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OCCUPATIONAL HEALTH AND SAFETY – HOW TO ACHIEVE EFFECTIVE PERFORMANCE EVALUATION

Abstract: Occupational health and safety (OHS) is not a phenomenon of the modern world and has deep roots in history. The history of occupational safety can be divided into several phases of development. EU-OSHA estimates that the social cost of work-related injuries and diseases is 3.9% of global GDP and 3.3% of EU GDP. The loss of GDP in the EU is the lowest of all regions according to the classification of the World Health Organization (WHO). In these challenging times, when the world of work is experiencing various rapid changes, the evaluation of the performance of occupational health and safety is becoming increasingly important. It is necessary to monitor various performance indicators at different levels and functions and to use different methods. A review of recent scientific literature and OHS international standards in this area has been conducted. The article presents the latest considerations on how to achieve effective evaluation of OHS performance using international standards.

Keywords: evaluation, indicators, occupational health and safety, performance

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INTRODUCTION

The history of occupational health and safety (OHS) can be divided into several phases of development, from the initial primitive work to the application of robots and artificial intelligence. Therefore, OHS is not a phenomenon of the modern world and has deep roots in history. EU-OSHA estimates that the social cost of work-related injuries and diseases is 3.9% of global GDP and 3.3% of EU GDP (Eurostat, 2024). The loss of GDP in the EU is the lowest of all regions according to the classification of the World Health Organization (WHO) (European Commission, 2021). In these challenging times, when the world of work is experiencing various rapid changes, the evaluation of the OHS performance is becoming increasingly important. It is necessary to monitor various performance indicators at different levels and functions and to use different methods.

Occupational health and safety is generally defined as the science of predicting, identifying, assessing and controlling hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment (Wolff, 2007). A wide range of skills, knowledge and analytical capacity are needed to coordinate, implement, and monitor all elements and indicators to protect workers (Alli, 2008).

Economically, morally, and legally, OHS has become an important issue. Companies are trying to remain profitable in an increasingly competitive global economy. For these companies, addressing the issue of

worker safety and health can mean more than good business practice; it can help in new business successes. Therefore, strong safety and health programs with continuous monitoring and evaluation of indicators can further contribute to business development (Friend & Kohn, 2007).

Effective OHS management requires appropriate and reliable measurement of OHS performance. Various indicators are used to measure performance. According to ISO 45004:2024, indicators are variables that can be measured or described, representing the status or a characteristic of operations, processes, management, and conditions or outcomes.

Indicators designed to measure OHS performance in companies are intended to provide information on the extent to which the desired outcome has been achieved or on the quality of the processes leading to that outcome. Different types of indicators are used to measure the success of OHS, which show the inputs, processes, and outcomes of OHS (Pawłowska, 2015).

Indicators that reflect OHS outcomes and are applied during the reactive monitoring process, with a focus on measuring losses, are called trailing indicators. In the literature on this topic, the term *outcome indicators* (Health and Safety Executive, 2001) is used in addition to the term *negative performance indicators* (Bottomley, 2001) or lagging indicators (Dyck & Roithmayr, 2001). Various researchers emphasize that timely and accurate analysis of these indicators is essential for successful prevention (Karwowski et al., 1988). These indicators are easy to calculate based on

data collected in the company in accordance with legal requirements (Health and Safety Executive, 2006). Latency indicators can provide information about the effectiveness of actions taken in the past, but do not allow for their immediate monitoring and correction.

Indicators that show input data and processes belong to the group of leading indicators (Nelson, 2008) and are most often called positive performance indicators (National Occupational Health and Safety Commission, 1994).

Over the years, various guidelines have been developed to support companies in measuring OHS performance, among which those of the British Health and Safety Executive (Health and Safety Executive, 2001) (Health and Safety Executive, 2006) and Australian National Health and Safety Commission (Department of Employment and Workplace Relations, 2005) are particularly noteworthy.

A new dimension and significance to the assessment of OHS performance are given by the requirements related to non-financial reporting on corporate sustainability ESG, i.e. the requirements of the ESRS S1 and ESRS S4 standards (ESRS, 2024).

So, regardless of whether an organization is a public company, a private enterprise, or a non-profit organization, effective OHS management can contribute to business success (O'Neill & Wolfe, 2017).

