	14	6	89	117	6	0
19	**Ternopil region**	74	76	11	13	11	6	0	0
20	**Kharkiv region**	368	402	28	29	110	125	0	4
21	**Kherson region**	114	152	9	13	12	35	0	0
22	**Khmelnytskyi region**	167	162	14	18	1	2	1	0
23	**Cherkasy region**	130	143	16	14	18	12	0	0
24	**Chernivtsi region**	54	54	8	9	0	1	0	0
25	**Chernihiv region**	146	157	6	10	5	4	1	0
26	**Kyiv**	558	591	48	41	16	17	0	0
27	**Sevastopol**	67	82	9	7	0	1	0	0

Source: made by the author according to: social.org.ua (2013).

The basis for mathematical expression of risk indices is its distribution according to the area. Individual potential danger in any area characterizes the risk against a certain type of danger for an individual during the year. The value of individual risk does not depend on the distribution of enterprise staff or population on a territory. It only shows the level of potential danger created by a particular individual for some objective reasons. Therefore, based on the methodological approach proposed by (Henley, 1981), the cost of individual risk of a person that is at the point with coordinates $(x;y)$ can be presented in the following way:

$$R_{\sum(x;y)} = \sum_{ii} \Delta_i \times \mathrm{E}_{ii}(x;y) \times F_i. \quad (1)$$

The average size of risk will depend on the scenario and the number of reported fatal accidents at work:

$$IR^{ov} = \frac{\sum_{(x;y)}(x;y)\times N(x;y)}{\sum_{(x;y)}(x;y)} = \frac{F}{N}. \quad (2)$$

The total risk can be expressed in the following way:

$$F = \sum_{x;y} R_{\Sigma}(x;y)\times N(x;y) = IR^{ov}\times N. \quad (3)$$

Then the equivalent of economic losses from operational risks is:

$$ESC = \sum C_i^{*}\times N_i^{p}(1{,}2 < p < 2, \quad (4)$$

where Δ_i – the probability of the i scenario implementation; $E_{ij}(x;y)$ – the probability of implementation of the influence mechanism i at the point $(x;y)$; $N(x;y)$ – the number of people who may be at the point with coordinates $(x;y)$; N – the total number of people who are under the influence of negative factors; N_i^{*} – the probability of negative consequences if the emergency scenario is implemented i; N_i^{p} – the number of deaths in case of emergency scenario p.

The well-established public accounting system and summarizing of statistical information on occupational injuries operates sufficiently to determine the actual or predicted values of frequency or probability (risk) of accidents with fatal consequences and without such consequence. Currently there is no relevant information on the value of all losses in the result of occupational injuries available in statistical sources of public administration and companies. There is some information about particular components of losses (insurance payments to victims, tangible and obvious enterprise damages etc.), but there is no full picture of all the losses.

Therefore, we can assume that the amount of loss from occupational injuries (fatal and without such effect) consists of two main groups: insurance compensation for victims and losses of an enterprise that are not the subject for compulsory insurance. Insurance compensations are made in legislation governing limits on account of insurance contributions of enterprises that are established depending on the class of professional risk to which an enterprise belongs. Therefore, when the risk price of insurance compensations for victims is determined, all the costs of the insurance system should be taken into account. Information on these costs can be found in the annual performance report of the Social Insurance Fund against accidents at work and occupational diseases of Ukraine.

Table 2. **Average monthly insurance payment per victim and the risk cost of injury at work**

Years	Average size of insurance payments per victim (a member of his family), UAH	Risks (frequency) injury, victim / number of employees	Price risk, cost per unit of risk injury at work, UAH
2011	989.2	0.0008235	216.7
2012	1338.1	0.0008144	293.6
2013 (6 months)	1641.88	0.0007712	338.8

Source: author's in social.org.ua (2013).

The next objective is to coordinate the criteria of professional and social risks. The approach, based on the index of potential loss of life, proposed by (Schofield, 1993) can be used:

$$N_{max} \times IR = \sum f(N) \times N^{\beta}, \quad (5)$$

where N_{max} – the maximum number of people living under the hazard conditions; IR – the maximum individual risk; $f(N)$ – the frequency of deaths; β – the risk aversion factor.

It is assumed that there is a maximum allowable level of risk that must not be exceeded and a low level of risk that is beyond individual or social anxiety. These two levels include all other levels of risk that are used to determine the relevant criteria in a particular country. The area between these two limits is called the area of acceptable risk. There is a value here, which is considered as a "target level" of risk.

This method makes it possible to present the dependency of factor values of risk aversion and the maximum individual risk as separate functions for different population (N_{max}), which experience the effects of hazards. The value of this method is the possibility of "averaging risks" and their spread not only over employees, but also people who live near hazardous facilities.

Conclusions and recommendations for further research. The analysis has proved the presence of causal relationships between professional and social risks. It has also confirmed the compatibility of social risk with the criteria of individual risk. Despite a wide variety of approaches to occupational risks' cost assessment and their management, nowadays there is a need to introduce the common risk criteria. It will make possible to optimize the benefits of social insurance against industrial accidents and occupational diseases in Ukraine. The area for further scientific research must be binding risk criteria to specific areas where people are subject to hazardous factors. The criteria can also be used for all hazardous areas, according to the cost of individual risks and the level of expected mortality of population.

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