Development of informative content and online training system of occupational safety and health information in the context of intelligent specialization

Alina Trifu[1], Vicentiu Ciocirlea[1], Iulian Ivan[1]

1Researcher, National Institute for Research and Development in Occupational Safety "Alexandru Darabont" – INCDPM, B-dul Ghencea 35A, Bucharest, Romania

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ABSTRACT: This research paper presents the partial results of an ongoing project that aim to investigate ways in which informative content and online training systems can be developed and adapted in accordance with the requirements of smart specialization in the domain of occupational safety and health. The contribution of the project to the development of knowledge in the field will materialize first of all at the level of fundamental research, through the development of an original conceptual framework regarding the principles and criteria for the development of occupational health and safety training topics. The novelty and originality of this framework consists in approaching the phenomenon of occupational injury and illness in the context of a systemic vision of the work process, by virtue of which all the elements involved in the realization of the process generate risks for the occupational safety and health of workers. The development of training topics and modules in relation to the assessed risks for the work system associated with a work process is an original and the most complex possible solution, because it guarantees that no dangerous element or dangerous situation that exists will be omitted or it may occur at a workplace.

KEYWORDS: Occupational safety, Online training, e-learning, Health and safety Training modules

I. INTRODUCTION

In recent years, amidst the evolution of technology and growing concerns regarding occupational safety and health, the development of informative content and online training systems has become crucial to ensuring an efficient and updated approach in this field. An approach that integrates smart specialization can bring significant benefits, facilitating rapid adaptation to changes in the professional environment and promoting sustainable and safe practices across various sectors.

This paper presents the partial results of an ongoing project that aim to investigate ways in which informative content and online training systems can be developed and adapted in accordance with therequirements of smart specialization in the domain of occupational safety and health.

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II. METHODOLOGY

The methodology that we approach for this project has four components: Training Needs Analysis, Evaluation of Available Technologies, Design and Implementation of Informative Content, Testing and Evaluation.

In the „Training Needs Analysis" stage we assessed the current industry requirements concerning occupational safety and health and identify areas that require increased attention within smart specialization. In the „Evaluation of Available Technologies" stage we will examine various online platforms and technologies that can be utilized for the efficient development and delivery of informative content in an interactive manner. In the „Design and Implementation of Informative Content" stagewe will create online training materials that address the identified needs, employing modern instructional design methods and tailored technologies.In the „Testing and Evaluation" stage we will test the content and online training system in real-world settings and evaluate their effectiveness in promoting understanding and application of occupational safety and health practices.

The literature provides much direct and indirect evidence in support of the benefits of occupational safety and health education and training in ensuring safe and healthy working conditions. Training workers could achieve immediate and short-term goals. These include increasing hazard awareness among at-risk workers, improving knowledge and work practices, and acquiring skills that should lead to reduced risks and improved workplace safety. There is evidence to suggest that management support is essential for effective OSH training, particularly in the transfer of new knowledge and behaviours to the workplace. Optimal results result from policies and work climates in which workers had opportunities to apply knowledge from training or that reinforced learned behaviour through incentives or other means.

However, some methodologies used in these studies were found to be more effective than others. Some studies used quasi-experimental designs that included manipulations of variables and appropriate controls for potential confounders. Other evaluation methodologies were not well controlled: results were usually derived from a post-hoc analysis of post-training surveys where training outcomes may have been contaminated by the effects of other workplace activities.Many evaluations were based on short-term results, so the sustainability of any training effect remained uncertain. Also, the final outcomes of interest - injury and disease - were often not studied. The degree to which these results correlate with typical measures of the effects of occupational safety and health education and training, such as knowledge gain and behaviour change, is unclear at best. These limitations in methodology suggested the need for more rigorous investigations of training effectiveness to confirm the importance of different variables.

The acquisition of knowledge and the reduction of worker accidents, injuries, and illnesses depended on the level of worker involvement in training (higher involvement required more active employee participation). Training involving behaviouralmodelling, a substantial amount of practice, and dialogue was generally more effective than other methods.

The potentially relevant learning theories and previous research findings were not necessarily incorporated into the design and content of occupational safety and health training. It was proposed that principles in learning theory could lead to new training approaches as well as new research methodologies that would better address safety and health research issues.Improved training approaches require trainee involvement in the learning process and its transfer to the workplace and will occur primarily through practice, dialogue with peers and the instructor, action-focused self-reflection, and self-regulation while developing procedures, knowledge, and skills.