METHODOLOGY

Aim, tasks and research methodology

The problem that has been identified in this area is the lack of recent knowledge on how to achieve effective OHS performance evaluation. The aforementioned problem is manifested through the small number of studies in this area, but also the low level of understanding of the area. Given the identified problem, the aim of this research is to investigate and demonstrate how to achieve effective OHS performance evaluation.

In accordance with the set objective, the research tasks are to

- collect data on the areas and process of OHS evaluation;
- identify the most significant OHS performance indicators;
- analyze the levels and functions at which indicators are collected;
- present how to achieve effective OHS performance evaluation.

The research methodology used in this study involves the application of various scientific methods. A combination of deductive and inductive analysis is used to classify and summarize the basis of the research subject. The method of studying the content of scientific and professional literature analyzes the content that considers the evaluation of performance. The description method describes the essential features and elements of the research subject. The synthesis method draws conclusions.

Hypotheses

Based on the identified problem and the set research objective, hypotheses were set that will be confirmed or rejected based on the research results:

H1: Each level or function in a company has its own group of OHS performance indicators.

H2: There are factors that can lead to wrong conclusions in the process of evaluating OHS performance.

H3: It is possible to achieve effective OHS performance evaluation.

RESULTS AND DISCUSSION

Occupational health and safety

Occupational health and safety are the key aspects of organizational management, aimed at ensuring safe and healthy working conditions. Effective performance evaluation in the field of occupational health and safety involves systematic processes of monitoring, measuring, analyzing, and improving working conditions. According to ISO 45004:2024, performance evaluation is essential for determining whether planned objectives are being met, including the continual improvement of occupational health and safety, compliance with legal and other requirements, and the achievement of defined safety goals (ISO 45004:2024).

In the Republic of Croatia, the field of occupational health and safety is primarily regulated by the Occupational Health and Safety Act (OG 71/14, 118/14, 94/18, 96/18), which imposes the obligation on employers to implement occupational safety measures. The Regulation on Risk Assessment (OG 112/14, 129/19) defines the conditions, methods, and procedures for risk assessment, which serves as the foundation of effective occupational health and safety management.

ISO 45004:2024 emphasizes the use of various evaluation tools, including inspections, pre- and post-activity reviews, incident investigations, audits, and management reviews. As stated in ISO 45004, inspections enable quick and efficient determination of the current state regarding the application of risk controls and regulatory compliance (International Organization for Standardization, 2024). The Croatian legislative framework is fully aligned with these recommendations.

The effectiveness of occupational health and safety management largely depends on the definition of clear performance indicators. Indicators can be classified as leading, which are proactive and predictive of future performance (e.g. employee participation in training for safe work practices), and lagging, which reflect past events (e.g. workplace injury rate) (International Organization for Standardization, 2024). The use of both types provides a comprehensive overview of performance. For example, Croatian companies regularly monitor indicators such as the frequency rate of occupational injuries and occupational diseases, thereby fulfilling legal obligations and providing a basis for improvements in occupational safety.

ISO 45004 also highlights potential adverse effects related to the selection and application of indicators, such as underreporting of incidents due to fear of consequences or financial incentives that may compromise data accuracy. Therefore, it is essential to maintain a transparent and supportive reporting culture within the organization, actively involving workers at all levels to ensure data accuracy and the effectiveness of safety management (International Organization for Standardization, 2024).

In practice, comprehensive evaluation of occupational health and safety enables organizations to identify and correct deviations from planned safety outcomes. Effective assessment processes include regular collection and analysis of data related to workplace incidents, exposure levels, and the effectiveness of implemented safety measures. Internal and external audits provide critical feedback, allowing for rapid adaptation to changing conditions and regulatory requirements.

Integrating a structured assessment of occupational health and safety aligned with ISO 45004 and Croatian legal requirements equips organizations with robust mechanisms for enhancing workplace safety and health. Continuous monitoring, proactive use of indicators, and effective internal communication foster a culture of safety, resulting in risk reduction and improved overall organisational performance.

OHS performance evaluation

Performance evaluation encompasses a process or set of processes that compares the outcomes achieved by organizations against pre-established objectives. These objectives may include the continuous improvement of occupational health and safety (OHS) performance, the achievement of OHS-related goals, and compliance with legal and other obligations.

When conducting performance evaluation, organizations should consider various sources of information that can serve as input data. To achieve set objectives, it is advisable to use diverse sources of information to ensure a concise and comprehensive assessment, as relying on a single source may lead to incomplete or inaccurate conclusions. The purpose of performance evaluation is to help organizations determine the extent to which their objectives have been achieved.

