

Occupational Accidents and Occupational Health and Safety Management Systems ISO 45001:2018 in EU

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Abstract:

Research Question (RQ): Occupational health and safety (OH&S) is an important cornerstone of social development and one of the key elements of modern organizations' operations. Therefore, our primary research question was whether the number of organizations with the ISO 45001:2018-certified OH&S system affects the number of accidents at work in EU member states.

Purpose: The primary purpose of our research was to obtain the answer to our research problem. In addition, the research examined possible correlations between accidents at work, number of employed persons in EU member states and number of organizations certified to ISO 45001:2018.

Method: The analysis was based on the Eurostat data on the number of accidents at work and the number of employed persons in the 27 EU member states, as well as on data of International Organization for Standardization, on the number of organizations certified to ISO 45001:2018 in 2020. The ESAW methodology was applied to calculate the incidence rate and the ISO 45001:2018 certificate rate. Statistical processing of numerical data was done by means of the Minitab software, while the obtained results are shown in bar charts. The set hypotheses were tested by calculating the Spearman's correlation coefficient »r,« and by regression analysis.

Results: In 2020, 2,738,920 accidents at work were recorded in EU member states, 3,355 of which were fatal. In absolute terms, the highest number of non-fatal accidents was observed in Germany, while the number of fatal accidents was the highest in Italy. The highest incidence rate of non-fatal accidents was recorded in Denmark, while that of fatal accidents was observed in Cyprus. In 2020, there were 30,849 organizations in the EU with the OH&S system certified to ISO 45001:2018, with Italy being the country with the highest number of certificates issued per 100,000 employed persons. It was established that there is a correlation between the number of accidents at work, number of employed persons, number of ISO 45001:2018 certificates, incidence rate and ISO 45001:2018 certificate rate. The main finding of our research is that the number of organizations certified to ISO 45001:2018 does affect the number of accidents at work in EU member states. An increase in the number of certified organizations results in a decrease in the incidence rate.

Organization: The research provides information on the number of accidents at work and the number of issued ISO 45001:2018 certificates in EU member states. However, the major finding for organizations is that by implementing the OH&S management system certified to ISO 45001:2018 they can reduce the number of accidents at work. The results of our research may stimulate non-certified organizations to obtain certification.

Society: The findings of our study can provide a basis for society and, in particular, legislators to strengthen the measures in terms of incentives for organizations to opt for ISO 45001:2018 certification of their OH&S systems, resulting in the reduction of accidents at work.

Originality: The study examined the current 27 EU member states and was based on the latest publicly available Eurostat data on accidents at work in 2020. In terms of exploring the impact of the OH&S management system certified to ISO 45001:2018 on the number of accidents at work, our study is the first of its kind in the EU.

Limitations / further research: The study was limited to the EU area and the latest publicly available Eurostat data on accidents at work in 2020, which were only studied in terms of non-fatal and fatal accidents. It would be useful to extend the study to the geographical area of Europe and to address the industries in which organizations operate. In particular, we suggest that the analysis be

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conducted over several consecutive years, which would enable the study of the trend of the effect of the ISO 45001:2018-certified OH&S system on the number of accidents at work.

Keywords: occupational health and safety management system, accidents at work, ISO 45001:2018, incidence rate, European Union.

1 Introduction

Social and economic environment have recently undergone profound changes, and the health and safety of employed persons have become an important cornerstone of social development as they represent an issue that needs to be tackled in the context of global economic development. On the one hand, the economic impact of accidents and risks at work is increasing, while on the other, international human rights are receiving increasing attention. Accordingly, the occupational health and safety (hereinafter referred to as OH&S) issue receives a great deal of public attention since it is a complex social issue that cuts across a number of areas and has therefore attracted increased attention in recent years. The key to managing OH&S is figuring out how to achieve optimal allocation of resource costs and efficient use of resources in the context of specific objectives. But it is the relevant laws, regulations and tools, such as ISO 45001:2018, that are a strong guarantee for improving the OH&S situation. (Chen, Hou, Zhang, & Li, 2020, pp. 1-5)

Economic factors drive the need to improve working conditions, which is a common concern for all organizations. A safe and healthy working environment is an essential element of the quality of work (Coelho, 2018, p. 86). Work safety is an increasingly important issue worldwide, but it is also a relevant and multifaceted problem for organizations, workers and OH&S policy and law makers (Cioni & Savioli, 2016, p. 858). Fierce competition and changes in the market compel organizations to constantly adapt and optimize their processes, while at the same time they put constant pressure on prices of goods and services organizations bring to the market. All this may result in the reduction or abandonment of concern for health and safety of employees as well as in increased accidents at work (Ajmal, Isha, Nordin, & Al-Mekhlafi, 2022, p. 1).

The fourth industrial revolution requires that health and safety of workers adapt to the new economic and business environment (Torrecilla-García, Pardo-Ferreira, Rubio-Romero, Calero-Castro, & Nebro-Mellado, 2021, p. 1). Based on this proposition, the OH&S system has become a fundamental and strategic element of today's business and therefore one of the most important areas of research for organizations because of its direct and indirect benefits to them (Sharma & Mishra, 2021, pp. 1-2). In particular, effective OH&S management is required to ensure both a social and economic sustainability of organizations (De Merich et al., 2018, p. 101).

2 Theoretical framework

The issue of ensuring the safety of workers at work is one of the key elements for the functioning of modern enterprises. Providing workers with safe working conditions positively affects their health and performance at work. The importance of safety at work in the current economic reality is demonstrated by the fact that it is governed both by international and national legal regulations. Legal provisions define the requirements for employers and work standards. Highly developed countries attach great importance to the issues of work safety, and building on best practices, enterprises enlarge the scope of their activities aimed at improving safety in the enterprise. (Malysa & Gajdzik, 2021a, p. 1)

Work accidents and occupational diseases generate concerns in organizations in a global sphere. Although strategies to reduce or eliminate occupational risks and measures of prevention are being increasingly developed worldwide, accidents remain very frequent (Ferrari, Leal, Galdamez, & de Souza, 2020, p. 1). In principle, politicians, the regulatory authorities, employers and employees all agree that nobody should be injured when they are at work. Furthermore, they agree that preventive measures in the field of OH&S are better than corrective actions after accidents. The question then is why we still see so many occupational accidents happening again and again. What do we miss or have not understood about how to avoid these accidents (Jørgensen, 2016, p. 46).

First, it needs to be stressed that it is the organization that is responsible for the occupational health and safety of its employees and other persons who may be affected by its activities. This responsibility also entails the promotion and protection of physical and mental health of employees (ISO, 2018, p. 6). The principal task of the top management should be the creation of the proper safety culture. The promotion of coherent policy in the field of safe work organization and cooperation of employers with employees may contribute to the limitation of workplace accidents or occupational diseases (Malysa, Nowacki, & Lis, 2017, p. 2244). Achieving the highest level of protection of health and safety of workers is a management priority of every organization. Care for the protection of employees' health and safety at work is not only a legal and moral obligation, but also an activity that significantly influences individual and organizational success. The impact of an active role of management in establishing a safety system is reflected in the reduction of work-related injuries (Stefanović, Dobrosavljević, Urošević, & Mladenović-Ranisavljević, 2022, pp. 1850-1855). The management should focus on improving the occupational health and safety management practices and introducing practical measures to increase compliance with safety regulations and reduce the costs of safety and accidents at work (Ajmal, Isha, Nordin, & Al-Mekhlafi, 2022, p. 13).

