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SAFETY RISCOLOGY

The rapid expansion of the technosphere, imbalanced geopolitical, ecological, and biological processes of modern times demand from us a complete reconsideration and deep understanding and study of risk in all spheres of human life and activity. War, non-trivial actions of aggressors force us back to the necessity of risk management on a reactive principle, while not excluding the need for the application of proactive management principles, which complicates the determination of the priority of preventive measures at each stage of activity of subjects and objects of risk, requiring the combination of these principles and again and again rethinking risks in order to develop effective measures of positive-compensatory influence. The actual state of human (humanity's) protection indicates that without creating a "risk science," without creating a corresponding educational discipline, further effective and rational risk management is already impossible.

Wherever there is a human, there is risk. There is no such branch of the economy where risk is absent. To date, the concepts of "risk" and "acceptable risk level" are enshrined and/or interpreted and applied in the Law of Ukraine "On Objects of Increased Danger" [2245-14], in the Civil Protection Code of Ukraine [5403-17], in the "Agreement between the Government of Ukraine and the Government of the United States of America on increasing operational safety, reducing the risk of operation, and strengthening the regulatory systems of civil nuclear facilities in Ukraine" [1198-2023-r], in the "Procedure for risk management of emergencies of a technogenic nature and fires" [z1397-23], as well as in over 30,000 laws, codes, state standards, regulatory and legal acts, orders, and other official documents of the state. One of the first methodological documents in the field of determining technospheric risk is the "Methodology for determining risks and their acceptable levels for declaring the safety of objects of increased danger" [v0637203-02]. Since 2002, this methodology remains the basis for the development of departmental and industry-specific guiding documents for risk analysis of objects of increased danger according to their specificity.

Starting from 2003, Ukrainian legislation in the field of labor protection and hygiene is being reformed to ensure the implementation of European occupational safety standards. The legislature believes that the introduction of a risk-oriented approach into national practice will enable Ukraine to ratify International Labour Organization conventions, which, according to the legislator, provide more rights and guarantees for workers compared to the current national legislation. This includes the "Convention concerning the Promotion of Occupational Safety and Health" under No. 187, signed on June 15, 2006.

In the "Concept of reforming the occupational safety management system in Ukraine" [1], the Cabinet of Ministers of Ukraine declares the problematic issues that have accumulated over the years due to the application of morally outdated non-risk-oriented approach to the occupational safety and hygiene management system, and proposes a way to address them.

In the provisions of the "Concept of risk management of emergencies of technogenic and natural character" [2], the Cabinet of Ministers of Ukraine proposes ways and means to solve the problems of population and territory protection of Ukraine from emergencies, reducing the risks of occurrence, and minimizing the consequences of emergencies of technogenic and natural character. There are also governmental concepts of chemical, radiation, and other types of safety.

Considering the above, it can be argued that the concepts of "risk" and "risk-oriented approach" have fully and completely entered into the management system of our state, and that the reform of the state governance system in this direction began long ago and continues to this day.

It is known that not everything in life can be predicted, but it is desirable to be prepared for everything. This approach is based on the fact that:

a) the risk of a negative event is never zero, and the desire to minimize it at any "cost" can itself become an irrational risky decision;

b) the cost of maintaining assets, the value and level of resource protection, and investments determine the cost price of production (service provision), and consequently, the profit and everything else in the money circulation circle.

This is how modern risk-oriented production and business processes work, various methods, techniques, and management standards that are gradually being implemented in companies in developed countries around the world. Enterprises and companies in our country are not exceptions here; despite the war, they also move in this direction, and it is necessary for us as educators and educational researchers to meet the needs of industries for qualified personnel.

The list of domestic companies (enterprises) implementing and optimizing risk management systems for production and business processes is quite extensive. Here are some of them: PJSC "Ukrzaliznytsia" (Ukrainian Railways); NJSC "Naftogaz of Ukraine"; SE "NNEGC "Energoatom"; LLC "SCM"; PJSC "ArcelorMittal Kryvyi Rih"; PJSC "Dniproazot"; NEC "Ukrenergo"; PJSC "Ukrainian Defense Industry", and it's clear that this list is far from exhaustive.