Performance evaluation is essential for effective OHS management and supports better decision-making within organizations. For example, it enables organizations to

- assess whether top management demonstrates commitment and support for OHS management;
- identify which processes are achieving planned results and which are not;
- detect deviations in processes or activities affecting OHS performance, as well as the causes of such deviations;
- recognize opportunities for improvement or the need to take action to enhance processes (International Organization for Standardization, 2024).

In conducting performance evaluations, organizations must consider all business processes, such as procurement, production, logistics, the effectiveness of the OHS management system, and organizational assumptions and safety culture that influence employee behaviour. It is especially important to identify incorrect assumptions, such as the belief that incidents are always the result of unsafe worker behaviour or that a low rate of accidents automatically indicates a high level of workplace safety.

The evaluation process includes setting objectives, determining measures for their achievement, monitoring results through various tools and information sources, and taking corrective or improvement actions. Regular monitoring, analysis, and assessment ensure the organization responds to identified issues and unforeseen consequences.

Furthermore, organizations may use various data sources and methods, including

- **Inspections:** A quick way to check working conditions, the use of personal protective equipment, and control effectiveness;
- **Pre- and post-activity reviews:** Analysis of planned and actual working conditions, safety measure effectiveness, and training needs;
- **Exposure assessments and workers' health surveillance:** Monitoring harmful factors such as hazardous chemicals, biological and physical hazards (e.g. noise), and ergonomic risks to prevent adverse effects;
- **Safety meetings and focus groups:** Discussions at different organizational levels to gather feedback and identify opportunities for improvement;
- **Surveys and interviews:** Questionnaires and interviews with workers can reveal issues such as inadequate training, psychosocial risks, and other relevant concerns.

Collecting data on injuries, accidents, and occupational diseases helps understand risks and the effectiveness of protective controls. Organizations must be cautious, as a low number of reported injuries may not reflect the real situation but rather indicate a lack of awareness or fear of reporting.

Incident analysis helps understand root causes and supports the implementation of corrective measures. In this context, organizations should avoid placing sole blame on workers and instead consider broader factors, such as work organization and resource allocation.

Results from internal and external audits and management reviews are key to identifying system weaknesses and improvement opportunities. The goal of evaluation is the continuous improvement of safety, health, and working conditions and the achievement of set goals through data analysis and action based on findings (International Organization for Standardization, 2024).

OHS performance indicators

To monitor and measure the status of processes, management, and outcomes, organizations should use

performance indicators. Indicators may be applied at various levels, including the entire organization, management, specific departments, processes, or tasks, and should cover various types of risks.

The selection of indicators must align with OHS objectives and policies. Roles and responsibilities for performance evaluation should be clearly defined and communicated. Indicators may be general for benchmarking against other organizations or specific to the organization's context.

Key features of indicators

- Meaningful, measurable, and aligned with organizational goals;
- Sensitive to change;
- Verifiable and comparable;
- Useful for monitoring short- and long-term changes, understandable at the operational level, and tailored to different organizational functions (International Organization for Standardization, 2024).

Table 1. Indicators at various levels/functions within the organization (source: International Organization for Standardization, 2024)

Level or function	Example indicators
Organization/Top Management	Injury and illness frequency rates and trends. Aggregate results of health surveillance (while maintaining data confidentiality). Degree of worker involvement (e.g. participation in performance/risk assessment, improvement proposals).
OHS Management System / Responsible Personnel	Scope of OHS management system implementation. Percentage of objectives achieved. Percentage of equipment changes requiring consequence review. Effectiveness test results of OHS improvement programs.
Departments / Managers	Degree of implementation of risk reduction activities. Percentage of risks reduced or eliminated, or opportunities implemented. Effectiveness of on-site inspections.
Processes and Tasks / Supervisors	Percentage of procedures updated as scheduled. Percentage of competent workers available for a specific task compared to required number.
Worker Participation	Percentage of concerns or suggestions submitted. Percentage of participation in OHS discussions. Percentage of incidents reported.

Indicators may lose relevance over time due to changes in organizational context, such as legislative updates,

process changes, or risk evolution. Therefore, they must be regularly reviewed and adapted to remain effective. Quantitative indicators, such as the percentage of implemented corrective actions, can be complemented with qualitative indicators, such as findings from analyses, as performance evaluation evolves.