OH&S management is linked with moral, legislative and business aspects. Moral obligations involve the protection of employees' lives and health. Legal reasons relate to the preventative, punitive and compensatory effects of laws that protect workers' safety. The business aspect of the OH&S management entails a proactive OH&S management that increases employee

commitment, which enhances the internal climate and external reputation, while at the same time reduces accident costs. An important topic of OH&S management is the analysis of accident costs, which is important from societal, workers' and company perspectives. From a worker's perspective, an accident leading to an injury generates pain and suffering and brings negative consequences to their family. For companies, accident costs associated with injuries and work-related ill-health can have negative effects, such as production losses and increased insurance premiums. Occupational health and safety management is a problematic field of analysis, which is linked with moral, ethical, legislative and economic aspects. (Battaglia, Frey, & Passetti, 2014, pp. 354-364)

Work accidents, injuries, and illnesses are serious problems in organizations. Rates show that, despite efforts to contain these events, accidents still happen (Veloso Fracasso, De Souza Libânio, & Gonçalves Amaral, 2022, pp. 257-258). Occupational accidents are primarily a direct threat to the loss of human life and the health of employees. Furthermore, organizations have financial costs to bear in terms of productivity, compensation paid, and workdays lost. In addition, they also face the non-financial cost of occupational accidents, e.g., the psychological trauma of employee absence from work. In the last two decades, investigations of major industrial accidents pointed out the leading factor, i.e., poor safety management. Therefore, attention to occupational accident prevention has been shifted from human and technical errors to catering employees' safety with management practices. In this regard, safety management plays the most significant role in intervening in the caution process of occupational accidents (Ajmal, Isha, Nordin, & Al-Mekhlafi, 2022, p. 1).

The definition of the accident differs across the countries. An occupational accident shall mean a sudden externally caused event related to the performed work resulting in injury or death of a worker (Malysa & Gajdzik, 2021b, p. 166). Accident at work is defined in ESAW (European Statistics on Accidents at Work) methodology as a discrete occurrence in the course of work which leads to physical or mental harm. The phrase »in the course of work« means while engaged in an occupational activity or during the time spent at work. A 'fatal accident' means an accident which leads to the death of a victim within one year of the accident. Non-fatal accident means an accident at work due to which an employee is absent from work at least four calendar days. Non-fatal accident frequently causes harm to the employee and their family, and it may also cause permanent disability, a high number of days lost or even permanent incapacity (European Union, 2013, pp. 5-6).

A more frequent occurrence of non-fatal accidents can provide information on direct causes, which can, in the worst case, result in fatal accidents (Bellamy, 2015, p. 93). It appears that fatal accidents generally involve the working environment and structures, while non-fatal accidents also involve machinery or devices. The most typical unsafe acts among fatal accidents are dangerous working methods, such as conscious or unconscious risk-taking in task execution. The most typical latent condition is inadequate work instructions, which is also the case with non-fatal accidents (Lind, 2008, p. 392).

Accident models and theories in safety and prevention have traditionally treated accidents as all of the same kind. However, the definition of an accident at work has been formulated in many ways throughout history. An analysis of different accident models shows that three elements are always to be found in models; the description of the causes, the events leading up to them and the consequences. The treatment of non-fatal accidents as insignificant and self-evidently present is still too prevalent in organizations, mainly on the basis that such accidents at work are easy to explain, while the consequences of these accidents are injuries with minor consequences. Since these simple accidents are easy to explain once they occur, organizations may also feel that they could have been easily prevented. However, in the case of these so-called simple accidents at work, which are caused by simple hazards that can also result in serious injuries, the root causes of such accidents are very rarely analysed. (Jørgensen, 2016, pp. 46-57)

Considering that an accident at work requires the involvement of objective and subjective causes, whose interaction generates the event, determining the sequence of causes and effects leading to the generation of the accident is a basic element in the equation of prevention (Băncilă-Afrim, Moraru, Cioca, & Băbuț, 2019, p. 19). The two factors of an accident at work are suddenness and external cause. The consequences of an accident at work are damage, harm or loss. There are three versions of the outcome, namely accident equated with the injury, accident equated with the injury and the situation prior to the accident, and the injury that is one of the possible consequences of the accident. Also, the essential differences are observed within the assessment of the accident results, which may include physical injuries of the worker, material damages, production disruptions and the damages to the reputation of the company (Malysa & Gajdzik, 2021b, p. 166). Accidents can be considered to demonstrate unsuccessful safety management and inappropriate supervision, which is considered an organizational factor. As regards unsafe acts, the decision to use unsafe working methods or not to use personal protective equipment is up to the workers (Lind, 2008, p. 932).

Organizations also differ in size, industry, age and geographical location (Črv, 2021a, p. 87). This requires them to regularly review the working environment, assess the risks, implement the necessary measures and then check that the measures taken are having the desired effect. The work must be conducted in collaboration with employees and safety representatives. There must be sufficient knowledge for the work. It must be clear who is to do what. This work shall be included as a natural part of day-to-day activities. A well-functioning systematic OH&S management is expected to lead to risks and shortcomings being discovered before accidents occur or ill health arises (Sjöberg Forssberg, Vänje, & Parding, 2022, p. 1).

A positive OH&S climate in an organization is key to maintaining safety in the workplace. The climate is reflected in how employees perceive safety at work, safety measures, practices and safety behavioral norms. The OH&S climate at individual and group level has been shown to predict employee safety behavior and influence employee motivation for safety. The management's commitment to safety is the most important dimension of the OH&S climate. Its commitment to addressing the OH&S issues is driven by established legal obligations and

stakeholder interest in reducing occupational injuries, reducing occupational diseases and achieving full protection of employees. The OH&S assessment standards were adopted because of the need for an overarching OH&S management system standard on the basis of which the system could be assessed and certified. This is the ISO 45001:2018 standard. (Stefanović, Dobrosavljević, Urošević, & Mladenović-Ranisavljević, 2022, p. 1849)

Safety management in organizations is more than hazard identification; it includes risk analysis to reduce the chances of occupational accidents, planning of safety activities and their effective implementation. Safety training at every level of organization and effective investigation of workplace accidents and near misses play an important role in promotion and facilitation of safety culture. Management should focus on promoting a safety culture, while compliance with safety standards and requirements should be paramount, as it plays a key role in establishing employee attitude towards safety. (Ajmal, Isha, Nordin, & Al-Mekhlafi, 2022, p. 2)

Many organizations around the world are beginning to show an interest in the concept of safety culture as a means to reduce the potential for accidents at work. Safety culture can be defined as shared attitudes and values held by different groups. Safety culture is recognized as an important factor and also represents psychological and behavioral characteristics of organizations, which may result in the success or failure of OH&S practices. Successful implementation of workplace safety practices needs the support of those who have the greatest interest in reducing the hazards of work, namely the potential victims (i.e., the workers) themselves. Government regulations, policies and legislation are not enough to control workplace hazards; therefore, the question arises about what can guarantee a hazard free work environment if statutory regulation alone cannot accomplish this outcome (Claxton, Hosie, & Sharma, 2022, pp. 57-65). Safety culture must be aligned among all organizational spheres and must be subject to continuous training of both management and other employees (Velošo Fracasso, De Souza Libânio, & Gonçalves Amaral, 2022, p. 9). OH&S issues, which also include safety culture issues, can be analyzed mainly from the perspective of risk identification (Cioni & Savioli, 2016, p. 859). OH&S risk management consists of the following steps: identifying hazards and hazardous events, evaluating associated risks, prioritizing risks, selecting techniques or strategies to manage the risks, implementing the selected techniques and strategies, and finally monitoring their effectiveness in order to avoid incidents (García-Gómez, González-Gaya, & Rosales-Prieto, 2020, p. 2).

OH&S can also be defined as the science that recognizes, evaluates, and controls growing risks located or arising from the work area that can affect the health and well-being of workers. One way to avoid accidents and maintain control over the achievement of objectives and goals is through the development and use of indicators. The OH&S indicators evaluate safety measures and diagnose what is out of legal compliance, providing fundamental information for the planning of accident protection and prevention measures. However, it's necessary that the set of OH&S indicators used by the organization is the most appropriate for the company's reality and that its data collection is substantial for the improvement of the organization's OH&S management. An incorrect selection and use of indicators means a waste of time and resources

for the organization, and, ultimately, a poor safety culture. (Ferrari, Leal, Galdamez, & de Souza, 2020, p. 2)

Occupational safety in individual countries is also determined by the general and specific regulations in force (Malysa, & Gajdzik, 2021b, p. 165). Safety legislation has been growing continuously for the last sixty years, making employers the main ones responsible for their employees' safety (Jørgensen, 2016, p. 46). Legislation and regulations are often seen as the backbone of OH&S management, but on the other hand they also offer advantages for the prevention of risks at work. Despite some limitations, there is undoubtedly a need for OH&S management systems that incorporate regulations and are integrated into the management system of organizations (Ruiz-Frutos, Pinos-Mora, Ortega-Moreno, & Gómez-Salgado, 2019, p. 114). Although each country has its own OH&S requirements, in addition to EU regulation, all countries can use additional systems to improve the situation in this area, such as the use of ISO 18001:2018 (García-Gómez, González-Gaya, & Rosales-Prieto, 2020, p. 15).

