Digitization of the occupational health and safety system and its role in reducing occupational accidents in the industrial environment - an explanatory analytical study.

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Abstract:
This study aims to recognize the role of the digitization of the occupational health and safety system in enhancing the reduction of occupational accidents and risks to the worker at his workplace Occupational health and safety ", is a backbone of the enterprise system as a whole because it maintains the integrity of the human resource against accidents in the professional environment. It must be protected by modern technical means in this field to achieve high productivity adequacy of quality with minimal effort by the worker in the performance of his duties and speed of implementation. This paper addresses the most important concepts from the topic of the study as well as the theoretical interrelationship of the topic from various aspects to some recommendations.

Keywords: digitization, occupational health and safety system, occupational accidents.

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1. Introduction:

The field of occupational health and safety is a critical topic within industrial psychology that warrants thorough study. This is due to the rising rates of workplace accidents, which stem from various causes. One of the most significant contributors to these accidents is the impact of technological advancements, as organizations face the inevitable need to keep pace with modern developments to maintain their market reputation and meet consumer demands by delivering high-quality services at lower costs. Consequently, adopting advanced technological tools and methods across various organizational functions has become essential to achieve goals with minimal losses.

Among these functions, occupational safety systems must also embrace digital transformation to provide a safe, healthy, and hazard-free environment for workers. The digitization of occupational health and safety systems has become an urgent necessity due to the growing need for a comfortable work environment. Digitization enables organizations to promptly identify and analyze risks, contributing to faster solutions that prevent losses affecting human resources, material assets, and market standing.

2. Definition of Key Concepts:

2.1. Digitization:

The term "digitization" encompasses a range of concepts, with definitions varying by field and specialization. Below are some notable definitions:

- **Sharqi and Haddouch (2021)** define digitization as an administrative process undertaken by organizations to convert traditional data (reliant on paper archives) into electronic data using the advanced capabilities of the internet. This transformation spans various administrative processes, including planning, organizing, directing, and controlling resources to achieve organizational goals (Sharqi & Haddouch, 2021, p. 1164).
- **Naas (2023)** describes digitization as the process of converting traditional administrative tasks and data into a digital processing system using advanced technology. This aims to enhance efficiency, effectiveness, and cost reduction while accelerating administrative procedures, saving time and effort (Naas, 2023, p. 5).

From these definitions, a comprehensive understanding of administrative digitization can be derived: it is a process where organizations utilize modern technological tools, relying on the internet and technology, to upgrade traditional data into electronic formats. This improves performance, increases productivity, and delivers high-quality services with minimal effort and cost.

2.2. Occupational Health and Safety:

Occupational health and safety refer to the technical measures organizations implement to protect workers' health from workplace hazards. With the technological evolution of

production methods, occupational safety has become more comprehensive, as it is closely tied to the most critical production element: the "human resource." Organizations aim to provide workers with a hazard-free environment, safeguarding them from workplace risks and illnesses (Khalid & Al-Khatib, 2009, p. 9).

2.3. Occupational Accidents:

• **Bahri Saber (2016)** defines occupational accidents as any injury sustained by a worker that disrupts their work activity, resulting in material and moral losses for both the worker and the organization (Bahri, 2016, p. 140).

2. Motivations for Emphasizing Occupational Health and Safety:

There are several motivations that drive the focus on occupational health and safety, which can be summarized as follows:

2.1. Humanitarian Motivations:

The human factor is the primary reason for prioritizing occupational health and safety. This is due to the physical, psychological, and social consequences of workplace accidents and illnesses that workers may suffer. Such incidents can lead to undesirable outcomes, including partial or total disability, chronic illnesses, and other physical, mental, or emotional injuries that cause significant suffering for the worker, often beyond what any compensation can remedy. Additionally, health-related damages and fatalities negatively impact social and family life. For instance, the death or permanent disability of a worker who supports a family can leave their dependents in distress, creating a ripple effect that affects the broader community.

