

APPLICATION OF OCCUPATIONAL RISK ASSESSMENT METHODS IN THE ORGANIZATION

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Abstract:

The essential resource of an organization is represented by the human resources (HR). Organizations are mandated to ensure the well-being and satisfaction of human resources in the workplace and the main way to do it is by implementing a safety culture where occupational health and safety (OHS) is continuously improved. Globally, there are a wide range of methods for occupational risk assessment. The first part of the paper presents a comparison between the main methods used internationally for the risk assessment. Based on this analysis, in the second part, there will be presented a propose methodology that will be then tested and validated in the case of a transport company headquartered. The risk assessment process will demonstrate the validity of the proposed methodology and also, the OHS situation in the analysed company, together with some improvement measures that have to be implemented. The main findings of the risk assessment will suggest aspects of risk mitigation, together with their influence or impact on employees' well-being and satisfaction in the workplace. General conclusions will be presented in the final part of the paper.

Keywords: occupational risk assessment, method, occupational health and safety, human resource, organisation, well-being

1. INTRODUCTION

Beyond any doubt the central element of any organization is the human resource (HR). All types of organisational actions should be analysed and shaped for OHS. First of all, the key for a successful organization is the prevention of risks. The entire risk evaluation process starts from identifying stringent organisational issues and materialises in applying occupational risk assessment methods in the workplace. The steps of this process are identification of possible risks, their analysis and evaluation and the applicable improvements and developments for a qualitative strategy aimed at risk mitigation and/or elimination. In this paper, a risk evaluation method highly used in Romania was applied to an international transport company to evaluate and reduce risks for truck drivers.

The case study is presenting an application of an occupational risk assessment method in order to provide innovation, security and health improvements. Results of the study are quantified in the final part, showing the necessity of an immediate intervention. The importance of this study is derived from the necessity to improve work conditions, considering that their work life style is one with limited conditions (a long time spent in the car cabin without physical activities, inadequate alimentation, working in day and night shifts). In addition, the organisation's long-term objectives imply continuous business growth and improved efficiency. Globally, the necessity of risk assessment became compulsory by law and has multiple advantages.

2. IMPORTANCE OF OCCUPATIONAL RISK ASSESSMENT METHODS IN ORGANIZATIONS

Nowadays, the interest for human resource increased, organizations developed, improved conditions and qualitative OHS measures in the workplace. In long term, the well-being of human resource is a source of stability, prosperity and performance. On the other hand, an important aspect is the necessity of a risk assessment in the organization, in order to maintain or increase a correct and comprehensive definition of OHS performance. An occupational risk assessment represents a detailed examination of all possible incidents, of potential harmful actions which are tolerated or not in an organization. One of the most important aspects is that every organization should identify and choose the risks which are on the limit of the precautionary measures, which shall be analysed and revised. The severity of consequences reflects the gravity of a result that can be generated by an undesirable and unexpected event.

The probability of an event occurrence should be estimated under consideration of existence or absence of control systems (Moraru, 2010). According to the EU Directive 89/391/EC (Article 6 "General obligations on employers" sub-point 2) the employer shall implement the measures of prevention: avoiding risks; evaluating the risks that cannot be avoided; combating the risks at source; adapting the work to the individual; adapting to technical progress; replacing dangerous elements with non-dangerous or less dangerous ones; developing a coherent work organizing, working conditions, social relationships (Niskanen, 2012, article 43). A central EU commitment from the Lisbon strategy is to give equal importance to increased employment and productivity through greater competitiveness. The cost of accidents at work and occupational diseases in the EU-15 ranges from 2.6% to 3.8% of gross national product. As well as reducing accidents and ill health, production and efficiency benefits can follow as a result of: more productive workers and more efficient working methods, enhancing the levels of motivation, cooperation and morale in the workforce, improving the quality of employee recruitment. (OSHA)

OHS is a pre-condition to make work sustainable throughout a person's working life and contributes to healthier, longer and more productive environments. Good working conditions and risk prevention contribute to a healthy workforce, which, in turn, will help supporting the financial sustainability and achieving higher and qualitative performance (EU-OSHA, 2014). The employer's assumption of managing prevention and protection activities according to art. 16 HG 1425-2006 by designating one or more workers to carry out the protection and prevention activities and by establishing an internal service or resorting to external prevention and protection services. (Rusu- Zagar G., 2013).

3. OVERVIEW OF MAIN OCCUPATIONAL RISK ASSESSMENT METHODS

Health and safety at workplace has become one of the most important and substantial sectors in the EU social policy in the last years. „The European Community Strategy is based on setting up and reinforcing a culture of risk prevention, on combining a variety of tools for the implementation of the Community policies: legislation, social dialogue, technical progress and best practices, corporate social responsibility and economic incentives – and on building partnerships among all the actors on the stage of health and safety at work.” (Rusu- Zagar G., 2013). The most difficult aspect for an occupational risk assessment is choosing the right method for the application. Having a qualitative time and results, the evaluators should observe the possible risk, analyse it and after a quite briefing, choose the most appropriate risk assessment method. An universal quantification of risk assessment is observed in table 1, with respectively likelihoods.