International standard ISO 45001:2018 offers guidelines for the standardization of the organization's OH&S system, defining criteria, policies and objectives to be followed. However, for these safety measures to be effective, companies need to maintain control over them. (Ferrari, Leal, Galdamez, & de Souza, 2020, pp. 1)

ISO 45001:2018 specifies the requirements for an occupational health and safety management system, or OH&S system, and provides guidelines for its application, based on ensuring safe and healthy workplaces and the prevention of occupational accidents and ill health. The essential purpose of the OH&S system, besides hazard elimination and risk reduction, is above all to involve workers and their requirements and expectations, as well as the requirements and expectations of other interested parties. An OH&S system that can be implemented in any organization, regardless of its size, type and activity, also helps to meet regulatory requirements and achieve intended results, as it is based on preventive action and continuous improvement within the context in which the organization operates. (ISO, 2022)

ISO 45001:2018 brings a renewed approach by placing the OH&S system at the core of organizational objectives and strategy, encouraging proactive risk management and requiring the maintenance of an effective OH&S system (Karanikas, Weber, Bruschi, & Brown, 2022, p. 1). Thus, one of the solutions that have an impact on improving safety is the use of ISO 45001:2018. The implementation of the OH&S system gives organizations the tools to take on challenges and restrict behaviors that can lead to accidents at work. The aim of the OH&S management system is to control risks that may adversely affect the health and safety of employees. The implementation of the OH&S system allows occupational risk to be maintained at an acceptable level, not only to comply with legal requirements, but also as an element of the assessment of the effectiveness of the OH&S management system (Malysa & Gajdzik, 2021b, p. 165).

Implementing an OH&S system that complies with ISO 45001:2018 enables an organization to manage its OH&S risks and improve its performance in implementing OH&S activities, while helping to meet legal and other stakeholder requirements. The management and maintenance of the OH&S system, its effectiveness, and its ability to deliver the intended results depend on a number of factors, but in particular on the successful integration of the OH&S system into the organization's business processes and its compliance with the organization's legal requirements. Mere adoption of ISO 45001:2018 in each organization will not ensure a reduction in accidents and prevent deterioration in employee health, ensure safe and healthy workplaces and improve OH&S system performance. From the perspective of an occupational accident risk management system, the effective adoption or implementation of the ISO 45001:2018 standard may be understood as a tool that can help an organization to manage these risks. (Brocal, González, Reniers, Cozzani, & Sebastián, 2018, pp. 11-12)

A mere implementation of a management system into an organization's existing business model is very important, as it has an impact on the operational and business performance of the organization, and business performance is one of the key indicators of the organization's activities (Črv & Markič, 2023, p. 235). The implementation of ISO 45001:2018, in particular, supports the organization's efforts to move beyond the focus on individual OH&S components to a better understanding of the whole security domain. This standard addresses the interactions and flow of information in an OH&S system, the functional interdependencies between the elements of the system, the shared responsibility of all those involved, the effects of internal and external factors, and the need to develop the capability of the system to sustain its continuous growth. (Karanikas, Weber, Bruschi, & Brown, 2022, p. 12)

ISO 45001:2018 is a powerful tool that can help organizations control and manage risks, improve working conditions, enable safer and healthier workplaces as well as facilitate safety culture. In addition, ISO 45001:2018 specifies that an organization should implement measures to monitor, analyze and evaluate its OH&S performance, defining what should be measured, what the monitoring methods should be, when the measures should be implemented and when the results should be analyzed. In this way, the organization provides continuous information on the performance of its OH&S system. According to the International Labor Organization, the introduction of ISO 45001:2018, in combination with existing international safety guidelines and other standards, can highlight the strategic importance of OH&S issues in a global context, while providing an opportunity for the management of an organization to take action in the OH&S field and, as a result, implement a more socially responsible vision. Also, ISO 45001:2018 focuses on involving OH&S problems in the decision-making process within organizational management, bringing greater emphasis on the development and use of the OH&S indicators (Ferrari, Leal, Galdamez, & de Souza, 2020, pp. 1-3)

The main objective of ISO 45001:2018 is to prevent OH&S risks, highlighting the process of continuous improvement. The OH&S system is linked to results that generate positive effects when introduced in an organization, impacting both safety and productivity. Thus, the effectiveness and efficiency of the OH&S system become a challenge to corporations that seek

to organize their processes in search for better results. However, as in any other management system, there are margins for obtaining positive and negative results in the OH&S management system according to ISO 9001:2018 as well. (Velošo Fracasso, De Souza Libânio, & Gonçalves Amaral, 2022, pp. 257-258)

Organizations that wish to be competitive in the global market need to meet the demands of an ever-greater number of stakeholders, both internal and external (Črv, 2021b, p. 268). The domain of OH&S must therefore respond to the requirements set by rapid technological development and progress. The OH&S practices have gradually improved over the decades, but there are still many challenges and long-term issues that remain unresolved. New technologies and innovations are rapidly entering the workplace, creating new risks that need to be identified and then managed effectively. Despite increasing knowledge, experience, legislation and standards, technological advances and the automation of many OH&S processes, organizations have still not achieved a significant reduction in the number of occupational accidents and the incidence of occupational diseases (Nicolaidou, Dimopoulos, Varianou-Mikellidou, Boustras, & Mikellides, 2021, p. 1).

The development of safety at work is a multi-step process in the management of an enterprise that has strong behavioral aspects. The key success factors leading to the development of work safety are in accordance with standard ISO 45001:2018 (Malysa & Gajdzik, 2021a, p. 2). On the other hand, accidents at work have economic and social costs, and their occurrence affects the performance of organizations. It is therefore important to develop and implement methods and techniques for the prevention of accidents at work in order to protect the business of organizations. The approach to OH&S management must also consider the technological profile of the organization. In the light of modern concepts of OH&S management, the effective application of technical, organizational, and psychological measures is important for organizations. Technical solutions most often reduce the risk of accidents at work from the outset, organizational measures have an impact on the development of work procedures, while psychological measures focus on employee commitment and their significant influence on the development of a safety culture (Malysa & Gajdzik, 2021b, p. 165).

Based on the theoretical framework findings, our main research question was whether the number of organizations with the ISO 45001:2018-certified OH&S system affects the number of accidents at work in EU member states. The following hypotheses were thus suggested.

Hypothesis 1: »There is a statistically significant correlation between non-fatal and fatal accidents at work. «

Hypothesis 2: »The number of accidents at work depends on the number of persons in employment. «

Hypothesis 3: »The number of ISO 45001:2018 certificates depend on the number of persons in employment. «

Hypothesis 4: »ISO 45001:2018 certificate rate affects the incidence rate. «

3 Method

The last publicly available data on the number of accidents at work reported by Eurostat, the Statistical Office of the European Union, relates to year 2020. Therefore, in addition to this data, data on fatal and non-fatal accidents as well as data on the number of employed persons was taken from the same source and for the same period. Data on the number of ISO 45001:2018 certificates for 2020 was obtained from ISO, the International Organization for Standardization (ISO Survey 2020, 2022). Using this data, an empirical analysis was performed.

Eurostat, the Statistical Office of the European Union, and ISO, the International Organization for Standardization, periodically publish data that has been extracted and processed based on their own validated methods, which are publicly available. By making this information public, they both guarantee their reliability and credibility.