Considering the demand and novelty of such training directions, the size and complexity of large companies, the number of civil servants and officials of local self-government bodies, it is correct to assert that there is currently and will continue to be a demand for specialists with relevant qualifications.

Returning to the previous analysis, it is worth noting that in conditions of stable demand for specialists with in-depth knowledge of social, financial, and technospheric risk management, such offers from domestic universities in the labor market are completely absent. The consequence of this situation is the employment in leading positions of budget-forming companies and state institutions (establishments), at best, of retrained mechanical engineers who have undergone "unclear courses for non-existent qualifications." This often becomes the root cause of making unpredictable and risky management decisions of unsatisfactory quality with severe socio-economic consequences.

Therefore, just as the absence of statistics on negative events in the past cannot guarantee that they will not occur in the future, the absence of negative events at present cannot indicate that there is no need for employees to acquire specialized competencies for relevant "risk positions".

Moreover, during our research, it was established that in accordance with the requirements of higher education standards of the Ministry of Education and Science of Ukraine for the specialty 263 "Civil Security", in the field of knowledge 26 "Civil Security", graduates must acquire, among others, the following competencies:

- the ability to assess the risks of emergencies on the objects of economic activity and risks in the field of occupational safety;
- the ability to conduct techno-economic analysis, risk assessment, comprehensive justification of projects, plans, decisions, and their implementation in the field of civil security.

Along with this, it was found that in accordance with the requirements of the mentioned standards, graduates of higher education, upon completion of their studies, should demonstrate, among others, the following learning outcomes:

- the ability to choose optimal measures and means aimed at reducing professional risks, protecting the population, preventing emergencies;

- the ability to identify and analyze potential threats of emergencies, accidents, incidents, assess their possible consequences and risks, etc.

Thus, it can be argued that some competencies in "risk-oriented thinking", acquired by students, will enable them to address basic occupational safety issues (issues of providing proper, safe, and healthy working conditions for employees) and civil security, as envisaged by current education standards. Moreover, the state, represented by the Ministry of Education and Science of Ukraine, has provided domestic universities with the opportunity to create and implement educational disciplines with a risk-oriented focus in the field of knowledge 26 "Civil Security".

However, during the study of open sources such as educational programs, work programs of educational disciplines in universities in the field of knowledge 26 "Civil Security", publicly available elements of educational-methodical complexes of disciplines of the specialty 263 "Civil Security", scientific articles, monographs, dissertations, etc., we have found that there is no discipline that comprehensively and in-depth explores the concepts and aspects of phenomena such as risk in the field of technospheric, production, civil security, and life safety. Such a discipline would teach the laws (regularities) of risk, examine the theoretical (methodological, practical) principles of risk management, present to students the modern state position on the concept of "acceptable risk", explain the relationship between riskology and other academic disciplines, and define the required level of formation of certain sets of skills and abilities in students, which is not taught in domestic universities.

Therefore, we propose the introduction of a new educational discipline called "Safety Riskology", and in the future, the establishment of a separate scientific research direction "Safety Riskology".

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ERGONOMIC STUDIES OF THE WORKPLACE USING MOTION CAPTURE

Musculoskeletal disorders (MSDs) continue to be the main cause for occupational sick leave in countries with no foreseeable improvement. On the contrary, producing companies find themselves confronted with demographic changes leading to increasing average working age and a rise in the share of the population aged 65 and over. At the same time companies have the ethical obligation to protect the health of their workers, and the economic challenge to secure competitiveness. Therefore, companies need to adapt to the changing age structure because physical intensive tasks lead to work-induced impairments which increase with age and result in more employee absences. In order to prevent MSDs, workplaces need to be ergonomically designed and workload needs to be managed (e.g., task distribution) so that individual workers are not overloaded.

Common methods for ergonomic risk assessment usually analyze body posture and physical stress to identify critical work steps and critical workplaces. They compare measured values with fixed threshold values and compute a risk ratio for MSD occurrence for existing processes or for processes