2.2. Economic Motivations:

Economic considerations also necessitate a focus on occupational health and safety due to their significant implications for organizations and national economies. Workplace accidents and occupational illnesses lead to reduced productivity, increased operational costs (both direct and indirect), and abnormal wear and tear on production resources. These factors negatively impact organizational efficiency and profitability, threatening the long-term sustainability of the organization.

3. Elements of Successful Occupational Health and Safety Management:

The success of occupational health and safety management systems depends on several key elements, which are outlined below:

3.1. Policy:

Organizations that achieve high standards of health and safety have well-defined policies that guide their operations while fulfilling their responsibilities toward individuals and the environment in compliance with legal requirements. These policies meet the expectations of stakeholders, employees, customers, and society at large. They are cost-effective and aim to preserve and develop natural and human resources, minimize

financial losses, and reduce legal liabilities. Health and safety policies influence all organizational activities and decisions, including resource selection, work system design, product and service development, and waste management.

3.2. Organization:

Successful organizations implement their health and safety policies effectively by fostering a positive culture that encourages active participation and contribution at all levels. This is achieved through effective communication and continuous skill development, enabling all workers to make informed and meaningful contributions to health and safety efforts.

3.3. Planning:

These organizations adopt a structured and systematic approach to implementing their policies, aiming to minimize risks associated with work-related activities, services, and products. They use risk assessment methods to prioritize goals, set performance standards, and establish measurable benchmarks. Specific procedures are in place to promote a positive health and safety culture while eliminating or mitigating risks.

3.4. Performance Measurement:

In successful organizations, health and safety performance is measured against predefined standards. This helps identify when and where improvements are needed. The effectiveness of risk reduction efforts is evaluated through self-monitoring, which includes technical tools to inspect and review structural components (e.g., workplaces, buildings, materials) and programmatic components (e.g., personnel, measures, systems), including individual behavior. Failures in risk reduction are identified through feedback mechanisms, requiring thorough investigations into incidents, health issues, or near-misses that could result in harm or loss. The goal of monitoring and feedback is not only to identify direct causes of poor performance but also to uncover underlying issues and improve the design and operation of the health and safety management system.

3.5. Auditing and Reviewing Performance:

Learning from relevant experiences and applying lessons learned are critical to effective health and safety management. This requires regular performance reviews based on monitoring data and continuous auditing of the health and safety management system. (Zouiter, 2020, p. 74)

4. Objectives of Occupational Health and Safety Management:

Occupational health and safety management aims to achieve several goals, which can be outlined as follows:

- **Protecting Human Resources**: Preventing workers from injuries, accidents, and occupational illnesses.

- **Safeguarding Machinery and Equipment**: Preventing damage or loss caused by workplace accidents.
- **Reducing Production Costs**: Minimizing expenses related to workplace injuries or damage to machinery and equipment.
- **Creating a Safe and Comfortable Work Environment**: Ensuring workers feel secure and confident, which boosts morale and enhances performance and productivity.
- **Raising Awareness Among Workers**: Educating employees about safe work practices and the importance of adhering to safety regulations. (Mishan, 2019, p. 19)

These objectives can be summarized into three main elements:

- Protecting human resources.
- Protecting machinery and equipment.
- Protecting material resources.

5. Outcomes of Implementing Occupational Health and Safety Systems:

The results of implementing occupational health and safety systems can be categorized into direct and indirect outcomes, as outlined below:

5.1. Direct Outcomes:

By identifying potential workplace hazards and understanding how to address them, workers can:

- Reduce workplace disorders and occupational illnesses.
- Minimize accidents and disasters that harm the organization and its resources.

