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Risk Assessment, Risk Identification, and Control in The Process Of Steel Smelting Using the Hiradc Method

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ABSTRACT

Workplace accidents include illnesses brought on by working conditions, accidents on the way to and from work, and other incidents. Steel smelting, an operation that involves melting steel to produce an iron rod (billet), which is subsequently molded into different materials needed, is one of the work environments where accidents can happen with risks ranging from low to severe. Using the HIRADC approach, work safety can undoubtedly be evaluated. Using a scale based on the potential outcome, this method can identify the risk, dangers, and assessments that may arise throughout the steel-smelting process. The HIRADC approach will be used in this study to identify risks and gauge the likelihood of accidents in the Indonesian steel smelting process. As a result, 36 dangers with varying levels of low, medium, and high risk exist. Various additional safety tools must be owned because Indonesia's level of safety control is still quite poor.

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1. INTRODUCTION

The implementation of Occupational Safety and Health, commonly referred to as K3, plays a pivotal role in safeguarding individuals from potential accidents and occupational diseases[1]. K3 not only serves as a protective measure against various workplace risks but also serves as a means of ensuring safety and well-being within the work environment [2]. Its primary objective is to cultivate a secure and comfortable workspace that ultimately enhances productivity levels[3]. K3 is a fundamental necessity across all sectors of employment, ranging from large-scale building construction projects like apartments to critical industries such as healthcare, specifically in hospitals. The wide-ranging application of K3 is driven by its potential to prevent and mitigate the risks associated with work-related accidents and occupational diseases[4]. One of the key components of K3 is the provision of comprehensive training programs in Occupational Health and Safety (OHS)[5]. These training initiatives are instrumental in reducing the likelihood of workplace accidents [6]. It's worth noting that there exists a direct correlation between an employee's knowledge of OHS and their susceptibility to accidents [7]. The more informed and aware employees are about OHS practices, the lower the risk of accidents, while inadequate knowledge in this area increases the likelihood of workplace mishaps[8].

Figure 1. Occupational Safety and Health

In many instances, work-related accidents can be traced back to deficiencies in the management's commitment to implementing Occupational Health and Safety measures (K3) [9]. This inadequacy forms the foundation of workplace accidents [10]. In light of the escalating incidence of work-related accidents and the associated losses, as well as the growing potential hazards inherent in production processes, it becomes imperative for organizations to adopt effective, all-encompassing, and integrated OHS management strategies. Effective management of OHS within organizations carries multiple benefits [11]. It not only minimizes the likelihood of accidents but also enhances employees' morale and instills confidence in the organization's management. This, in turn, fosters a safer and more productive work environment, contributing to the overall success and sustainability of the organization [12].

Nonetheless, it remains a challenge to make occupational safety and health (OSH) the primary guiding principle for many individuals, particularly in Indonesia [13]. This persistent issue has led to a high incidence of workplace accidents across various sectors, including engineering, technical, and others. An OSH expert in the United States has underscored the substantial role of human error in work-related accidents. It is evident that a significant portion, ranging from 80% to 90%, of work accidents can be attributed to negligence or individual errors [14]. These unfortunate incidents not only result in injuries but also damage equipment and, tragically, claim lives [15]. Furthermore, they have a profound impact on the quality of work, production efficiency, and overall profitability. Regrettably, many individuals tend to underestimate the importance of occupational health and safety. They often rely on assumptions and guesswork, assuming that their familiarity and experience in their respective fields make them immune to accidents. This overconfidence can lead to complacency, where individuals believe that nothing will go wrong because they feel capable and proficient in what they do. In response to these pressing issues, the author has chosen to employ the Hazard Identification, Risk Assessment, and Determining Control (HIRADC) method. This approach helps in identifying and assessing potential dangers, evaluating risks, and ultimately serves as a solution to enhance awareness among individuals, particularly employees, regarding the importance of OSH and its integration into their daily behavior.