Table 1: Universal quantification of risk assessment

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain (>90%)	5	10	15	20	25
Likely (50%-90%)	4	8	12	16	20
Moderate (10%- 50%)	3	6	9	12	15
Unlikely (3%- 10%)	2	4	5	8	10
Rare (<3%)	1	2	3	4	6

Source: authors inspired from Risk assessment, 2015

Risk value legend:

Low: ≤ 5- Green

Medium: >5, ≤12 – Yellow

High: >12 - Red

This quantification is appropriate for a quick assessment in any organizations, with the purpose of a constant conditions evaluation. The likelihood is between 1% and 100%, with 5 classifications (almost certain, likely, moderate, unlikely, rare). The consequences are on 5 levels (insignificant, minor, moderate, major and catastrophic), quantified depending on likelihoods.

A categorisation of risk assessment methods includes self-reports from workers, which can be used to collect data on exposure in the workplace through interviews, questionnaires and worker diaries; the - observational methods and the direct measurements of exposure variables at work (David, 2005).

A short and detailed literature classification of risk assessment methods includes different methods:

- *deterministic qualitative methods* (Action Errors Analysis- AEA, checklist, Analysis of Failure Mode and Effects, Hazard and Operability- HAZOP, The insurers involvement by reducing the risk, preliminary risk analysis- APR, „What if?” analysis, Process Risk Management Audit- PRIMA); which are based on consideration of equipments while assessing the consequences expressed by human effects. The results of applying this methods are qualitative.
- *deterministic quantitative methods* (The method of I.N.C.D.P.M. Bucharest, Accident Hazard Index- AHI, Dow’s Chemical Exposure Index, Hazard Identification and Ranking- HIRA, The SEVESO II Directive); which have the characteristics of deterministic methods, those having quantitative results.
- *probabilistic qualitative methods* (Delphi tehnic, Structural Reliability Analysis- SRA); which are based on estimating a probability or frequency for a danger situation or materialization of potential consequences of an accident. This kind of methods are focused on the defectation of equipments and the results are qualitatives.
- *probabilistic quantitative methods* (DEFI method, the analysis by tree events- AAE); which have the same characteristics, with quantitative results.

- *combined qualitative methods* (Safety Culture Hazard and Operability- SCHAZOP, Reliability Block Diagram- RBD, Level of Protection Analysis- LOPA); which are based on a comprehensive analysis of industrial site or work system. (have a simultaneously deterministic and probabilistic action). Those methods have qualitative results.
- *combined quantitative methods* (AMDEC, Quantitative Risk Assessment, QRA, Rapid Ranking, Optimal Risk Assessment, ORA, butterfly knot method); which have the same characteristics like combined qualitative methods but with quantitative results.(Moraru, 2010).

This paper aims to present an occupational risk assessment method in an international transport organization, where drivers are the major workers category. The method that was chosen and applied on the transport company is INCDPM method, a quantitative method that will be describe in detailed in the next chapter. (includes the analysing system, identification of the workplace risk factors, evaluation of the injury and occupational disease risk, selection of the risks and establish the priorities of prevention and eventually the proposal for the prevention measures. (Moraru, 2010).

4. INCDPM RISK ASSESSMENT METHOD APPLIED IN TRANSPORT AND LOGISTICS ORGANIZATIONS

As presented in the previous chapters, risk assessment is compulsory and reflects the level of security in an organization. In Romania, the method used for occupational risk assessment is developed by the National Institute of Research and Development for Safety at Work (INCDPM). The INCDPM method is highly preferred for risk assessment in organisations, as it comprises all risk categories and enhances their evaluation with high levels of accuracy. The method is applied to workplaces and the organisation as a whole. The most common use is for risk assessment at a specific workplace. A main advantage of the method is the possibility of easily identifying risks by categories.

Methodology of INCDPM method comprises five steps:

1. Workplace and company description
2. Identification of risks
3. Assessment of the probability and severity each identified risk
4. Quantification of the two parameters (probability and severity) and calculation of partial and total level of security for the respective workplace
5. Interpretation of results

Workplace and company description are aimed at offering a general background on the particularities of the workplace which is to be evaluated. In this step, the four elements of the work system (means of work—utensils, equipment, machines etc.—, work environment, work load and worker) are described and they represent a preamble to the risk assessment.

Identification of risks is also made for the four elements of the work system. For each of these, risks are divided into categories, such as physical, chemical, mechanical, electrical, thermic, biological factors, and wrong actions and omissions (in the case of workers).