The succession of technical operations within the module training e-learning solution implementation project are as shown in fig.1:

- Content identification (targeted audience, learning objectives, pedagogy, applications, quizzes)
- Project plan development (team identification, technology choice, delivery method choice)
- Content development (converting files to XML format, ensuring file compliance, creating apps, creating animations, creating quizzes)
- Preparation of the implementation environment (installation/customization, implementation specific requirements of the professional training provider, testing content developed in the project)
- Q/A (VET provider testing, content, functionality)
- Reception from the continuing education provider
- Uploading to the computer network (Dedicated database server, dedicated file server, complete back-up system, complete failover system)
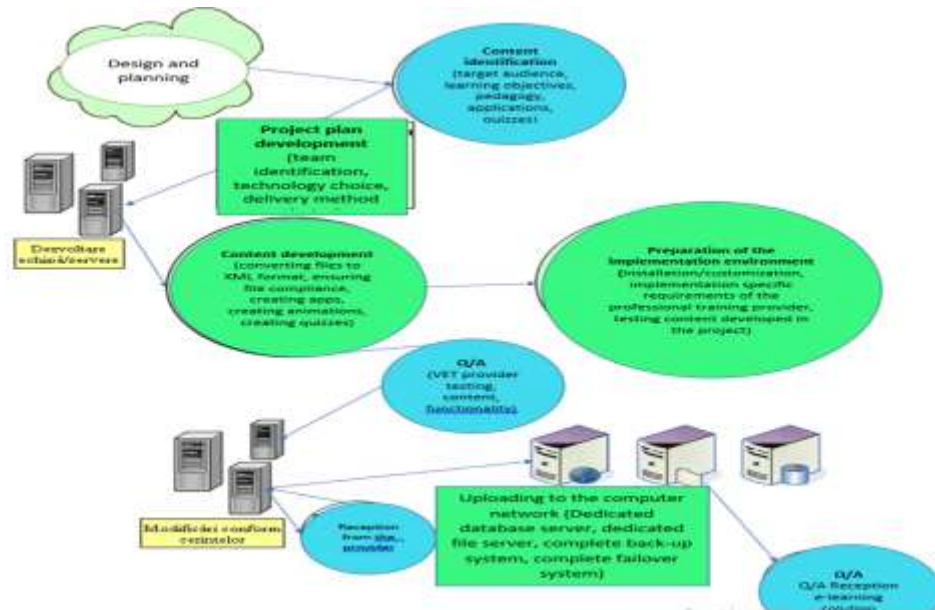- Q/A Reception e-learning solution

Fig.1 Succession of technical operations within the e-learning solution implementation project

III. RESULTS AND DISCUSSION

The objective of the project was the scientific substantiation of the development of the safety and health at work training methodology by establishing the principles and criteria that must be applied to the development of the training methodology in the field of safety and health at work, the creation of a generic training-testing model and establishing the role and functions that training modules and topics (SSM) must fulfil in the legislative context of our country.

For the development of the conceptual framework for the development of training modules and themes in the field of safety and health at work for musculoskeletal disorders, psychosocial risks, mechanical risks and physical risks in the IT activity and electricity production sectors, it was concluded that they will be necessary going through the following steps:

Identification of specific needs by identifying specific risks for each activity sector (IT and power generation) in terms of musculoskeletal conditions, psychosocial risks, mechanical risks and physical risks. The needs assessment also identifies the gap between the knowledge, skills and attitudes required according to the tasks and responsibilities of (groups of) staff, workplace risks, legal requirements, certification requirements, etc., and the level of knowledge, skills and staff attitudes (experience, previous training, social context, cultural context).

Consult existing resources, check existing occupational health and safety regulations and guidelines for each sector as they can provide valuable information on existing legal requirements and standards.

Establish training objectives by clearly defining the learning objectives for each training module. Training objectives set out the outcomes that the training should achieve. Training objectives should be as specific as possible to improve assessment. Examples of specific training objectives: "workers know how to use personal protective equipment correctly", "management knows and understands the prerequisites for introducing a behaviour-based safety campaign". Another example, for musculoskeletal conditions, an objective is "to understand the main musculoskeletal conditions and how to prevent them in the IT sector".