In light of the aforementioned challenges, the primary objective of this article is to reach out to individuals, particularly employees, with the hope of instilling a profound understanding of the significance of OSH when performing their duties. This understanding should be reflected in their daily behavior and work practices. The utilization of OSH assessments, aimed at reducing workplace risks, serves as a valuable tool for obtaining data on potential hazards, especially for those directly involved in the tasks. By minimizing risks, we not only mitigate individual losses but also safeguard public interests and well-being. The pressing issue of work-related accidents persists due to the lack of attention to occupational safety and health practices. Human error plays a substantial role in these incidents. To address this, the HIRADC method is being employed to identify, assess, and control risks within the steel smelting process in Indonesia. The ultimate goal of this article is to raise awareness among individuals, especially employees, about the importance of OSH in their daily activities, thus reducing the risk of accidents and safeguarding both individual and public interests.

2. LITERATURE REVIEW

2.1 Work Safety and Employee Performance

Efficient management of human resources (HR) within a company is essential to strike a harmonious balance between employee needs and the organizational demands and capabilities [16]. This equilibrium serves as a linchpin for the company's productive and rational development [17]. Employee performance is a pivotal factor influencing a company's success [18]. According to Liebert, employee performance encompasses the quality and quantity of work accomplished by an employee while executing their duties, aligning with the responsibilities assigned to them [19]. Occupational safety plays a crucial role in safeguarding employees from injuries stemming from work-related accidents [20]. Safety risks encompass various aspects of the work environment, including potential fire hazards, electrical disruptions, physical injuries such as bruises, sprains, and fractures, as well as the loss of personal protective equipment, vision, and hearing. On the other hand, occupational health comprises a set of efforts and regulations designed to maintain optimal physical, mental, and social well-being [21]. This preservation of well-being enables individuals to function at their best in the workplace [22].

The work environment, as elucidated by Joseph, holds significant importance for individuals employed within an organization [23]. The work environment can directly or indirectly impact those working within it [24]. Broadly categorized by Griffith, the work environment can be divided into two facets: the physical and non-physical work environment [25]. The physical work environment encompasses all the tangible conditions surrounding the workplace that can have direct or indirect effects on employees. In contrast, the non-physical work environment encompasses all aspects related to work relationships, including interactions with superiors and colleagues. Apart from occupational safety and health, another pivotal factor influencing employee performance is workload. As per Jess, employee workload can manifest in three distinct conditions. First, workload aligns with established standards. Second, the workload becomes excessively high, exceeding an employee's capacity. Third, the workload is disproportionately low, resulting in underutilization of an employee's capabilities. Excessive or overly demanding workloads can significantly impact employee performance, leading to a decline in overall output and efficiency. Managing human resources effectively is essential for achieving a harmonious balance between employee well-being and organizational demands. Employee performance, encompassing both quality and quantity of work, plays a central role in a company's success. Occupational safety and health are instrumental in safeguarding employees from work-related injuries, while the work environment, including both physical and non-physical aspects, also influences employee well-being and productivity. Additionally, monitoring and managing employee workloads are crucial to maintaining and enhancing their performance levels.

2.2 Occupational Safety and Health (OHS) Programs

Occupational Safety and Health (OHS) programs prioritize the holistic well-being of employees, addressing their physical, social, and psychological health, not just physical safety [26]. These programs emphasize the efficient use of work equipment and tools, ensuring that employees are well-trained and equipped for safe and effective usage. Maintenance procedures are conducted with a focus on the safety of production products, including protocols for machinery upkeep. Additionally, OHS programs promote employee nutritional health, foster positive workplace dynamics to boost motivation, and proactively prevent health issues stemming from the working environment. The ultimate goal is to create a work environment where employees feel secure and confident in their safety.

Implementing Occupational Health and Safety (OHS) programs offers numerous advantages, according to Donn. These include heightened employee productivity, as a safe and healthy work environment fosters motivation and commitment. OHS programs also enhance overall company efficiency and productivity by reducing accidents and streamlining operations. Furthermore, they support human resource development by providing training and support for employees to carry out their tasks safely. Properly implemented OHS practices can increase a company's competitiveness by promoting safety and quality as complementary factors. Conversely, neglecting OHS can result in reduced product quality, diminishing customer trust and satisfaction.