In addition to the absolute values for the number of accidents at work and the number of ISO 45001:2018 certificates awarded, the incidence rate and the ISO 45001:2018 certificate rate were also used in the analysis.

The incidence rate was calculated using equation 1, adapted from the ESAW methodology (ESAW, 2013, p. 16).

$$\text{Incidence rate} = \frac{\text{number of accidents (fatal or non – fatal)}}{\text{number of employed persons in the covered population}} \times 100,000 \quad (1)$$

Using the same methodology, the ISO 45001:2018 certificate rate was calculated with equation 2.

$$\begin{aligned} &\text{ISO 45001 certificate rate} \\ &= \frac{\text{number of ISO 45001: 2018 standards}}{\text{number of employed persons in the covered population}} \times 100,000 \quad (2) \end{aligned}$$

The existence of a possible statistical correlation between the factors considered in the hypotheses was examined using the Spearman's correlation coefficient "rs", considering a confidence level of 95% and a significance level α at 0.05. The relationship or interaction between the ISO 45001:2018 certificate rate and incidence rate was further tested using regression analysis.

The distribution of accidents at work and ISO 45001:2018 certificates in 2020 by individual EU member states is shown in bar charts.

Statistical processing of numerical data used in the analysis was done by means of the Minitab software version 19.2020.1.

Figure 1 illustrates the research model and the set hypotheses.

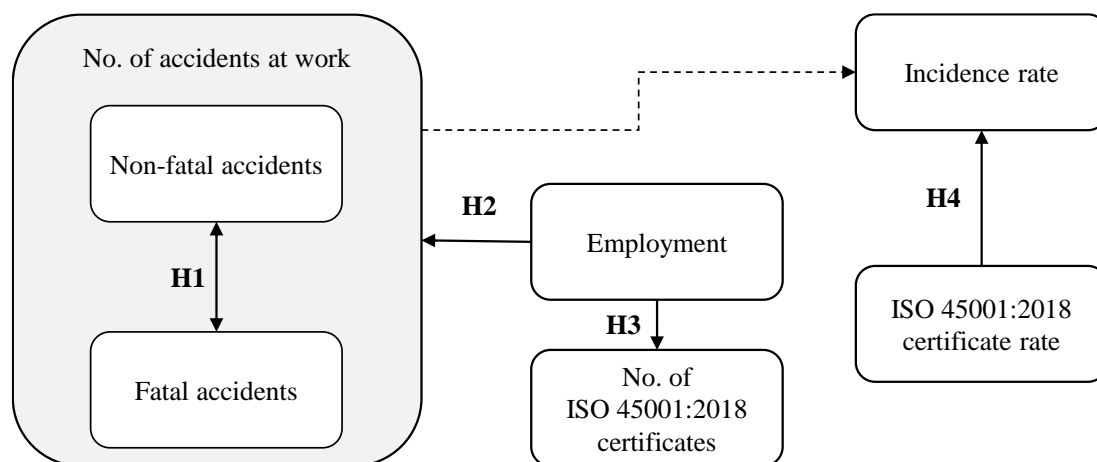


Figure 1. Research model and the set hypotheses.

The sample in our research consisted of current EU member states (the total of 27 countries) as follows: Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

4 Results

4.1 Accidents at work in EU

The Statistical Office of the European Union recorded 2,738,920 accidents at work in 27 EU member states in 2020, 3,355 of which were fatal accidents. Germany was the country with the highest number of non-fatal accidents (766,192), followed by France (623,654), Spain (388,474), Italy (323,683) and Portugal (108,772), while the European average was at 101,317. Other EU countries were below the EU average in terms of the number of non-fatal accidents recorded, while Cyprus recorded the lowest number of non-fatal accidents (1,511). The highest number of fatal accidents was reported in Italy (776), while France (541), Spain (392), Germany (371), Poland (190), Romania (179) and Portugal (131) were also above the EU average (124). Luxembourg and Malta are the leaders among countries with the number of fatal accidents below the EU average, with their numbers being the lowest (7).

Considering individual EU countries in terms of the absolute value of accidents at work would not be optimal, as countries vary considerably in terms of the number of persons in employment. Therefore, the analysis also considered country-specific data on the incidence rate, which was

calculated based on the equation given in the ESAW methodology (equation 1). The incidence rate is defined as the number of accidents at work per 100,000 persons in employment. The incidence rate for non-fatal accidents at work is shown in Figure 2.

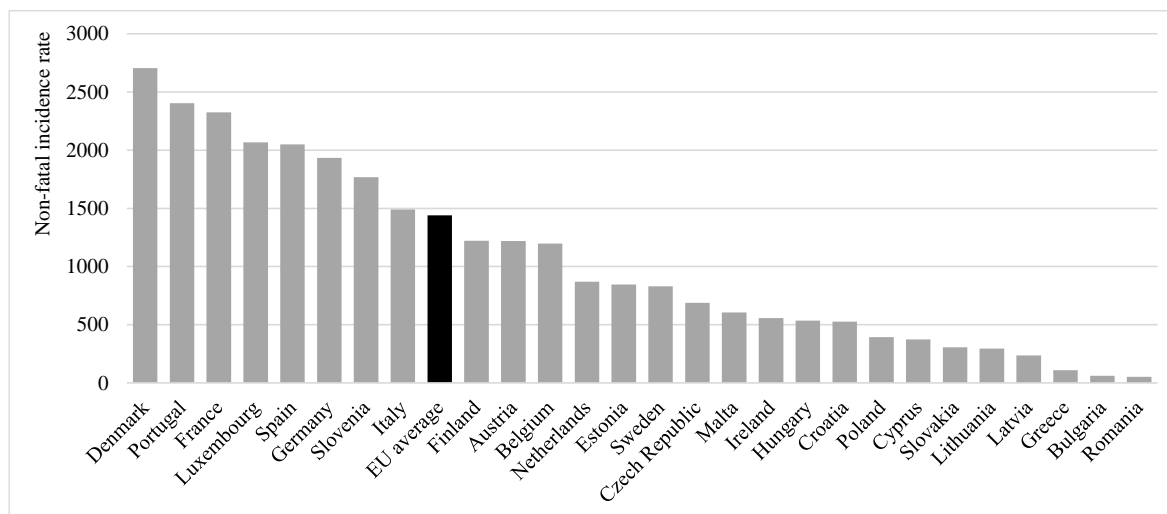


Figure 2. Incidence rate for non-fatal accidents at work.

The highest incidence rate for non-fatal accidents at work was recorded in Denmark (2,705), followed by Portugal (2,404), France (2,324), Luxembourg (2,067), Spain (2,049), Germany (1,934), Slovenia (1,769), Italy (1,490), Finland (1,222), Austria (1,219), Belgium (1,197), the Netherlands (869), Estonia (845), Sweden (830), the Czech Republic (687), Malta (605), Ireland (558), Hungary (536), Croatia (526), Poland (392), Cyprus (373), Slovakia (306), Lithuania (294), Latvia (235), Greece (110), Bulgaria (61) and Romania (52). The incidence rate for non-fatal accidents at work in the EU was 1,439.

The incidence rate for fatal accidents at work is shown in Figure 3.