Probability of a risk signifies the likeliness that it will occur. Severity refers to the most critical consequence of the respective risk. Every risk has a specific probability and severity. In order to properly evaluate the risk, INCDPM method comprises a table where risks are defined by category, and for each of the risks the evaluator quantifies its probability (P) and severity (S). The two indicators are quantified as follows:

Table 2: Quantification of risk severity in INCDPM method

Consequences	Severity of Consequences	Value
Negligible	Minor; work incapacity of maximum three days (healing without treatment)	1
Small	Reversible consequences; temporary work incapacity of 3–45 days (requires medical treatment)	2
Medium	Reversible consequences; temporary work incapacity of 45–180 days (requires medical treatment and hospitalisation)	3
High	Irreversible consequences, with diminution of work capacity to minimum 50%, individual being able to have professional activity (third level invalidity)	4
Severe	Irreversible consequences, with 100% diminution of work capacity, but with ability of self-service, ability to control the body and spatial orientation (second level invalidity)	5
Very severe	Irreversible consequences with complete loss of work capacity, self-service, ability to control the body and spatial orientation (first level invalidity)	6
Maximum	Death	7

Source: Moraru, Babut, 2010, p. 245.

Table 3: Quantification of risk probability in INCDPM method

Type of Event	Occurrence Frequency	Value
Extremely rare	P > 10 years	1
Very rare	5 < P < 10 years	2
Rare	2 < P < 5 years	3
Less often	1 < P < 2 years	4
Often	1 month < P < 1 year	5
Very often	P < 1 month	6

Source: Moraru, Babut, 2010, p. 245.

Every risk will have a corresponding pair of severity-probability values. INCDPM method establishes the level of security or insecurity of a workplace, based on assignment of value indicators for each pair, and the calculation of partial and total security. The indicators for each pair are as per Table 3. An important thing to mention is that risk represents the opposite of security. Therefore, a high level of risk is, in fact, a low level of security.

Table 4: Scale for determining risk/security level in INCDPM method

Risk Level	Severity-Probability Pair	Security Level
1 Minimum	(1,1) (1,2) (1,3) (1,4) (1,5) (1,6) (2,1)	7 Maximum
2 Very Low	(2,2) (2,3) (2,4) (3,1) (3,2) (4,1)	6 Very High
3 Low	(2,5) (2,6) (3,3) (3,4) (4,2) (5,1) (6,1) (7,1)	5 High
4 Medium	3,5) (3,6) (4,3) (4,4) (5,2) (5,3) (6,2) (7,2)	4 Medium
5 High	(4,5) (4,6) (5,4) (5,5) (6,3) (7,3)	3 Low
6 Very High	(5,6) (6,4) (6,5) (7,4)	2 Very Low
7 Maximum	(6,6) (7,5) (7,6)	1 Minimum

Source: Moraru, Babut, 2010, p. 245.

After quantifying probabilities and severity of risks, the method requires calculation of the risk level of the respective workplace, using the following formula:

Formula used for calculation of the risk level

$$N_{rg} = \frac{\sum_{i=1}^n r_i \cdot R_i}{\sum_{i=1}^n r_i}$$

Where:

N_{rg} – Global risk level for the analysed workplace

r_i – number of identified risks

R_i – risk level for each identified risk

The method in case considered that an acceptable risk level should be maximum 3.5. This 3.5 level was chosen because of the severity of consequences which are 7. The middle of the 7 values is 3.5, the limit of acceptable risk level. According to the authors of the method, those delimitations are suitable for any case in our country, Romania, in order to find quickly the occupational risks.

Global risk levels higher than 3.5 involve workplaces with high (inacceptable) risks and need immediate efforts to increase security.

The fifth step, interpretation of results, consists in a list of solutions proposed for each risk in the 3-7 range. Also, statistics regarding what type of risks prevail in a workplace, what is the general level of security for that workplace and any other insights regarding the evaluation made.

It can be easily observed that INCDPM method is comprehensive and within reach for any professional in occupational health and safety.

The authors of this paper performed a risk assessment at a national and international transport company, for the 'driver' occupation. The company, MERCUR INTERNATIONAL is headquartered in Resita, Romania and was founded in 2001. The main activity of the company is road haulage. It has 50 drivers who transport various types of goods across Romania, Belgium, France, Germany, Italy, Ireland, the Netherlands and the UK. A risk assessment for drivers is compulsory, as they represent the majority of the company's personnel and they are exposed to a large variety of risks.

Employees work for nine hours per day; after four and a half hours of driving, drivers have 45 minutes break. After driving 9 hours per day, it is compulsory that drivers have 11 hours of rest. Each transport is tracked via GPS satellite system to prevent deviations from the route and control fuel consumption.