Content development. Depending on the identification of needs and objectives, the content must be carefully determined. The content of the training must be consistent with what is expected in terms of knowledge and skills. It is particularly important to adapt OSH training to the risks associated with tasks and working conditions. Therefore, the content must be based on the results of the risk assessment. The selection of content should also consider the age, cultural background and experience of the staff. For each training module, appropriate content will be developed, including teaching materials, case studies, practical examples and additional resources, tailored to the specific needs of the respective sector.

Choosing suitable teaching methods such as lectures, interactive sessions, case studies, simulations, practical demonstrations or online

training ensuring that teaching methods are interactive and engaging. Teaching methods should be selected according to the objectives, the selected content and the language, levels and experience of the target group. As a general rule, it can be assumed that the learning effect will improve if the training is tailored to individual needs, easily recognized and in line with practice. Interactivity and active participation are also important, especially for programs where a trainer trains a group of workers together.

Assessing knowledge by developing assessment tools to measure participants' knowledge and skills. This may include tests, quizzes, projects or practice exams. An evaluation and monitoring of the training is necessary to determine whether the objectives have been met and to obtain ideas for future improvements to the training units.

Integrating case studies by using sector-relevant case studies to illustrate specific risks and how to prevent them.

Ensuring regular updating by planning regular updates of training modules to keep pace with new regulations and research in occupational safety and health.

Evaluation and feedback. After each training session, feedback is collected from the participants and the modules are adjusted according to the suggestions received. Training records should be kept to maintain an overview of training courses attended, to determine when refresher courses are required and if further training is required. Such traceability is also a requirement in formal occupational safety management systems such as ISO45001.

Implementation and monitoring.

Implementation of training modules in the respective sector and monitoring of their impact on occupational safety and health. And making adjustments as needed.

The key criteria that were the basis for the development of the training modules and that must be taken into account when developing the training methodology in the field of safety and health at work, were: Risk Identification - identifying the specific risks of the workplace and ensuring that the training modules cover these risks, this includes assessing work situations, equipment used and chemicals used; Clear Objectives - Setting clear learning objectives for each module, employees need to know exactly what they need to learn and what is expected of them; Interactivity -training modules should be interactive and engage participants through the use of case studies, simulations, discussions and other methods that actively involve employees; Emphasis on Preventive Measures -ensuring that training focuses on preventing OH&S accidents and incidents, not just responding to them; Evaluation - the inclusion of processes for evaluating the knowledge and skills acquired in the training, this allows measuring the effectiveness of the program and identifying possible gaps; Learning Resources - providing additional resources such as documentation, guides and access to experts to help employees deepen their OSH knowledge; Adaptability - Training modules must be able to be adapted to the specific needs of different departments or teams in the organization; Monitoring and reporting - it is necessary to ensure the existence of a system for monitoring and reporting incidents or problems related to OSH, in order to be able to intervene appropriately.
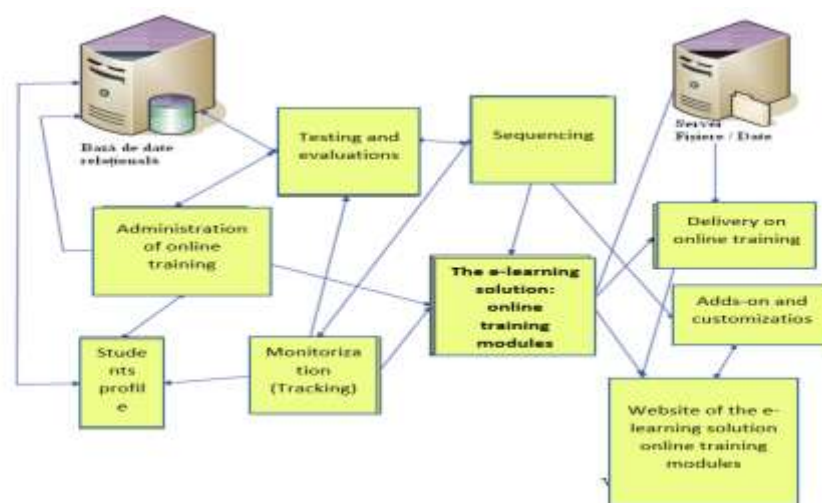