2.3 Understanding Work Accidents

Work accidents, as defined by the International Labor Organization (ILO), can be attributed to several key factors. These factors encompass technical equipment issues, related to the condition and suitability of company equipment and machinery. In some cases, machinery that is no longer fit for use can pose significant risks. Another critical category is work environment factors, encompassing both the physical conditions within the workplace and the broader social and psychological aspects of the environment. Finally, human factors play a crucial role, which involves actions and decisions made by workers. This can include instances where employees lack awareness of safe procedures or engage in hazardous actions. Additionally, workforce limitations, where employees may be unable to meet job requirements leading to substandard actions, and non-compliance with existing regulations and requirements, even when they are aware of them, can contribute to work accidents. Identifying and addressing these factors is essential to minimizing the occurrence of work accidents and enhancing overall workplace safety.

2.4 OHS Control in the Workplace: A Strategic Investment

The Occupational Safety and Health (OHS) Control System is strategically designed to achieve the ambitious goal of preventing, reducing, and ultimately eliminating the risk of work accidents, with the ultimate aim of achieving a "zero accident" workplace. It is crucial to view the application of this concept not merely as a means to curtail the substantial costs incurred by companies due to occupational accidents and diseases, but as a forward-looking, long-term investment that yields abundant benefits in the future. Occupational safety and health represent proactive measures that primarily involve the identification, substitution, elimination, assessment, and management of hazard risks. The critical first step in this process is hazard identification, which can be accomplished through various means, including workplace inspections, surveys, and ongoing monitoring. In order to comprehensively identify OHS challenges and formulate effective solutions, it is imperative to conduct OHS audits, engaging both management and engineering perspectives. This diligent approach not only safeguards the well-being of employees but also serves as a strategic investment in the company's future, ensuring sustained productivity, cost reduction, and long-term success.

2.5 HIRADC: Enhancing SMK3 Implementation

In the pursuit of effective Safety and Health Management System (SMK3) implementation within companies, Hazard Identification, Risk Assessment, and Determining Control (HIRADC) stands as a valuable tool. HIRADC not only aids in identifying hazards but also assesses the associated risks, including work accidents. The culmination of an occupational risk analysis endeavor lies in determining the risk's status (referred to as risk event status), which is computed by multiplying the probability and impact of a potential occupational accident risk. This calculation hinges on predetermined criteria, and the outcome of risk analysis manifests as risk levels denoted as Risk Rate (RR). These risk levels serve as pivotal data and information, empowering companies to evaluate risks comprehensively and formulate precise mitigation strategies for potential incidents. HIRADC, thus, plays a crucial role in fortifying the company's commitment to occupational safety and health, ultimately fostering a safer and more secure work environment.

Table 1. Likelihood

Tiers	Description	Description
1	Very Unlikely	Likely never to occur
2	Unlikely	May occur, but rarely
3	Possible	May occur under certain conditions
4	Likely	May occur periodically
5	Almost Certain	May occur at any time

Source: AS/NZS 4360,2004

Table 2. Severity and Impact (Consequence)

Tiers	Description	Description
1	Very Unlikely	No injury, low financial loss.
2	Unlikely	Minor injury, moderate financial loss.
3	Possible	Moderate injury, medical treatment required, high financial loss high.
4	Likely	Severe injury to more than one person, high losses and production disruption.
5	Almost Certain	Fatal to more than one person, very high losses and extensive impact. widespread impact with long-lasting impact and cessation of all activities.

Following the meticulous risk analysis and the computation of Risk Rate (RR), the next pivotal step involves the compilation of appropriate and effective control priorities. In this process, the RR value is meticulously compared to the Risk Matrix, as illustrated in the table, delineating the permissible and impermissible risk thresholds. Control measures are systematically applied to all the identified hazards, guided by the risk rating. To ensure a systematic approach, it is imperative to adhere to the hierarchy of control measures, commencing with elimination a strategy that entails the removal or separation of materials or components posing hazards within the industrial processes. Substitution is the subsequent layer, involving the replacement of materials or equipment to mitigate risks in industrial processes. Engineering or engineered solutions come next, encompassing the design, construction, repair, and installation of equipment to enhance worker safety within hazardous processes.

