METHODS FOR DEVELOPING A SAFETY CULTURE

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Abstract: The development of a safety culture is one of the fundamental conditions for preventing occupational accidents, reducing workplace hazards, and ensuring the long-term protection of human health. Safety culture is not limited to compliance with established rules and regulations; it represents a system of shared values, attitudes, knowledge, and behaviors that determine how individuals and organizations approach safety in their daily activities. This article examines the main methods for developing a safety culture in educational institutions, construction organizations, and industrial enterprises. Particular attention is given to safety education and training, personal responsibility, leadership commitment, behavioral approaches, risk assessment, employee participation, and the application of digital technologies. The study is based on a theoretical analysis of international research and occupational safety management principles. The findings indicate that safety culture develops most effectively when educational, organizational, behavioral, and technical measures are implemented together. The article also emphasizes the importance of introducing safety culture principles at the stage of professional education, particularly in preparing future specialists for construction, architecture, engineering, and industrial activities.

Keywords: safety culture, occupational safety, safety education, risk assessment, safety behavior, occupational accidents, safety training, leadership, digital technologies, professional competence

INTRODUCTION. Occupational safety is an essential component of sustainable economic development and social well-being. Every organization, regardless of its size or field of activity, is responsible for creating working conditions that protect employees from occupational injuries, illnesses, and other work-related hazards. However, the effectiveness of occupational safety measures depends not only on technical equipment, protective devices, and regulatory requirements but also on the attitudes and behavior of individuals toward safety.

In many organizations, occupational safety is still perceived primarily as a set of formal instructions and mandatory regulations. Employees may attend safety training sessions, sign relevant documents, and receive personal protective equipment without fully understanding the importance of safe working practices. In such circumstances, safety requirements can become formal procedures rather than an integral part of everyday professional behavior.

This situation demonstrates the importance of developing a strong safety culture. A positive safety culture encourages individuals to recognize potential hazards, assess risks, follow preventive measures, communicate unsafe conditions, and take responsibility for their own safety and the safety of others. It also creates an organizational environment in which safety is considered a shared priority rather than the responsibility of a single department or safety specialist.

The concept of safety culture became particularly important in international research following major industrial accidents, which demonstrated that serious failures can result not only from technical defects but also from organizational weaknesses, inadequate communication, and inappropriate management decisions.

According to international occupational safety approaches, an effective safety culture requires commitment at all organizational levels. Management must demonstrate leadership in safety matters,

employees must actively participate in preventive activities, and educational systems must develop the necessary knowledge and competencies.

The development of safety culture is particularly important in construction, architecture, manufacturing, transportation, energy, and other sectors characterized by occupational hazards. In these fields, unsafe behavior or inadequate risk awareness can result in serious consequences for workers and the surrounding environment.

The purpose of this study is to examine the principal methods for developing a safety culture, identify the factors influencing safe behavior, and propose an integrated approach to strengthening safety awareness in educational institutions and workplaces.

MATERIALS AND METHODS. The study employs a theoretical and analytical research approach based on the examination of international scientific publications, occupational safety management principles, and recognized safety culture development practices.

The methodological framework includes comparative analysis, systematic examination of scientific literature, and conceptual assessment of organizational and individual factors affecting safety behavior.

First, the concept of safety culture was examined in relation to occupational safety management. Particular attention was given to the relationship between organizational values, management commitment, employee attitudes, and everyday safety practices.

Second, international research on workplace safety interventions was analyzed to identify methods that contribute to improving safety culture. Studies focusing on safety education, leadership, communication, behavioral monitoring, and organizational interventions were considered.

Third, the main methods of safety culture development were classified according to their application at individual, group, organizational, and educational levels.

Fourth, the possibilities of integrating modern digital technologies into safety education and workplace risk management were examined. These included digital training platforms, virtual reality, electronic safety instructions, and computerized risk assessment systems.

The research also considered the principles of the ISO 45001:2018 Occupational Health and Safety Management Systems standard and the International Labour Organization's ILO-OSH 2001 guidelines.

The study is conceptual and literature-based. It does not claim to present new experimental measurements or survey results. Its findings are derived from the analysis and synthesis of existing research and established occupational safety principles.

RESULTS. The analysis identified several interconnected methods that can be used to develop and strengthen a safety culture.

Education and Continuous Safety Training. Education is one of the primary instruments for developing a safety culture. Individuals cannot consistently demonstrate safe behavior if they do not understand workplace hazards, their potential consequences, and appropriate preventive measures.

Safety education should begin during professional training and continue throughout an individual's working life. In educational institutions, students should be introduced to occupational hazards, risk identification, personal protective equipment, fire safety, emergency procedures, and the principles of safe work organization.

Traditional lectures and theoretical explanations are necessary but insufficient on their own. Effective safety education should also include practical exercises, demonstrations, case studies, emergency simulations, and analysis of real workplace incidents.