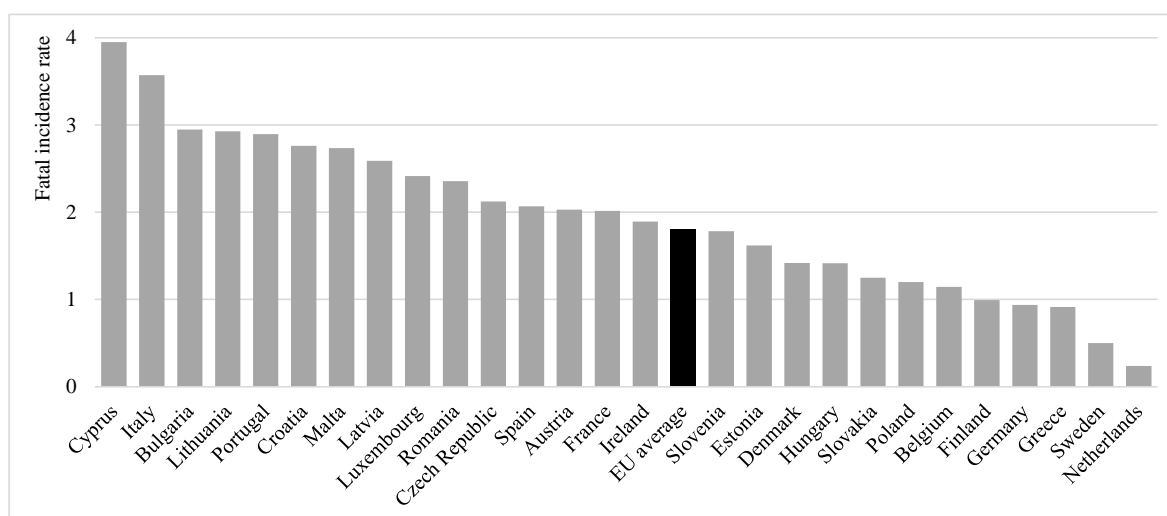


Figure 3. Incidence rate for fatal accidents at work.

The highest incidence rate for fatal accidents at work was recorded in Cyprus (4.0), followed by Italy (3.6), Bulgaria (2.9), Lithuania (2.9), Portugal (2.9), Croatia (2.8), Malta (2.7), Latvia (2.6), Luxembourg (2.4), Romania (2.4), the Czech Republic (2.1), Spain (2.1), Austria (2.0), France (2.0), Ireland (1.9), Slovenia (1.8), Estonia (1.6), Denmark (1.4), Hungary (1.4), Slovakia (1.2), Poland (1.2), Belgium (1.1), Finland (1.0), Germany (0.9), Greece (0.9), Sweden (0.5) and the Netherlands (0.2). The incidence rate for fatal accidents at work in the EU was 1.8.

The absolute numbers of persons in employment as well as the absolute numbers of combined non-fatal and fatal accidents at work are shown in Figure 4.

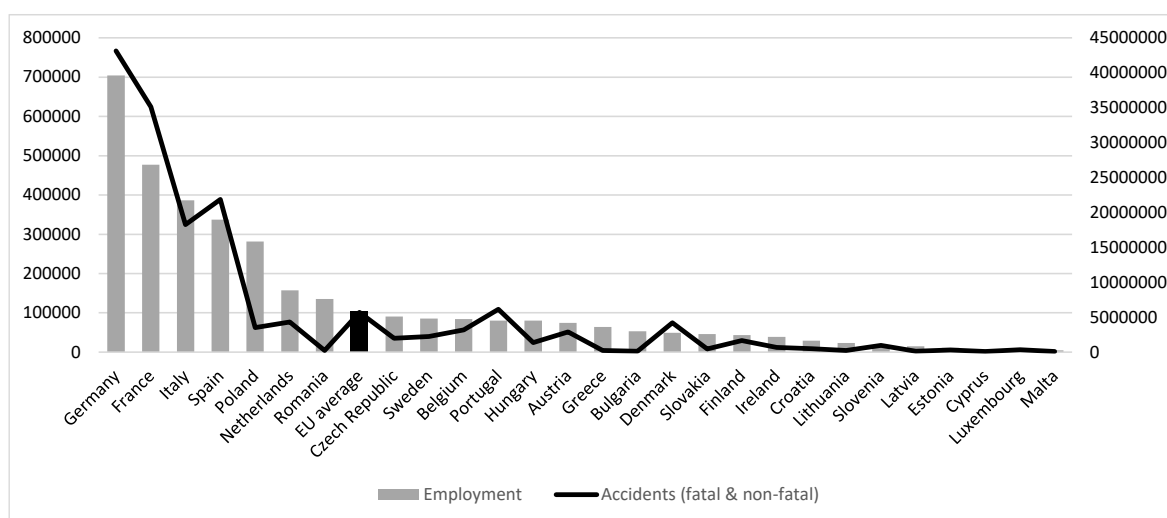


Figure 4. Number of employees and number of accidents at work.

The highest number of persons in employment in 2020 was in Germany (39,621,000), followed by France (26,832,000), Italy (21,721,000), Spain (18,958,000), Poland (15,853,000), the Netherlands (8,849,000) and Romania (7,592,000). These countries were above the EU average of 5,809,418 persons employed. The number of persons in employment in other EU member states was below the EU average and was as follows: the Czech Republic (5,087,000), Sweden (4,805,000), Belgium (4,720,000), Portugal (4,525,000), Hungary (4,519,000), Austria (4,185,000), Greece (3,607,000), Bulgaria (2,985,000), Denmark (2,753,000), Slovakia (2,564,000), Finland (2,420,000), Ireland (2,165,000), Croatia (1,630,000), Lithuania (1,298,000), Slovenia (954,000), Latvia (850,000), Estonia (618,000), Cyprus (405,000), Luxembourg (290,000) and Malta (256,000).

It is evident from Figure 4 that in Italy, which has a higher number of employed persons than Spain, the number of recorded accidents at work is lower. Another such example is Poland versus the Netherlands. The case of Portugal and Hungary is also interesting. In this case, the two countries have roughly the same number of employed persons, but Hungary has a lower number of accidents at work than Portugal.

4.2 ISO 45001:2018 certificates in EU

The International Organization for Standardization (ISO) reported that there were 30,849 organizations in the EU in 2020 that had the OH&S system certified to ISO 45001:2018 (ISO Survey 2020, 2022). The number of ISO 45001:2018-certified organizations by individual EU member states is shown in Figure 5.

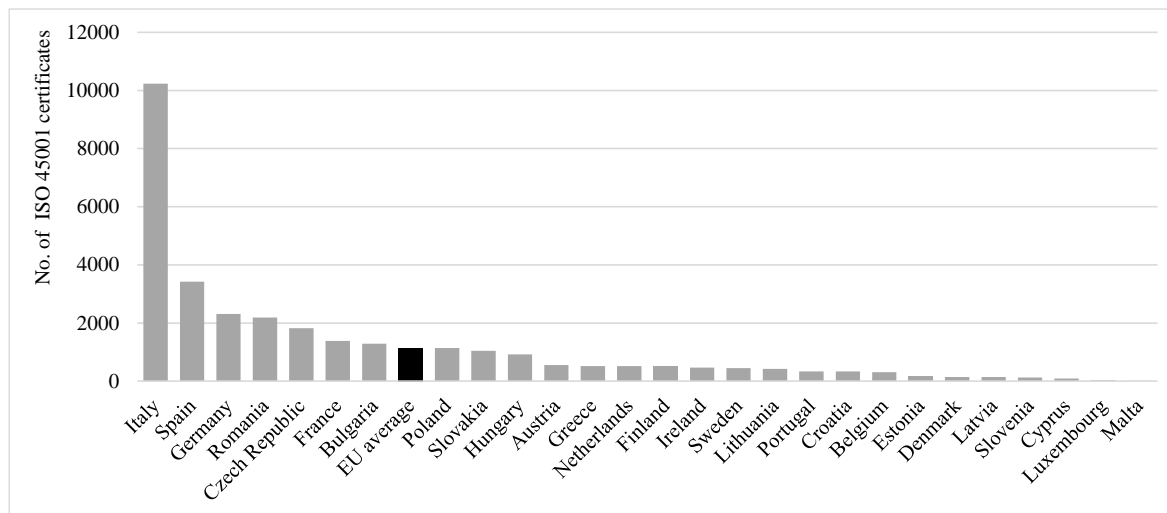


Figure 5. The number of ISO 45001:2018-certified organizations in EU.

With 10,230 organizations, Italy was the country with the highest number of ISO 45001:2018 certificates, followed by Spain with 3,420 certificates, a number three times lower than that in Italy. Countries that were above the EU average (1,143 certificates) were as follows: Germany (2,310 certificates), Romania (2,191 certificates), the Czech Republic (1,823 certificates), France (1,385 certificates) and Bulgaria (1,287 certificates). These countries were then followed by Poland (1,141), Slovakia (1,039), Hungary (917), Austria (550), Greece (522), the Netherlands (516), Finland (493), Ireland (462), Sweden (446), Lithuania (418), Portugal (339), Croatia (333), Belgium (308), Estonia (171), Denmark (144), Latvia (141), Slovenia (125), Cyprus (92), Luxembourg (32) and Malta (14).