Administrative controls are then implemented, focusing on methods related to the implementation of company policies and guidelines to manage and mitigate risks. Finally, personal protective equipment (PPE) tailored to the company's specific context, financial capabilities, personnel resources, environmental factors, and human variables is prepared to safeguard individuals based on their roles and the prevailing conditions. This comprehensive approach to risk control underscores the commitment to creating a safe and secure work environment, prioritizing the well-being of employees, and ensuring the continued success of the company.

Table 3. Risk Matrix

RISK ANALYSIS MATRIX 5X5			Impact			
		1	2	3	4	5
Description	Likelihood	Insignificant	Minor	Moderate	Major	Castrophic
Almost Certain	5	H	H	E	E	E
Likely	4	M	H	H	E	E
Possible	3	L	M	H	E	E
Unlikely	2	L	L	M	H	E
Rare	1	L	L	M	H	H

Source. AS/NZS 4360:2004

The outcomes of a thorough risk assessment serve as the foundation for risk control in the workplace, aimed at minimizing or eliminating occupational accident risks. This multifaceted approach encompasses the elimination of hazards, substitution with safer alternatives, the implementation of engineering solutions, administrative controls through policies and guidelines, and the provision of personal protective equipment when necessary. By systematically evaluating risks and employing these control measures, organizations can create a safer work environment and proactively protect their employees from occupational accidents.

3. RESEARCH METHODS

The process of hazard identification through observation is a critical endeavor aimed at recognizing potential situations or events that could lead to workplace accidents and occupational diseases. Hazards encompass various elements, including conditions or actions that hold the capacity to result in harm, injuries, damage, or disruptions. Acknowledging the existence of these hazards necessitates concerted control efforts to prevent adverse consequences. In the context of steel smelting production in Indonesia, several hazards have been observed. These encompass activities such as steel smelting, the manipulation of clay and sand, metal molding processes, the lifting or removal of molds, grinding procedures, and welding operations. Identifying and addressing these hazards is imperative to ensure the safety and well-being of workers in this industry, mitigating potential risks and fostering a secure work environment.

3.1 Risk Assessment: Evaluating Hazard Risk

Risk assessment is a systematic process focused on evaluating the risks associated with hazards within a given context. It involves a comprehensive analysis that considers the effectiveness of control measures in place and ultimately determines whether the assessed risk is deemed acceptable or not. This meticulous process is executed across various stages, beginning with the initial reception of materials and extending through each subsequent activity performed on the machinery. By scrutinizing risks at every step of the process, organizations can proactively identify potential hazards, assess their impact, and implement necessary control measures to maintain a safe and secure working environment.

3.2 The Risk Evaluation Process: A Strategic Approach

In establishing a comprehensive risk evaluation process, management has reached a consensus regarding the essential categories employed for conducting risk assessments. These categories encompass risk likelihood, risk severity, and a risk likelihood-severity matrix. This structured framework is thoughtfully designed to align with the scale and unique characteristics of the company, particularly in the absence of a pre-existing Occupational Health and Safety (OHS) management system. By implementing these categories, the organization can systematically assess and categorize risks, allowing for more effective risk management and the development of targeted mitigation strategies tailored to the company's specific needs and circumstances.

4. RESULT AND DISCUSSION

Following a thorough series of observations, the researcher has gathered valuable data pertaining to various activities within the steel smelting process. These activities encompass the intricate processes of printing molds with clay, steel melting, metal molding, the intricate task of removing or extracting prints from molds, meticulous cleaning procedures, grinding operations, and welding tasks. The outcome of this exhaustive examination culminated in the identification of specific risks associated with these activities. These findings serve as a foundation for a more detailed discussion and the formulation of targeted risk mitigation strategies, ensuring the safety and well-being of individuals engaged in the steel smelting process.