5.2. Indirect Outcomes:

- Preserving skilled labor, which enhances productivity and contributes to an efficient and profitable organization.
- Allocating budgets for repairing damaged machinery or purchasing new equipment, thereby improving operations. (Bala, 2019, p. 26)

6. Stages and Elements of Occupational Accidents:

When analyzing occupational accidents, they can be divided into four elements:

6.1. Indirect Causes of Occupational Accidents:

Occupational accidents often occur due to indirect causes, such as:

- Lack of awareness about the importance of workplace safety measures.
- Insufficient safety guidelines and instructions, along with a lack of emphasis on their implementation.
- Failure to integrate safety plans into work processes.
- Ignoring lessons from past accidents and their causes, leading to repeated incidents.

6.2. Individual–Related Causes:

- Lack of focus and inability to control senses during work.
- Excessive fatigue, which reduces concentration.

- Some workers may suffer from hearing or vision impairments that affect their performance.

6.3. Direct Causes of Accidents:

These include:

a) **Unsafe Actions by Workers**: Such as failing to use protective equipment, handling sharp or slippery tools improperly, or engaging in risky movements like climbing, jumping, or running.

b) **Unsafe Working Conditions**: Such as inadequate safety measures, poor physical conditions (e.g., extreme heat, humidity, or lighting), or environments that hinder workers' ability to perform tasks effectively.

6.4. The Accident Itself:

Accidents in the workplace can take various forms, such as collisions, slips, explosions, fires, or radiation damage.

6.5. Consequences of Accidents:

Occupational accidents can lead to:

- Delays in production or damage to production lines.
- Loss or damage to machinery, materials, and equipment.
- Reduced product quality due to the impact of the accident.
- Human injuries, ranging from permanent disabilities to fatalities.

For these reasons, labor unions often advocate for governments and organizations to consider workers' conditions and job roles when planning projects. This ensures a safe and comfortable work environment that prioritizes worker safety. (Mengel, 2016, p. 76)

7. Dimensions of Workplace Accidents:

Workplace accidents are not limited to affecting human resources alone; they have serious dimensions that negatively impact organizations, human resources, society, and the state. These dimensions include:

a) Economic Dimension:

The economic impact is evident on both organizations and the national economy, as outlined below:

- **Impact on Organizations**:

Costs: Organizations incur financial expenses in the following areas:

- Treatment of workplace injuries and accidents.
- Salaries and wages for injured workers during their recovery period.
- Compensation for permanent disabilities or fatalities.
- Loss of productivity due to work interruptions caused by accidents.
- Costs associated with recruiting, selecting, and training replacement workers.

Profitability: The costs of treating workplace accidents increase production expenses, which may lead to higher product prices. This can make the product less competitive, threatening the organization's market share and long-term profitability, or even its survival.

- **Impact on the National Economy**:

o A decline in national output due to the substantial costs incurred by organizations for treating workplace accidents.

o A high rate of workplace accidents can, over time, reduce the workforce, negatively affecting overall productivity. This can hinder organizations' ability to enter new markets or maintain their current market positions, ultimately harming the national income.

b) Humanitarian Dimension:

The humanitarian impact is reflected in the following aspects:

- **Social Aspect**: Workplace accidents result in health damages such as disabilities, chronic illnesses, and fatalities, which negatively affect social and family life.
- **Psychological Aspect**: A high rate of workplace accidents lowers employee morale, as workers fear working in hazardous environments that threaten their health, safety, and future. This reduces job satisfaction, even if other job-related factors are favorable.

8. Accident Prevention:

Many workplace accidents and injuries can be avoided by implementing training programs, health education, and safety policies. Key prevention methods include:

8.1. Engineering Prevention Methods:

- Proper organization of the workplace, including adequate spacing for machinery and worker movement.
- Designing workspaces with optimal physical conditions, such as lighting, walkways, work areas, windows, flooring, and storage spaces.
- Replacing manual processes with automated systems where possible.
- Installing protective barriers around machinery.
- Ensuring proper storage of industrial materials.

8.2. Health Prevention Methods:

- Conducting initial medical examinations during employee recruitment.
- Performing periodic medical check-ups for employees.