Types of indicators

- **Leading indicators** focus on activities that can improve future performance (e.g. number of trained workers).
- **Lagging indicators** measure past performance (e.g. number of workplace injuries).
- **Quantitative and qualitative indicators** provide objective data; qualitative indicators enable deeper process analysis (International Organization for Standardization, 2024).

Inadequate selection or use of indicators can result in incorrect reporting or misinterpretation. Organizations must recognize and manage risks associated with insufficient or excessive reporting to maintain credibility in performance evaluation processes.

Benchmarking enables comparison with other organizations to improve processes. However, contextual differences must be considered, particularly between sectors. Properly used, benchmarking can be highly beneficial.

These indicators and approaches support systematic and effective OHS performance evaluation and contribute to continuous improvement.

Table 2. Examples of unintended consequences due to misinterpretation/misuse of indicators (source: International Organization for Standardization, 2024)

Influencing Factors	Potential Unintended Consequences
Lack of worker participation	Reduced engagement and trust in OHS matters (e.g. fewer suggestions for improvement)
Indicators not aligned with organizational strategy	Lack of senior management support for OHS issues
Focus only on frequent incidents	Neglect of low-frequency but high-impact potential incidents
Poor communication with stakeholders	Inappropriate indicator selection or result misinterpretation
Complex indicators	Lack of support if stakeholders cannot understand them
Universal global indicators	Unreliable results when used across diverse locations without accounting for context (e.g. legal requirements, work practices, culture)
Cost-driven indicator selection	Ineffective indicators leading to poor decision-making and weaker OHS outcomes
Financial and other incentives	Distorted reporting or under-/over-reporting may result in incident reports from a limited group only.

Integration of OHS performance evaluation into business processes

Despite technological progress and the development of OHS management systems, creating a sustainably safer work environment still largely depends on developing and strengthening safety culture. Compliance with legal requirements, implementation of OHS management systems, and active management of cultural change are key elements for achieving a positive safety culture (Kim et al., 2016).

In this context, ISO 45004:2024 emphasizes the importance of continuous evaluation of OHS measures as a fundamental tool for improving OHS performance. Systematic monitoring and analysis enable not only compliance but also the development of a proactive safety approach essential for sustaining safety culture within the organization.

Implementing and improving workplace safety culture reduces the frequency of accidents and injuries, thereby lowering operational costs and losses. As safety culture is an integral part of organizational culture and structure, it is also a vital component of OHS performance evaluation (Palačić, 2010).

Organizations should use performance evaluation to verify the alignment of planned outcomes with business plans and expectations. Improvements in OHS performance may also serve to assess and enhance other business processes, particularly since OHS management is an integrated part of organizational operations.

Accordingly, organizations should integrate OHS monitoring processes into business processes and systems. It is also highly advisable and important to assign responsibility for monitoring and measuring business processes across all levels of management

Examples of integration and alignment activities

- The process of selecting and conducting performance evaluations, including indicators, proactively assesses potential unintended consequences and negative impacts on other business sectors.
- OHS system inspections and internal audits are integrated with other management systems (e.g. quality, environmental, energy).
- Consistent methods are used to investigate incidents affecting OHS, environment, and quality.
- Equipment damage reports include potential OHS and environmental impacts.
- Performance evaluation and corrective action processes are aligned across management systems, with common issues identified and addressed.
- Surveys on organizational culture related to OHS, including psychosocial factors and psychological well-being, safety, and health, can provide insights into quality, environmental impact, productivity, and workforce retention.
- OHS equipment is included in the general calibration program.

- Worker exposure monitoring is integrated with indoor air quality workshops to address OHS performance issues and identify improvement opportunities.
- Consideration of cost, quality, productivity, and OHS in performance evaluation processes (procurement, contractors, suppliers) (International Organization for Standardization, 2024).

Acting on results

Following the analysis and assessment of results, organizations should prioritize actions by considering the following:

- The potential impact on OHS performance;
- Compliance with legal and other OHS-related requirements;
- Alignment with the organization's strategic direction;
- Opportunities for improving OHS management;
- Results and consequences of external OHS performance assessments (e.g. contractual compliance, recognition by authorities, or maintenance of OHS certification) (International Organization for Standardization, 2024).

CONCLUSION

Effective OHS management requires appropriate and reliable measurement of OHS performance. Various indicators are used to measure performance. According to ISO 45004:2024, indicators are variables that can be measured or described, representing the status or a characteristic of operations, processes, management, and conditions or outcomes.