Table 4. Receipt Identification Table

No	Work Station	Activity	Risk
1.	Molding with clay and sand	a. Loosening the soil b. Holding the Soil c. Burning Mold to Compact d. Opening the Mold	a) Fracture Partial Disability Disability b) Overall ARI Exposed to Burns c) Exposed to Combustion Ash Exposed to heat from combustion d) Burns Partial Disability Disability Overall
2.	Smelting Steel	a. Lifting Raw Materials b. Putting Raw Materials into the Furnace c. Pouring Steel Mixture (coal charcoal) into Furnace	a) Minor Injury SeriousInjury ARI Dehydration b) Burn Injury Partial Disability Overall DisabilityPermanent Disability Dehydration c) Severe Burns Worker Slight/Heavy Injury Partially or totally disabledwhole ARI Dehydration
3.	Printing Metal	a. Pouring metal liquid into molds b. Heat Light and Smoke From Furnace	a) Worker Slight/Heavy Injury Partial or Full Disability ARI Dehydration b) Dry itchy eyes Eye irritation Visual impairmentSore throat
4.	Removal or Ejection of Printouts and Cleaning of Prints Mold	a. Cutting or Cleaning the Product from the Mold b. Product Smoothing	a) Worker Minor Injury Low back pain Minor heatinjury b) Exposed to smoothingdust Scratched by rudimentary steel
5.	Grinding	a.Smoothing Products	a) Worker Low back pain Slashed by burrs Exposureto grinding dust

6.	Welding	a. Process Splicing	a) Musculoskeletal Disorders (MSDs) Worker mild injury Low back pain Exposure to light from welding Musculoskeletal Disorders (MSDs)

The authors then obtained the following information on the continuation of safety control in Indonesia:

Table 5. Risk Assessment Table

Risk	Likely (Likehood)	Severity (Consequence)	LxC	Level Risk
Broken Bone	1	3	6	M
Partial Disability	1	3	6	M
Overall Disability	1	3	6	M
URI	1	3	6	M
Burns	1	5	5	H
Exposed to Explosion	1	5	5	H
ARI	1	5	5	H
Exposed to Burns	4	2	8	H
Partial Defect	4	2	8	H
Overall Disability	4	2	8	H
Slight Injury	4	2	8	H
Western Injury	4	2	8	H
URI	4	2	8	H
Dehydration	4	2	8	H
Burns	3	4	12	E
Partially Disabled	3	4	12	E
Overall Disability	3	4	12	E

Permanent Disability	3	4	12	E
Dehydration	3	4	12	E
Severe Burns	3	4	12	E
Minor or Severe Injury Worker	3	4	12	E
Partially or Completely Disabled	3	4	12	E
URI	3	4	12	E
Dehydration	3	4	12	E
Dry, Itchy Eyes	4	3	12	H
Eye Irritation	4	3	12	H
Vision Impairment	4	3	12	H
Throat Inflammation	4	3	12	H
Dehydration	4	3	12	H
Worker Injury Mild	2	3	6	M
Low Back Pain	2	3	6	M
Minor Heat Sores	2	3	6	M
Exposed to Dust from Smoothing	1	3	3	M
Scratched by Imperfect Steel	1	3	3	M
Worker Minor Injury	3	2	6	M
Low Back Pain	3	2	6	M
Slashed by burrs	3	2	6	M
Exposure to Grinding Dust	3	2	6	M
Musculoskeletal Disorders (MSDs)	3	2	6	M
Minor Injury Worker	5	3	15	E
Low Back Pain	5	3	15	E
External Light Exposure	5	3	15	E
Musculoskeletal Disorders (MSDs)	5	3	15	E

Upon collecting and analyzing the data, it became evident that workers in various roles faced a spectrum of risks, spanning from low to medium and high, contingent on the specific activities they undertook. Notably, the most significant risk factors were identified in the steel smelting and metal molding processes, activities demanding utmost concentration to avert potential adverse risks. Unfortunately, there remains a considerable deficit in the provision of safety equipment, primarily because some essential safety gear is not readily available in Indonesia. To address these identified risks effectively, a strategic risk control approach was adopted, guided by the risk categories derived from the initial risk assessment. Emphasis was placed on those categories with higher risk level values, guiding the prioritization of risk control measures and activities. The risk control process entailed rigorous discussions with management and department heads, culminating in the formulation of tailored risk control alternatives.