8.3. Individual Prevention Measures:

- Providing and mandating the use of personal protective equipment (PPE) to safeguard workers from workplace hazards. (Al-Rousan et al., 2014, p. 34)
- Reducing workplace accidents across sectors requires the application of safety rules and occupational health and safety standards. Key requirements include:

o Appointing a health and safety supervisor at the workplace.

- Training and guiding workers on proper work procedures.
- Conducting initial and periodic medical examinations for all employees and promoting health awareness.
- Providing a safe work environment by improving working conditions and fostering a culture of safety among workers.
- Ensuring the availability of personal protective equipment at all times and enforcing its use. (Al-Dhamidi, 2002, p. 37)

Additionally, industrial safety programs can be strengthened by implementing reward systems that recognize employees who contribute to reducing workplace accidents by adhering to safety and maintenance protocols. (Khalil, 2018, p. 149)

9. Benefits of Digitizing Occupational Health and Safety Systems:

Digitization in the field of occupational health and safety offers numerous advantages that can help eliminate workplace accidents and achieve a zero-accident environment if implemented effectively. These benefits serve the organization as a whole, including its human resources, equipment development, and production efficiency by delivering high-quality products that satisfy customer demands. Below are some ways digitization can enhance occupational health and safety systems:

- **Advanced Monitoring Tools:**

Digitization enables the use of modern monitoring tools, such as sensors, to predict and prevent accidents. Examples include gas leak detectors, humidity sensors, and temperature monitoring devices. Additionally, remote monitoring systems using internet-based technologies can provide real-time oversight of workplace conditions.

- **Online Training Programs:**

Digitization facilitates the creation of online training programs for employees, raising awareness about workplace hazards and teaching them how to handle risks correctly. These programs also help workers quickly identify and resolve potential issues before they escalate into accidents.

- **Digital Management of Employee Data:**

Transitioning from traditional paper-based records to digital systems allows for easier access to employee medical records. This enables organizations to track workers' health statuses, conduct regular preventive check-ups, and analyze accident causes to implement corrective measures effectively.

- **Digital Communication Tools:**

Mobile applications and other digital platforms can be used to monitor workers' health and surrounding conditions. These tools can alert employees to potential dangers in real-time and allow them to report workplace issues instantly to health and safety supervisors.

- **Artificial Intelligence (AI) for Risk Analysis:**

AI-powered programs can analyze historical accident data to predict future risks and prevent potential injuries. AI can also monitor employee behavior during tasks, providing preventive recommendations and guidance to improve safety practices.

- **Digital Programs for Occupational Disease Prevention**:

Digital data can be used to identify and address common occupational diseases in the workplace. By analyzing this data, organizations can develop solutions to prevent the spread of such diseases.

10. **Summary**:

In summary, digitizing occupational health and safety systems offers numerous benefits that enhance workers' health and safety in the workplace. By leveraging digital tools and applications, such as online training programs for employees and health and safety managers, organizations can raise awareness about workplace hazards. Additionally, digital data analysis can help identify and mitigate risks, enabling quick and informed decision-making to prevent accidents and predict future risks.

11. **Recommendations**:

- **Adopt Digitization in Administrative Processes**: Prioritize the digitization of occupational health and safety systems to reduce workplace hazards.
- **Equip Industrial Organizations with Modern Technologies**: Implement advanced tools to monitor workers and control potential risks effectively.
- **Enhance Communication Among Teams**: Use advanced digital platforms to facilitate knowledge and experience sharing among employees.
- **Leverage Artificial Intelligence (AI) for Risk Management**: Utilize AI systems to predict and control workplace accidents proactively.
- **Conduct Training Programs Using Digital Tools**: Organize online training sessions to exchange knowledge and increase awareness of preventive measures.
- **Implement Digital Monitoring Systems**: Use digital tools to monitor workers' compliance with safety protocols and preventive measures.
- **Digitize Employee Records**: Transition to digital document management systems for quick and easy access to employee files and records.

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