For example, architecture and construction students should learn to identify hazards associated with working at heights, electrical installations, construction machinery, dust exposure, and the

movement of heavy materials. Such knowledge enables future specialists to consider safety requirements during the planning and implementation of construction projects.

Continuous training is also important for employees because workplace technologies, equipment, and production processes change over time. Regular updates help workers maintain the knowledge and practical skills required to respond to new risks.

Leadership and Management Commitment. Management commitment is a decisive factor in establishing a positive safety culture. Organizational leaders influence employee behavior through their decisions, priorities, communication, and personal examples.

If managers emphasize production targets while ignoring safety requirements, employees may gradually adopt the same attitude. Conversely, when management consistently demonstrates that safety is a priority, workers are more likely to follow established procedures and report hazardous conditions.

Effective safety leadership includes:

- establishing clear occupational safety policies;
- allocating sufficient financial and technical resources for safety measures;
- ensuring regular workplace inspections;
- encouraging employees to report hazards and unsafe conditions;
- investigating incidents and implementing corrective actions;
- recognizing responsible safety behavior.

Management should also ensure that safety requirements are incorporated into everyday organizational decisions. This means that production schedules, project planning, equipment selection, and workplace organization should all take potential risks into consideration.

A safety-oriented management approach creates conditions in which employees understand that protecting human life and health is a fundamental organizational responsibility.

Development of Individual Responsibility and Safe Behavior. Individual responsibility is another important element of safety culture. Every employee should understand that workplace safety depends not only on management decisions but also on personal actions and professional discipline.

Safe behavior includes using personal protective equipment correctly, following work instructions, maintaining workplace order, observing warning signs, and refusing to perform activities under clearly unsafe conditions.

Behavior-based safety approaches can be used to identify and improve unsafe working practices. These approaches involve observing workplace activities, identifying risky behavior, providing constructive feedback, and encouraging safe alternatives.

However, behavioral interventions should not be used as a substitute for eliminating hazards through technical and organizational measures. Workers should not be blamed for risks created by inadequate equipment, poor workplace design, or insufficient safety management.

An effective system combines individual responsibility with organizational responsibility. Employees must follow safety procedures, while employers must provide safe working conditions and appropriate preventive measures.

Risk Identification and Assessment. Risk assessment is a fundamental method for developing a preventive safety culture. It encourages individuals and organizations to identify potential hazards before accidents occur.

The risk assessment process generally includes identifying hazards, determining who may be affected, evaluating the likelihood and severity of potential consequences, selecting preventive measures, and reviewing their effectiveness.

In industrial enterprises, construction organizations, and educational workshops, risk assessment should be conducted regularly and whenever significant changes occur in equipment, technology, workplace conditions, or work organization.

The hierarchy of controls provides an important basis for selecting preventive measures. It prioritizes:

- Elimination of the hazard.
- Substitution with a less hazardous alternative.
- Engineering controls.
- Administrative controls.
- Personal protective equipment.

This hierarchy demonstrates that effective safety culture should be based primarily on preventing or reducing hazards at their source rather than relying exclusively on individual protective behavior.

For example, installing permanent edge protection on construction platforms is generally a more reliable preventive measure than depending only on workers to use personal protective equipment correctly.

Employee Participation and Safety Communication. A strong safety culture cannot be established without active employee participation. Workers often have direct knowledge of workplace conditions and can identify problems that may not be immediately visible to management.

Organizations should create opportunities for employees to participate in safety inspections, risk assessments, safety meetings, and incident investigations.

Open communication is particularly important. Employees should be able to report dangerous situations, technical defects, and near misses without fear of unjustified punishment.

Regular safety meetings, workplace discussions, information boards, and internal reporting systems can help strengthen communication between management and employees.

Near-miss reporting is especially valuable because it provides information about potentially dangerous situations that did not result in injury or damage. Analyzing such events allows organizations to introduce preventive measures before a more serious incident occurs.

Employee participation also strengthens a sense of shared responsibility and encourages workers to regard safety as an essential part of their professional identity.

Application of Digital Technologies in Safety Culture Development. Digital technologies provide new opportunities for improving occupational safety education and management.

Digital learning platforms allow organizations to distribute safety instructions, conduct online training, evaluate employee knowledge, and maintain records of completed training activities.

Virtual reality technologies can simulate hazardous workplace situations without exposing students or employees to actual danger. For example, learners can practice responding to fire emergencies, working at heights, or identifying construction-site hazards in a controlled virtual environment.

Building Information Modeling (BIM) can also contribute to safety culture development in architecture and construction. By integrating safety considerations into the design process, specialists can identify potential hazards, examine construction sequences, and consider safer arrangements for buildings and workplaces.