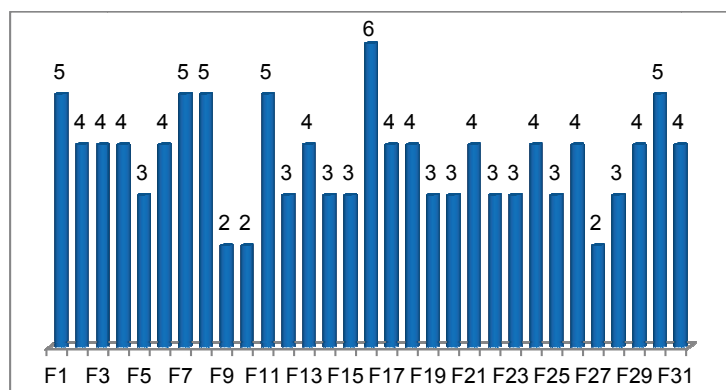
Occupational risks assessment was made using INCDPM method.

The global risk level for drivers at MERCUR INTERNATIONAL is 3.95, meaning that drivers are exposed to high risks.

There have been identified 31 risks, out of which 28 are above medium risk level (22 average level risks and 6 high level risks). Each risk level can be observed in figure 1. Considering the sources of the identified risks, 35.5 % are factors from means of work, 12,9 % are factors from the work environment, 6.5 % are generated by workloads and 45.2 % are factors dependent on workers. Therefore, the worker and the work environment (as part of the work system) account for most of the factors that generate risks for drivers, which is also visible in figure 2.

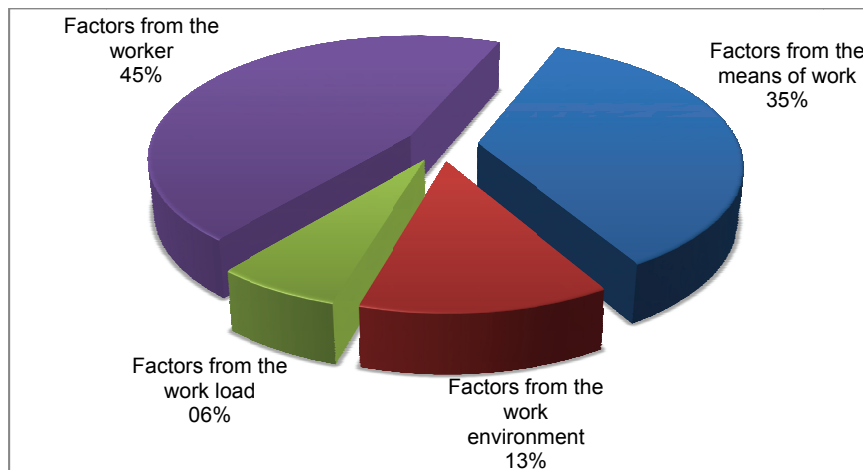
87.09% of the identified risks may have irreversible consequences on workers (death or invalidity).

Figure 1: Risk level for each identified risk – occupation "driver"



Source: Author processing of study results

Figure 2: Share of the identified risks – by elements of the work system



Source: Author processing of study results

The authors proposed solutions for the reduction of 11 risks. Among the proposals are trainings, technical reviews, technical improvement of trucks, use of protection equipment and sanctions for violation of company and driving rules. These proposals are meant at reduction of unacceptable risks within one year.

According to Law 319/2006 for Occupational Health and Safety, in Romania risk evaluation is compulsory at the creation of a workplace, every time an accident or incident takes place or whenever the organization makes changes for the respective workplace. Therefore, proposals for risk reductions become compulsory for the organization.

After implementing the proposals made by the authors for MERCUR INTERNATIONAL, driver workplace is likely to have an acceptable risk level (below or equal to 3.5).

5. CONCLUSIONS

More and more companies evaluate frequently the conditions of working and the mood of their workers for a performed evolution. Being a successful organization, the priority should be the human resources and their needs. Every worker's need which is not resolved and satisfied in time, becomes quickly a risk. The workers should know their rights and respect the organization's rules but when a risk appears they should alarm the leadership and make the change. The main focus on the paper is on application of occupational risk assessment method, study which encourages all the organizations to evaluate the workers conditions.

This application was a challenge for the organization in case, in order to justify the well-being and satisfaction of the human resources. This evaluation has a lot of advantages like an efficient communication and performance, correct and effective progress, qualitative health and safety.

The case study was a real perspective and an overview of the workers conditions. It present all the possible risks that appear in the organization, in consideration of establish the worker's necessities and eliminate every kind of danger. The results are quite over the limit of tolerance, which means that the organization should implement the proposals made by the authors to establish an acceptable risk level. Also the new implements for the workers conditions are opening a new target, a new profit.

In long term the occupational risk assessment methods should be the professional key between employee and employer.

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