Across various work activities, such as mold printing, steel melting, metal printing, print removal, cleaning, grinding, and welding, the author observed a total of 36 potential hazards, each posing an inherent risk of accidents. To mitigate these risks, Indonesia can employ a range of control strategies, including hazard elimination, equipment or work process substitution, engineering controls, work process segregation, policy adjustments concerning equipment and its operation, and the utilization of personal protective equipment (PPE). It is imperative to recognize that accidents and the onset of occupational diseases are often rooted in unsafe work environments, improper work attitudes, or the use of inappropriate and unsafe machinery. By addressing these factors systematically, organizations can significantly enhance workplace safety and protect their workforce from potential harm.

5. CONCLUSION

Implementing prevention measures through the Evaluation of Non-Deleterious Actions and Dangerous Conditions (ENDADC) represents the initial stride toward establishing a comprehensive safety system. Expanding these observations to encompass a wider array of machine stations offers a broader understanding of potential hazards within the workplace. This method serves as a valuable tool for analyzing risk levels, enabling timely alerts and reminders for employees to prioritize their safety and well-being during work.

Upon conducting a thorough examination, the author identified a total of 36 potential hazards, each categorized as having varying degrees of risk—ranging from high to medium and low. While Indonesia has taken commendable steps by providing personal protective equipment, it is essential to acknowledge that the quantity and quality of this equipment are yet to be optimized. This gap raises concerns regarding heightened risks and underscores the importance of further improvements in safety controls to ensure the well-being of employees.

REFERENCES

[1] Damayanty, S., Susanto, A., & Hipta, W. F. (2022). Implementation of Hospital Occupational Health and Safety Standards at General Hospitals in Kendari City.

[2] Aziz, A., Susanto, S., & Anggraeni, R. D. (2021). The Implementation of Occupational Safety and Health Law Enforcement In According To Law Number 1 of 1970 Concerning Work Safety And Act Number 36 of 2009 Concerning Health (Study at PT. Yamaha Indonesia). *Surya Kencana Tiga*, *1*(1), 46-64.

[3] Samanta, A. K. (2021). Organizational culture and employee engagement: A review of selected studies. *Asian Journal of Management*, *12*(2), 201-204.

[4] Galajda, L. (2023). A study of information security awareness on teleworking security risks and recommendations since Covid19 pandemic.

[5] Khoirunnisa, S. W. B., Vanchapo, A. R., Tusi, J. S., Lewar, E. S. B., Jayadi, A., Guilin, X., & Jiao, D. (2023). The Relationship of Occupational Health and Safety K3 to Employee Performance in the Workplace Systematic Review Prospective cohort study. *Journal of World Future Medicine, Health and Nursing*, *1*(2), 114-124.

[6] Righi, E., Lauriola, P., Ghinoi, A., Giovannetti, E., & Soldati, M. (2021). Disaster risk reduction and interdisciplinary education and training. *Progress in Disaster Science*, *10*, 100165.

[7] Liu, S., Nkrumah, E. N. K., Akoto, L. S., Gyabeng, E., & Nkrumah, E. (2020). The state of occupational health and safety management frameworks (OHSMF) and occupational injuries and accidents in the Ghanaian oil and gas industry: Assessing the mediating role of safety knowledge. *BioMed research international*, *2020*.

[8] Shankar, J., Lai, D., Chen, S. P., Turin, T. C., Joseph, S., & Mi, E. (2022). Highly educated immigrant workers' perspectives of occupational health and safety and work conditions that challenge work safety. *International journal of environmental research and public health*, *19*(14), 8757.

[9] Afrita, I., Yetti, M. H., Hum, M., & Arifalina, W. (2021). And Health Legal Protection For Workers On Safety Of Work In Construction Services Company Pekanbaru City. *Review of International Geographical Education Online*, *11*(7).

[10] Qiu, Z., Liu, Q., Li, X., Zhang, J., & Zhang, Y. (2021). Construction and analysis of a coal mine accident causation network based on text mining. *Process safety and environmental protection*, *153*, 320-328.