Artificial intelligence and data analysis can support the identification of recurring incident patterns, the analysis of near-miss reports, and the monitoring of potential workplace risks. However, these technologies should support rather than replace professional judgment and established safety management procedures.

The use of digital technologies is most effective when combined with practical training, employee participation, and continuous evaluation.

Establishing a Positive Safety Motivation System. Motivation is an important factor influencing how individuals perceive and follow safety requirements. Organizations should create an environment in which safe behavior is encouraged and recognized.

Positive motivation may include recognition of employees who actively contribute to workplace safety, participation in safety improvement projects, professional development opportunities, and appreciation of effective hazard reporting.

At the same time, motivation systems should be designed carefully. Rewarding only the absence of reported accidents may discourage employees from reporting injuries and near misses. Therefore, organizations should evaluate preventive activities, reporting quality, training participation, and the implementation of corrective measures rather than relying exclusively on accident statistics.

A positive motivational environment encourages employees to participate in safety improvement activities voluntarily and consistently.

DISCUSSION. The findings indicate that safety culture cannot be developed through a single educational or organizational measure. It is a complex process that requires the coordinated implementation of educational, managerial, behavioral, technical, and motivational approaches.

This conclusion is consistent with international research. Aburumman, Newnam, and Fildes (2019), in their systematic review of workplace interventions, identified the importance of management commitment, leadership style, and behavioral monitoring in improving safety culture. Their review also emphasized that the available evidence should be interpreted cautiously because of methodological limitations in the studies examined.

Similarly, Lee et al. (2019) found that safety communication and education were common components of interventions designed to improve safety climate. Their findings highlight the importance of combining employee training with improvements in safety leadership and organizational practices.

Dyreborg et al. (2022) emphasized the importance of organizational and group-level interventions in preventing occupational accidents. Their systematic review also demonstrated the value of multifaceted approaches, particularly those incorporating engineering controls and broader organizational changes.

These findings suggest that safety education should not be considered an independent solution to workplace accidents. Training is more effective when employees are provided with appropriate equipment, clear procedures, supportive management, and safe working conditions.

An important issue is the difference between safety knowledge and actual safety behavior. An employee may understand all relevant safety instructions but fail to apply them because of time pressure, inadequate equipment, insufficient supervision, or organizational practices that prioritize productivity over safety.

Therefore, developing safety culture requires the transformation of organizational values and everyday working practices. Safety should become an established element of decision-making, communication, project planning, and professional conduct.

In higher education, this approach is particularly important because students develop professional attitudes before entering the workplace. Integrating occupational safety into engineering, architecture, construction, and technical education can help establish preventive thinking at an early stage of professional development.

For architecture students, safety culture should be connected with the design of safe buildings, accessibility, fire protection, evacuation planning, construction safety, and the ergonomic

organization of spaces. This approach allows students to understand that the quality of an architectural project depends not only on its appearance and functionality but also on its contribution to human safety and well-being.

Based on the analysis, an integrated approach to safety culture development can be recommended. It should combine five interconnected components: professional education, management leadership, individual responsibility, employee participation, and continuous risk prevention. Digital technologies and motivational measures can support all five components.

The effectiveness of this approach should be evaluated through regular safety climate assessments, workplace inspections, training evaluations, analysis of reported hazards and near misses, and monitoring of corrective actions. Such evaluation helps organizations identify weaknesses and continuously improve their safety management practices.

CONCLUSION. The development of a safety culture is a continuous process that requires the active participation of individuals, management, educational institutions, and organizations. It cannot be achieved solely through formal instructions or occasional safety training. A sustainable safety culture emerges when safety principles become an integral part of professional knowledge, organizational values, and everyday behavior.

The study leads to several conclusions.

First, continuous education and practical training are essential for developing the knowledge and skills required to recognize hazards and prevent occupational accidents.

Second, management commitment and leadership play a central role in establishing organizational priorities and encouraging safe working practices.

Third, individual responsibility should be strengthened through constructive feedback, behavioral development, and opportunities for employees to participate in safety activities.

Fourth, systematic risk assessment and the application of the hierarchy of controls provide a preventive foundation for reducing workplace hazards.

Fifth, open communication and employee participation improve the identification of unsafe conditions and support organizational learning.

Sixth, digital technologies, including virtual reality, BIM, and artificial intelligence, offer additional opportunities for safety education, risk analysis, and the improvement of occupational safety management.

Finally, safety culture development should begin during professional education. Universities and vocational institutions have an important responsibility to prepare specialists who understand the relationship between professional performance, occupational safety, and human well-being.

In conclusion, a strong safety culture is achieved when every individual recognizes safety as a shared responsibility and when organizations consistently translate this principle into practical decisions and actions. The integration of educational, organizational, behavioral, and technological methods provides a foundation for creating safer workplaces and preventing occupational accidents in the long term.

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