In our analysis, data on the ISO 45001:2018 certificate rate was also used (equation 2). The ISO 45001:2018 certificate rate provides information on the rate of certificates per 100,000 employed persons and is shown in Figure 6.

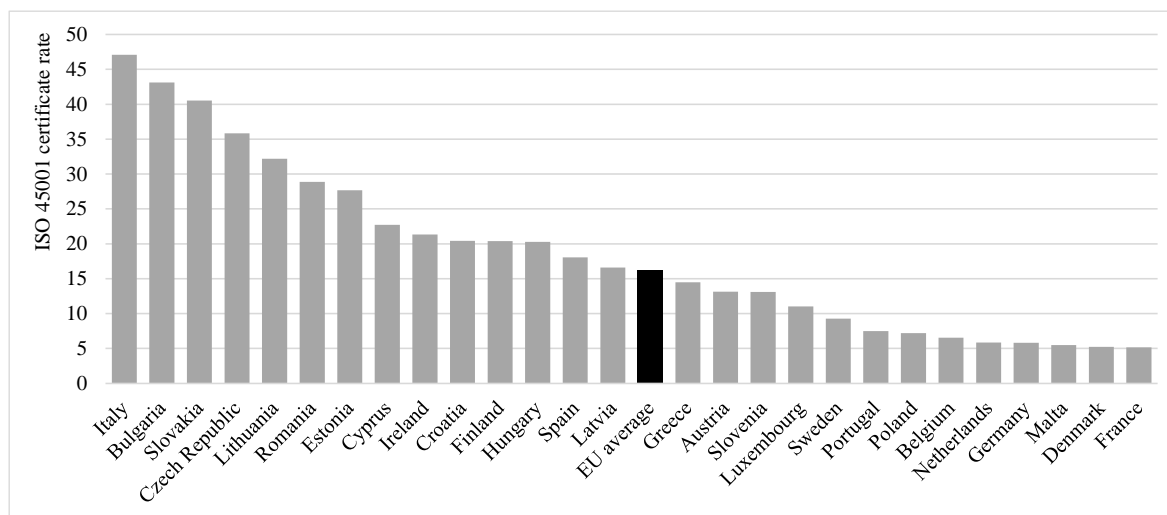


Figure 6. ISO 45001:2018 certificate rate.

Here, too, Italy was at the top among the EU countries with 47 ISO 45001:2018 certificates issued per 100,000 persons in employment. Countries that were above the EU average of 16 certificates were as follows: Bulgaria (43), Slovakia (41), the Czech Republic (36), Lithuania (32), Romania (29), Estonia (28), Cyprus (23), Ireland (21), Croatia (20), Finland (20), Hungary (20), Spain (18) and Latvia (17). The following countries were below the EU average: Greece (14), Austria (13), Slovenia (13), Luxembourg (11), Sweden (9), Portugal (7), Poland (7), Belgium (7), the Netherlands (6), Germany (6), Malta (5), Denmark (5) and France (5).

4.3 Correlation between accidents at work and ISO 45001:2018 certificates

Possible correlations between the factors considered are shown in Table 1.

Table 1. The Spearman's correlation coefficient values for chosen factors

	No. of fatal accidents at work	No. of employed persons	Incidence rate
No. of non-fatal accidents at work	$r_s = \mathbf{0.615}$ $CI = 0.274; 0.819$ $p = 0.001$		
No. of accidents at work		$r_s = \mathbf{0.789}$ $CI = 0.545; 0.910$ $p < 0.001$	
No. of ISO 45001:2018 certificates		$r_s = \mathbf{0.835}$ $CI = 0.629; 0.931$ $p < 0.001$	
ISO 45001:2018 certificate rate			$r_s = -\mathbf{0.543}$ $CI = 0.777; 0.178$ $p = 0.003$

The Spearman's correlation coefficient r_s between the number of non-fatal and fatal accidents at work is 0.615 and has a significant positive value, indicating a strong correlation between the two factors considered.

The correlation coefficient calculated for the interaction between the number of accidents at work and the number of employed persons has an equally significant positive value of 0.789, indicating a strong correlation between the two factors.

The calculated correlation coefficient between the number of ISO 45001:2018 certificates and the number of employed persons amounts to 0.835, reflecting a significant positive value and a very strong correlation between the two discussed factors.

The calculated correlation coefficient between the ISO 45001:2018 certificate rate and the incidence rate is -0.543 , indicating a significant negative value and a moderate correlation between the two factors.

The existence of a possible statistical correlation between the ISO 45001:2018 certificate rate and the incidence rate was examined using the regression analysis, where the independent variable was the ISO 45001:2018 certificate rate, while the incidence rate was the dependent variable.

The results of the regression analysis are given in Table 2.

Table 2. Results of regression analysis for chosen factors

Term	Coefficient	SE coefficient	T value	P value	VIF
Constant	1573	253	6,21	0,000	
ISO 45001:2018 rate	-29.3	-2.58	0,67	0.016	1.00

The p-value of the independent variable, i.e., the ISO 45001:2018 rate, is lower than the default value of statistical significance of 0.05, which means that there is sufficient evidence to conclude that the ISO 45001:2018 certificate rate correlates with the dependent variable, i.e., the incidence rate.

The regression model summary is given in Table 3.

Table 3. Regression model summary

S	R-sq	R-sq(adj)	R-sq(pred)
722.836	21.09%	17.93%	4.45%

R-sq is the percentage of variation in the response that is explained by the model. In our example, R-sq or the percentage of variation in the response explained by the model is 21.09%.

The analysis of variance is summarized in Table 4.

Table 4. Analysis of variance

Source	DF	Adj SS	Adj MS	F value	P value
Regression	1	3491035	3491035	6.68	0.016
ISO 45001:2018 rate	1	3491035	3491035	6.68	0.016
Error	25	13062308	522492		
Total	26	16553343			

The p-value of the independent variable, i.e., the ISO 45001:2018 rate, is lower than the default value of statistical significance of 0.05, which means that it can reasonably be concluded that there is a statistically significant correlation between the ISO 45001:2018 certificate rate and the incidence rate.

The correlation between the independent variable or the ISO 45001:2018 rate and the response in the regression model, represented by the dependent variable or the incidence rate, was formulated in the form of the following regression equation:

$$\text{Incidence rate} = 1573 - 29.3 \times \text{ISO 45001:2018 rate} \quad (3)$$

5 Discussion

In 2020, 2,735,565 non-fatal accidents at work and 3,355 fatal accidents at work were recorded in EU countries. In almost all sectors, the number of recorded accidents at work dropped in 2020 compared to 2019, except for health care (Eurostat, 2022). In absolute terms, the highest number of non-fatal accidents at work was recorded in Germany (766,192), while the lowest numbers were observed in Cyprus (1,511). The EU average for non-fatal accidents was at 101,317. In the case of fatal accidents, the highest number was recorded in Italy (776), while the lowest in Luxembourg and Malta (7). The EU average was 124 fatal accidents.

