

# Cross-Disciplinary Approach for the Risk Assessment Ontology Design

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## ABSTRACT

*The article describes a cross-disciplinary approach to support the risk assessment process through an integrative tool based on a global ontology. The designed global ontology allows the risk identification and characterization, the related potential work accidents and/or diseases, and decides better for appropriate preventive/corrective measures (the risk assessment logical chain). The global ontology structure follow a matrix model with two dimensions: one related to the work system structure/components and the other related to the risk assessment logical chain. For the integrative tools, solutions there have been developed a risk assessment process modeling with the purpose of better explain and understand the relations in the risk assessment logical chain. In addition, a concept model was developed and implemented for the global ontology complete definition. Finally, an expert system and a web platform are presented as integrative tools for the risk assessment.*

**Keywords:** Cross-Disciplinary Application, Expert System, Knowledge Based System, Knowledge Management, Occupational Health and Safety, Ontology, Risk Assessment/Evaluation, Web Platform

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## 1. INTRODUCTION: ARGUMENTS FOR RISK ASSESSMENT IN THE PROFESSIONAL LIFE

Occupational health and safety risks are research subjects of many sciences because of the causes, processes, actors and effects diversity. Much more the work-related and occupational diseases are multi-factorial diseases among

the working population that have a heavy impact on workers (employers themselves), enterprise (organizations communities) and society (family, local community). According to Hamalainen, Saarela, and Takala (2011, pp. 49-52) communicable diseases (28%), malignant neoplasm (25%), and circulatory diseases (21%) comprised 90% of all fatal work-related diseases based on calculated estimates for 2002 at the global level.

In the same context, there have been estimated that there are approximately 160 million

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occupational diseases each year; 30-40% of these evolve as chronic diseases that determine permanent work incapacity. For these reasons, occupational diseases are considered as *silent epidemics* because they are hard to diagnose, are discovered late, and cannot assure the reversibility of individual's health. Statistics show that 10-30% of the developed countries employees (workers) and 50-79% of the workers that belong to countries with low and medium economic development level are constantly exposed to occupational risk factors or work in non-ergonomic conditions (Hamalainen et al., 2011).

According to the recent EUROSTAT figures and the European Agency for Safety and Health at Work statistics, every year 5,580 people die in the European Union because of work-related accidents. In addition, the International Labour Organisation estimates that an additional 159,500 workers in the European Union die every year from occupational diseases. Considering both figures, it is estimated that every three-and-a-half minutes somebody in the European Union dies from work-related causes (European Commission, 2009, 2010).

Even in nowadays-economic crisis period, statistics related to work accidents, people injuries or health harmed in the workplace are not optimistic; the European Risk Observatory and the European Agency for Safety and Health at Work Annual Report demonstrate this facts in the last years (European Commission, 2009, 2010; Steinbuka, Clemenceau, & De Norre, 2010). Workers, employers and managers of different levels need to be made aware of the risks that they face and how to manage them in accordance with the Community Strategy for Health and Safety at Work, for the period of 2007-2012, which aims to cut work-related accidents by a quarter across the European Union and to reduce occupational illnesses and diseases.

For each company, enterprise or organization the problem of risk factors analysis, evaluation and assessment, the study of their genesis (appearance, development, evolution, effects or impact) has to be a key activity for

the professional life improvement and/or optimizations of work environment ("iceberg" model confirms that; Roughton & Mercurio, 2002). Nowadays the insurance companies have push organizations to sever measures/policies/strategies implementation for diminishing the numbers of work accidents, diseases, illnesses or fatal exposures, fatal errors etc. that have impact on individual or collective workers (of all categories). The work insurance schemes can work as motivators where the costs of the insurance are perceived to be high by employers (more than 1% of the payroll) (European Agency for Safety and Health at Work, 2004, pp. 2-8).

The costs of the negative phenomena, associated with professional life or the work processes, are composed on one hand, by their direct effects on treatment and hospitalization of the affected human operators. On the other hand, the costs include the indirect effects regarding the lost of temporary or definite work capacity (considering that work accidents and occupational diseases imply costs of 3% from the GDP in the first case and about 20% in the last case, as average values for the European countries). Also, the social investigations done for the affected workers showed that the psychological stress experienced by them affect their family and also the collectivity (at organizational level) by affecting the health, and the wellbeing of other society members (in accordance with the documents and statistics provided by International Labor Organization).

In the last years, accepting the fact that at European level in the field of occupational health and safety there was important progresses reported, there are still some empirical practices and unsolved aspects. The costs of work accidents and occupational disease are still too high and do not split into equal proportions for all parties involved. The money lost by work absence is about one milliard Euros per year. The employers pay for the sick leave, the replacement of absent workers, for their loose productivity, and many of these costs are not covered by the work insurance system (Roughton & Mercurio, 2002). Small and middle size enterprises (SMEs) are mostly exposed to

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