[11] De Merich, D., Gnoni, M. G., Malorgio, B., Micheli, G. J., Piga, G., Sala, G., & Tornese, F. (2019, December). Managing occupational health and safety in SMEs: An evolutionary web-based tool. In *2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)* (pp. 1179-1182). IEEE.

[12] Leitão, J., Pereira, D., & Gonçalves, Â. (2019). Quality of work life and organizational performance: Workers' feelings of contributing, or not, to the organization's productivity. *International journal of environmental research and public health*, *16*(20), 3803.

[13] Dlamini, B., Zogli, L., & Lawa, E. (2022). Determination of Fundamental Principles, Theories, Issues Pertaining to Occupational Safety, Health, Environmental Legislative Framework within Organizations in South Africa. *Selected Topics in Humanities and Social Sciences*, *9*, 62-70.

[14] Lucas, D. A. (2019). Wise men learn by others harms, fools by their own: Organisational barriers to learning the lessons from major accidents. *Revival: Safety and Reliability in the 90s (1990): Will past experience or prediction meet our needs?*, 50.

[15] Al-Hajj, S., Dhaini, H. R., Mondello, S., Kaafarani, H., Kobeissy, F., & DePalma, R. G. (2021). Beirut ammonium nitrate blast: analysis, review, and recommendations. *Frontiers in public health*, *9*, 657996.

[16] Hanić, A., & Jevtić, D. (2020). Human resource management between economy and ethics–research of Serbia and Bosnia and Hercegovina.

[17] Riva, G. (2020). *A decision-supporting framework for job automation and soft skills development, with job criticality as a linchpin* (Doctoral dissertation, Haute école de gestion de Genève).

[18] Esthi, R. B., & Savhira, I. (2019). The influence of work training, competence and discipline of work on employee performance in PT. Lestarindo Perkasa. *Journal of Research in Business, Economics, and Education*, *1*(2).

[19] Gruß, I., Bunce, A., Davis, J., Dambrun, K., Cottrell, E., & Gold, R. (2021). Initiating and implementing social determinants of health data collection in community health centers. *Population health management*, *24*(1), 52-58.

[20] Naji, G. M. A., Isha, A. S. N., Alzoraiki, M., Al-Mekhlafi, A. B. A., Sharafaddin, O., & Saleem, M. S. (2020). Impact of safety culture and psychosocial hazard on safety performance among upstream employees in malaysia at oil and gas industry. *Solid State Technol*, *63*(6), 4120-4126.

[21] Cordes, T., Bischoff, L. L., Schoene, D., Schott, N., Voelcker-Rehage, C., Meixner, C., ... & Wollesen, B. (2019). A multicomponent exercise intervention to improve physical functioning, cognition and psychosocial well-being in elderly nursing home residents: a study protocol of a randomized controlled trial in the PROCARE (prevention and occupational health in long-term care) project. *BMC geriatrics*, *19*, 1-11.

[22] Obrenovic, B., Jianguo, D., Khudaykulov, A., & Khan, M. A. S. (2020). Work-family conflict impact on psychological safety and psychological well-being: A job performance model. *Frontiers in psychology*, *11*, 475.

[23] Thabit, F., Almaamari, Q., Abdulrab, M., AlMamary, Y. H., & Alshammari, H. (2022). The Role of Employee Satisfaction as Mediator in The Relationship Between Rewards, Work Environment, and Employee Performance. *International Journal of Intellectual Human Resource Management (IJIHRM)*, *3*(01), 42-53.

[24] Rasool, S. F., Wang, M., Tang, M., Saeed, A., & Iqbal, J. (2021). How toxic workplace environment effects the employee engagement: The mediating role of organizational support and employee wellbeing. *International journal of environmental research and public health*, *18*(5), 2294.

[25] Christensen, J. O., Bakke Finne, L., & Kristiansen, J. (2021). *The future of the Nordic psychosocial work environment: Implications for occupational health*. Nordic Council of Ministers.

[26] Tamers, S. L., Streit, J. M., & Chosewood, C. (2022). Promising occupational safety, health, and well-being approaches to explore the future of work in the USA: An editorial. *International Journal of Environmental Research and Public Health*, *19*(3), 1745.