To make a more realistic comparison across the EU member states in terms of the incidence of accidents at work, the analysis also considered the incidence rate, which represents the rate of accidents at work per 100,000 persons in employment (Equation 1). EU member states differ in size and population, which also affects the number of people employed, so comparing them in terms of absolute numbers of accidents at work would not be most optimal. Based on the incidence rate, it was established that the highest number of non-fatal accidents at work per 100,000 persons in employment was recorded in Denmark (2,705), while the lowest in Romania (52). The incidence rate for the whole of EU amounted to 1,439 (Figure 2). As regards fatal accidents, the highest incidence rate was observed in Cyprus (4.0), and the lowest in the Netherlands (0.2). The incidence rate for the EU was 1.8 (Figure 3). In addition, the study found that some countries, such as Italy versus Spain, Poland versus the Netherlands, and Denmark versus Bulgaria, have a higher number of employed persons but show a lower number of accidents at work (Figure 4). On the other hand, Portugal (4,525,000) and Hungary (4,519,000), for example, have roughly the same number of employed persons, but Portugal has 4.5-times as many accidents at work as Hungary. Jacinto and Aspinwall (2004, pp. 933 - 936) found in their survey that European countries have different methods and procedures for collecting and

compiling data on occupational accidents, which inevitably poses problems when comparing accident statistics between the EU member states. They also found that there are differences in the legal definition of an accident at work across EU countries, as also agreed by Małysa, Nowacki, and Lis (2017, p. 2244). In this context, one might wonder whether the data on recorded accidents at work in EU countries really reflects the reality of the situation. Finally, Molinero-Ruiz, Pitarque, Fondevila-McDonald, and Martin-Bustamante (2015, p. 72) add thereto that there is great room for improvement in collecting and compiling data on accidents at work.

In 2020, there were 30,849 organizations in the EU that had the OH&S management system certified to ISO 45001:2018 (ISO Survey 2020, 2022). Among these countries, Italian organizations stood out with 10,230 certificates awarded, followed by Spanish organizations with 3,420 certificates. The lowest number of certificates in absolute numbers were owned by organizations in Malta, i.e., 14 certificates. The EU average was 1,143 ISO 45001:2018 certificates (Figure 5).

EU member states differ in size and population, which also affects the number of people employed, so comparing them in terms of absolute numbers of accidents at work would not be most optimal (Olkiewicz, Wolniak, & Skotnicka-Zasadzień, 2019, p. 873). Therefore, for a more realistic comparison, our analysis took into consideration the ISO 45001:2018 certificate rate, representing the rate of certificates per 100,000 employed persons (Equation 2). In terms of certificate rate, the highest rate was observed in Italy (47), followed by Bulgaria (43), Slovakia (41), the Czech Republic (36) and Lithuania (32). The lowest rate was recorded in France (5). The EU certificate rate was 16 ISO 45001:2018 certificates per 100,000 persons in employment.

The set hypotheses were tested using the Spearman's correlation coefficients r_s (Table 1).

Hypothesis 1: There is a statistically significant correlation between non-fatal and fatal accidents at work.

The correlation coefficient calculated between the number of non-fatal accidents and fatal accidents at work was 0.615, indicating a significant positive value. This led us to conclude that there is a strong correlation between the two factors (Table 1). Coelho (2018, pp. 93-97) also found in his study a moderate correlation between non-fatal and fatal accidents at work. He further established that fatal accidents at work are two to three orders of magnitude below non-fatal accidents at work, and that in many countries there is one fatal work accident for roughly every thousand non-fatal work accidents. This correlation was also observed by Bellamy (2015, p. 93) who claims that smaller severity more frequent accidents can provide information about the direct and underlying causes of bigger severity more catastrophic accidents. Based on the results obtained, Hypothesis 1 was confirmed.

Hypothesis 2: The number of accidents at work depends on the number of persons in employment.

The calculated correlation coefficient between the number of accidents at work and the number of employed persons was 0.789, showing a strong correlation between the two factors considered (Table 1). As regards this correlation, Cioni and Savioli (2016, p. 859) claim that it can be analyzed through various lenses, including employee profile. However, Valluru, Dekker, and Rae (2017, p. 786) claim that there is evidence suggesting both that the use of subcontractors is increasing and that the accident rates associated with subcontractor employees are higher than those of operator/site owner employees. Finally, Hammond, Bowen, Hallman, and Heaton (2019, p. 506) point to the rapid growth of the aging workforce, which may have a negative impact on the overall OH&S, as well as the number of accidents at work. Based on the calculated correlation coefficient, Hypothesis 2 was confirmed.

Hypothesis 3: The number of ISO 45001:2018 certificates depend on the number of persons in employment.

The correlation coefficient calculated between the number of ISO 45001:2018 certificates and the number of employed persons was 0.835, illustrating a significant positive value. Based thereon, it was established that there is a very strong correlation between the two factors studied (Table 1). ISO 45001:2018 is a powerful tool that can be implemented in any type of organization, regardless of its industry (ISO, 2022), and one that can help organizations improve the safety of their workplaces, and above all, the safety culture (Ferrari, Leal, Galdamez, & de Souza, 2020, pp. 1-3). Based on the very strong correlation found between the number of ISO 45001:2018 certificates and the number of employed persons, Hypothesis 3 was confirmed.

Hypothesis 4: ISO 45001:2018 certificate rate affects the incidence rate.

The calculated correlation coefficient between the ISO 45001:2018 certificate rate and the incidence rate was -0.543 , indicating a significant negative value and a moderate correlation between the two factors observed. The existence of a possible statistical correlation between the two factors was also examined using the regression analysis. It was established that the p-value of the independent variable, i.e., the ISO 45001:2018 rate, was 0.016, which was lower than the default value of statistical significance of 0.05. It is thus reasonable to conclude that there is a statistically significant correlation between the ISO 45001:2018 certificate rate and the incidence rate. Finally, it is also evident from the regression equation for incidence rate, that the incidence rate decreases as the number of organizations certified to ISO 45001:2018 increases (Equation 3). Based on the results obtained, Hypothesis 4 was confirmed.

6 Conclusion

Workplace safety is an increasingly important topic around the world (Cioni & Savioli, 2016, p. 858), and issues relating thereto have been gaining increasing public attention (Chen, Hou, Zhang, & Li, 2020, pp. 1-5), as the issue of ensuring the safety of workers at work is one of the key elements for the functioning of modern enterprises (Malysa & Gajdzik, 2021a, p. 1). One of the effective tools that can have an impact on improving safety in organizations is the

implementation of an OH&S system according to the ISO 45001:2018 standard (Malysa & Gajdzik, 2021b, p. 165).

Our study focused on accidents at work and the OH&S system certified to standard ISO 45001:2018, and our main objective was to answer the main research question of whether the number of organizations with the ISO 45001:2018-certified OH&S system affects the number of accidents at work in EU member states.

Our survey results show that in 2020, 2,738,920 accidents at work were recorded in EU member states. In absolute terms, the highest number of non-fatal accidents at work was observed in Germany (766,192), while the number of fatal accidents was the highest in Italy (776). Since EU member states differ in size and population (Olkiewicz, Wolniak, & Skotnicka-Zasadzień, 2019, p. 873), and organizations operating in these countries also differ in size as well as in the industry in which they operate (Črv, 2021a, p. 87), the study also looked at the incidence rate. Thus, it was established that the highest number of non-fatal accidents at work per 100,000 persons in employment (Figure 2) was recorded in Denmark (2,705), while the highest incidence rate for fatal accidents was observed in Cyprus (4.0). In 2020, there was a total of 190 million persons employed in the EU, most of them in Germany - 39.6 million.

In addition to EU regulation, each of its member states may have its own additional OH&S requirements. Moreover, countries use different tools to reduce accidents at work. One of the most recognizable standardized tools is the OH&S management system certified to ISO 45001:2018 (García-Gómez, González-Gaya, & Rosales-Prieto, 2020, p. 15), the main objective of which is to prevent OH&S risks (Velooso Fracasso, De Souza Libânio, & Gonçalves Amaral, 2022, pp. 257-258), which is, together with an active role of management, reflected in the reduction of accidents at work (Stefanović, Dobrosavljević, Urošević, & Mladenović-Ranisavljević, 2022, pp. 1850-1855). Therefore, in 2020, there were 30,849 organizations in the EU with the OH&S system certified to ISO 45001:2018. Italy was the country that stood out both in terms of the absolute number of certified organizations and in terms of the certificate rate or rather the number of ISO 45001:2018 certificates per 100,000 persons employed (Figures 5 and 6).

In our study, four hypotheses were set and then confirmed based on the obtained results. Thus, it was established that there is a strong positive correlation between the number of non-fatal and fatal accidents at work, as well as between the number of accidents at work and the number of employed persons. There is also a very strong positive correlation between the number of ISO 45001:2018 certificates and the number of employed persons. It was also found that there is a moderate negative correlation between the ISO 45001:2018 certificate rate and the incidence rate (Table 1).