Over the years, various guidelines have been developed for measuring OHS performance. Of course, each organization needs to determine for itself how to effectively measure OHS performance. Regardless of whether the organization is a public company, a private enterprise, or a not-for-profit organization, effective OHS management can contribute to business success. Therefore, it is very important to strive towards achieving the effectiveness of OHS evaluation.

The aim of this research was achieved. Also, the set hypotheses were confirmed. The paper showed how to achieve an effective evaluation of occupational safety.

A potential continuation of the presented research is to conduct empirical research on the application of OHS performance evaluation.

REFERENCES

- Alli, B. O. (2008). *Fundamental principles of occupational health and safety*. International Labour Organization. Geneva.
- Bottomley, B. (2021). OHSMS Performance measures that add up. Occupational health and safety management systems. Proceedings of the First National Conference, WorkCover NSW. 131–150.
- http://www.workcover.nsw.gov.au/formspublications/publications/documents/ohs_management_systems_4231.pdf.

- Department of Employment and Workplace Relations. (2005). *Guidance on the use of positive performance indicators to improve workplace health and safety*. Commonwealth of Australia. http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/150/GuidanceOnUseOfPPIs_2005_PDF.pdf.
- Dyck, D. & Roithmayr, T. (2024). Great safety performance: an improvement process using leading indicators. *AAOHN J.* 12(52). 511–520.
- European Commission. (2021). *The European Pillar of Social Rights Action Plan*. Luxembourg. Publications Office of the European Union. <https://op.europa.eu/webpub/empl/european-pillar-of-social-rights/en/index.html>
- European sustainability reporting standards (ESRS). ANNEX I to Commission Delegated Regulation (EU) 2023/2772 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards. Official Journal of the European Union 22 December 2023 including the corrigendum published on 18 April 2024. <https://xbrl.efrag.org/e-esrs/esrs-set1-2023.html>
- Eurostat: *Database, data for common economic sectors in the EU-15 (1994-2009) and for all economic sectors in the EU-27 (2010-2018)*. <https://ec.europa.eu/eurostat/data/database>
- Friend, M. A. & Kohn, J. P. (2007). *Fundamentals of occupational safety and health*. Government Institutes. Linham.
- Health and Safety Executive. (2001). *A guide to measuring health and safety performance*. <http://www.hse.gov.uk/opsunit/index.htm>.
- Health and Safety Executive. (2006). *Developing Process Safety Indicators. A step-by-step guide for chemical and major hazard industries*. http://antarisc consulting.com/docs/guides/unit_a/A3_HSG254_Developing_Process_Safety_Indicators.pdf.
- International Organization for Standardization. (2024). *ISO 45004:2024: Occupational health and safety management — Guidelines on performance evaluation*. ISO. <https://www.iso.org>
- Kim, Y., Park, J., & Park, M. (2016). Creating a culture of prevention in occupational safety and health practice. *Safety and Health at Work*, 7(2), 89–96 <https://doi.org/10.1016/j.shaw.2016.02.002>
- Karwowski, W., Rahimi, M., & Mihaly T. (1998). Effects of computerized automation and robotics on safety performance of a manufacturing plant. *Journal of Occupational Accidents*. 10. 217–233.
- National Occupational Health and Safety Commission. (1994). *Positive performance indicators for OHS: beyond lost time injuries. Part 1*. Commonwealth of Australia. doi:10.1080/10803548.2005.11076645.
- Nelson B. (2008). Inspections and severity: two safety leading indicators that you can use today. *Occup Health Saf.* 6. 87–90. http://www.indsci.com/docs/Press/OHS_0708.pdf.
- O'Neill, S., Wolfe, K. (2017). *Measuring and reporting on work health & safety*. Safe Work Australia. Canberra.
- Palačić, D. (2010). Istraživanje razvoja i utjecaja kulture sigurnosti na sustav upravljanja sigurnošću. *Sigurnost*, 52(2), 105–112. <https://hrcak.srce.hr/file/84104>
- Pawłowska, Z. (2015). Using lagging and leading indicators for the evaluation of occupational safety and health performance in industry. *International Journal of Occupational Safety and Ergonomics*. 21(3). 284-290, DOI: 10.1080/10803548.2015.1081769
- Wolff, J. (2007). Introduction: What is the value of preventing a fatality? In: Lewens, T. (eds.) *Risk: Philosophical Perspectives*. London. Routledge.