Fig. 2 Components of the proposed e-education solution (learning management system)
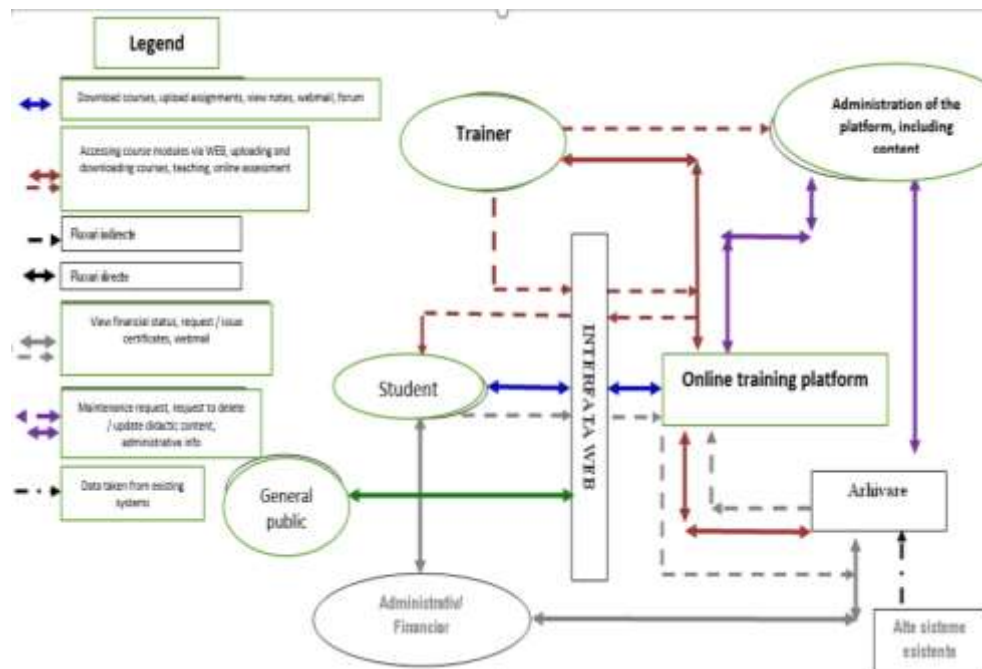
Fig.3 INFORMATION FLOW OF THE E-LEARNING TOOL

Safety and health at work are the determinant of a company's effectiveness alongside the level of occupational risk, as well as product performance and quality. It is impossible to implement a culture of occupational safety and health without appropriate employee attitudes and skills. The right attitude of an employee should be shaped by the exemplary attitude of superiors, informing and explaining to employees the importance of the importance of safety at work. Occupational safety training can be used for this purpose, which increases the awareness and skills of employees. Effective training has a positive impact on reducing the number of accidents and related costs.

Occupational safety training is a learning process that takes place outside of school, the main purpose of which is to acquire knowledge and skills or to increase and complete already acquired qualifications. Training employees in the field of occupational safety significantly improves the safety culture of the company.

As a result, our integrated training modules e-learning system offers a number of major benefits:

- superior performance in the educational process: an e-education system allows continuous monitoring of the training process of the students (bibliography consulted, time allocated to training, case studies/applications solved, etc.)
- increased access to educational content: learners can access electronic content regardless of where they are; lecturers can carry out distance teaching activities; an electronic community of course graduates can be developed;
- flexibility and availability: learning sessions are available 24h/day, 7 days/week.

IV. CONCLUSION

The development of informative content and online modules training systems in the field of occupational safety and health within the context of smart specialization is crucial to addressing the modern challenges of the professional environment. The integration of technology and continuous adaptation of content to industry needs and requirements can significantly contribute to improving occupational safety and health practices and ensuring a safer and healthier working environment for all employees.As a result, our integrated training modules e-learning system offers a number of major benefits: superior performance in the educational process: an e-education system allows continuous monitoring of the training process of the students (bibliography consulted, time allocated to training, case studies/applications solved, etc.); increased access to educational content: learners can access electronic content regardless of where they are; lecturers can carry out distance teaching activities; an electronic community of course graduates can be developed;flexibility and availability: learning sessions are available 24h/day, 7 days/week.

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