The results of the analysis, which led us to confirm the most important hypothesis 4, answered the main research question. The main finding of our research was thus that the number of organizations certified to the ISO 45001:2018 standard does affect the number of accidents at

work in EU member states (Table 1). This was also confirmed by the regression equation for incidence rate. It is namely evident from the regression equation that an increase in the number of certified organizations results in a decrease of the incidence rate (Equation 3). Ajmal, Isha, Nordin, and Al-Mekhlafi (2022, p. 1) also found that the OH&S management plays a very important role in intervening in the caution process of occupational accidents, while Ajmal, Isha, Nordin, and Al-Mekhlafi (2022, p. 13) also established the existence of a direct impact of the OH&S management on accidents at work. Biswas, Begum, Van Eerd, Smith, and Gignac (2021, p. 1) add that the OH&S system is a tool that supports the health and safety of employees, whereby Małysa, Nowacki, and Lis (2017, p. 2244), find that the cooperation of employees largely contributes to the reduction of accidents at work.

Various studies in the field of OH&S have already been conducted by several researchers, such as Valluru, Dekker, and Rae (2017, p. 785) who examined why subcontractors face different safety challenges when compared with operator/site owner employees. Sjöberg Forsberg, Vånje, and Parding (2022, p. 1) studied the impact of gender on safety at work, while Małysa, Nowacki, & Lis (2017, p. 2244) examined the correlation between the structure of employment and accidents at work. Further, Malysa and Gajdzik (2021, p. 1) investigated the dependence between the number of accidents at work, demographic characteristics (sex, age) and work experience of injured persons, and Coelho (2018, p. 86) studied the dimensions of social and working conditions. No study was discovered that would address the impact of the OH&S management system certified to ISO 45001:2018 on the number of accidents at work; thus, our study is the first of its kind in the EU.

Organizations in EU member states can use our survey to obtain information about non-fatal and fatal accidents at work and the ISO 45001:2018 certifications awarded. The comparison of the incidence rate and certificate rate may be of great interest to them. But what matters most to them is our answer to the main research question. Our findings confirm that the OH&S management system certified to ISO 45001:2018 is a useful tool, reducing the number of accidents at work. This enables organizations to set new policies and goals in this domain and invest in additional resources to ensure that the process of continuous improvement of the OH&S management system works. Moreover, organizations that are not yet ISO 45001:2018 certified will now find it much easier to do so, based on the findings of our survey.

The research was narrowed down to the current 27 EU member states. The last publicly available data on the number of accidents at work was published by the Statistical Office of the European Union for year 2020. Therefore, our study also incorporated data from ISO, the International Organization for Standardization, for the same period. Additionally, accidents at work were only studied in terms of non-fatal and fatal accidents and were not analysed in detail.

Taking into consideration our study and its findings, it would be useful to extend the study to the geographical area of Europe and to also include in its countries that are not members of the EU. We further suggest that the study be expanded in terms of addressing the industries in which organizations operate. In particular, we suggest that the research be repeated and

conducted over several consecutive years, which would enable the study of the trend of the effect of the ISO 45001:2018-certified OH&S system on the number of accidents at work.

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Povzetek:

Nesreče pri delu in sistem vodenja varnosti in zdravja pri delu ISO 45001:2018 v EU

Raziskovalno vprašanje (RV): Zdravje in varnost zaposlenih pri delu (OH&S) je pomemben temelj družbenega razvoja in eden ključnih elementov delovanja sodobnih organizacij, zato je bilo naše glavno raziskovalno vprašanje ali število organizacij s certificiranim sistemom OH&S po standardu ISO 45001:2018 vpliva na število nesreč pri delu v državah članicah EU.

Namen: Glavni namen je bil odgovoriti na raziskovalno vprašanje. Poleg tega pa tudi preučiti obstoj morebitnih povezav med nesrečami pri delu, številom zaposlenih v državah članicah Evropske Unije in številom organizacij, certificiranih po standardu ISO 45001:2018.

Metoda: Analiza je temeljila na podatkih Eurostat o številu nesreč pri delu in številu zaposlenih v 27. državah članicah EU ter mednarodne organizacije za standardizacijo ISO o številu certificiranih organizacijah po standardu ISO 45001:2018 za leto 2020. Za izračun stopnje incidence nesreč pri delu in stopnje certifikatov smo uporabili metodologijo ESAW. Numerične podatke, uporabljene v analizi, smo statistično obdelali z uporabo programske opreme Minitab, pridobljene rezultate smo prikazali s stolpčnimi grafikoni. Zastavljene hipoteze smo preverjali z rezultati izračunov Spearmanovega koeficienta korelacije »r_s« in regresijsko analizo.

Rezultati: V letu 2020 je bilo v državah EU zabeleženih 2,738,920 nesreč pri delu, od tega 3,355 nesreč s smrtnim izidom. V absolutnem številu je bilo največ nesreč brez smrtnega izida zabeleženo v Nemčiji, največ nesreč s smrtnim izidom pa v Italiji. Najvišjo stopnjo incidence za nesreče brez smrtnega izida so zabeležili na Danskem, najvišjo stopnjo incidence za nesreče s smrtnim izidom pa na Cipru. V letu 2020 je bilo v EU 30,849 organizacij s certificiranim sistemom OH&S po standardu ISO 45001:2018, največ v Italiji, ki je izkazala tudi največje število podeljenih certifikatov na

100,000 zaposlenih. Ugotovili smo, da med številom nesreč pri delu, številom zaposlenih, številom ISO 45001:2018 certifikatov, stopnjo incidence in stopnje certifikatov obstajajo povezanosti. Glavna ugotovitev raziskave pa je, da število organizacij, certificiranih po standardu ISO 45001:2018 vpliva na število nesreč pri delu v državah članicah EU. Povečevanje števila certificiranih organizacij ima namreč za posledico zmanjševanje stopnje incidence.

Organizacija: Raziskava podaja informacije o nesrečah pri delu in številu podeljenih certifikatov ISO 45001:2018 v državah EU, medtem, ko je zanje najpomembnejša ugotovitev, da uporaba sistema vodenja OH&S po standardu ISO 45001:2018 zmanjšuje nesreče pri delu. Rezultati naše raziskave lahko spodbudijo tiste organizacije, ki še niso certificirane, da to storijo.

Družba: Ugotovitve naše raziskave so lahko podlaga družbi, predvsem pa zakonodajalcem, da okrepijo ukrepe v smislu spodbud, da bi se organizacije odločale za certifikacijo sistema OH&S po standardu ISO 45001:2018, kar bi imelo pozitiven vpliv na zmanjševanje nesreč pri delu.

Originalnost: Raziskava je obravnavala aktualnih 27 držav članic EU in temeljila na zadnjih javno dostopnih podatkih Eurostat o nesrečah pri delu za leto 2020. Predvsem pa je iz vidika preučevanja vpliva sistema vodenja OH&S po standardu ISO 45001:2018 na nesreče pri delu, naša raziskava prva taka raziskava v EU.

Omejitve/nadaljnje raziskovanje: Raziskava je bila omejena na področje EU in zadnje javno dostopne podatke o nesrečah pri delu Eurostat za leto 2020. Nesreče pri delu smo preučevali le iz stališča nesreč s in brez smrtnega izida in jih nismo podrobneje razčlenjevali. Našo raziskavo bi bilo smiselno razširiti na geografsko področje Evrope ter jo poglobiti v smislu vključitve obravnave dejavnosti, v katerih organizacije delujejo. Predvsem pa predlagamo, da bi v raziskavi obravnavali več zaporednih let, kar bi omogočilo preučevanja trenda vpliva sistema vodenja OH&S po standardu ISO 45001:2018 na nesreče pri delu.

Ključne besede: sistem vodenja varnosti in zdravja pri delu, nesreče pri delu, ISO 45001:2018, stopnja incidence, Evropska Unija.

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