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“Toshkent irrigatsiya
va qishloq xo‘jaligini
mexanizatsiyalash
muhandislari instituti”
Milliy tadqiqot universiteti
G-bino, 604-xona

Telefon: +99871 237-19-86.
+99897 719-77-92

E-mail: technosphere@tiame.uz

Veb-sayt: www.technosphere.tiame.uz

**Maqolada keltirilgan fakt va
raqamlar uchun mualliflar
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Dizayner:
Mamajonov Ulug‘bek
Rustam o‘g‘li

Bosh muharrir:

Rajabov Nurmat Qudratovich,
“TIQXMMI” MTU dotsenti, q.f.f.d (PhD)

Ilmiy muharrir:

Haydarov Tuyg‘un Anvarovich,
“TIQXMMI” MTU dotsenti, t.f.n.

Muharrir:

Utepov Burxon Bektursinovich,
“TIQXMMI” MTU dotsenti, t.f.n.

Tahrir hay‘ati tarkibi:

Norov Begmat Xolmatovich
“TIQXMMI” MTU dotsenti, t.f.n.

Xojiyev Aliakbar Abdumannopovich
“TIQXMMI” MTU dotsenti, t.f.f.d (PhD).

Mirxasilova Zulfiya Kuchkarovna
“TIQXMMI” MTU dotsenti, t.f.f.d (PhD).

Tahrir kengashi tarkibi:

Andreev Andrey Viktorovich,
Sankt-Peterburg politexnika universiteti “Texnosfera
xavfsizligi” Oliy maktabi direktori, dotsent, h.f.n.

Yefremov Sergey Vladimrovich,
Sankt-Peterburg politexnika universiteti dotsenti, t.f.n.

Musayev Ma‘ruf Nabiyevich,
TDTU dotsenti, t.f.n.

Xusanova Sunbul Islamovna,
FVV akademiyasi huzuridagi FMI professori, p.f.d.

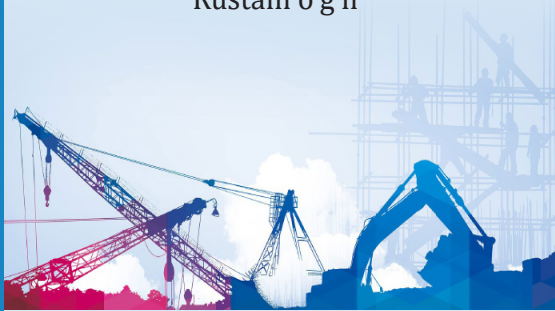
Yo‘ldosheva Ozoda Muxammadsodiq qizi,
TTESI professori, t.f.d.

Qurbonov Bobomurod,
FVV akademiyasi huzuridagi FMI boshliq o‘rinbosari,
podpolkovnik, t.f.f.d (PhD).

Yuldashev Orunbay Raxmanberdiyevich,
FVV akademiyasi huzuridagi FMI dotsenti, t.f.n.

Ochildiyev Otobek Shodiyevich,
TMTI dotsenti, t.f.f.d (PhD).

Narziyev Shovqiddin Murtozayevich,
TDTU professor v.b, t.f.f.n (PhD).



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LABOR PROTECTION DIGITALIZATION AND AUTOMATION PROCESSES AS A KEY PIECE OF THE OCCUPATIONAL SAFETY MANAGEMENT SYSTEM

Xo'jiyev Aliakbar Abdumannopovich,
Doctor of Philosophy (PhD) in Technical Sciences,
National Research University "Tashkent institute of irrigation and agricultural mechanization engineers"
Xikmatov Muhammad-Ali Fayzulla ugli,
Master's student 2nd degree,
National Research University "Tashkent institute of irrigation and agricultural mechanization engineers"

Annotation. The relevance and necessity of digitization and the adoption of automation technologies in labor protection are evaluated in the essay. Due to ongoing updates to Russian Federation law, occupational safety specialists currently have a high task at their respective organizations. The idea of a labor protection management system should foster an environment where accidents at businesses decline. The article will look at the benefits of automating and digitizing labor protection work procedures in order to ensure the labor protection management system operates to a high standard.

Keywords. Occupational safety management system, digitalization, injury reduction.

MEHNAT MUHOFAZASINI RAQAMLASHTIRISH VA AVTOMATLASHTIRISH MEHNAT XAVFSIZLIGINI BOSHQARISHNING ASOSIY BO'G'INI SIFATIDA

Xo'jiyev Aliakbar Abdumannopovich,
Texnika fanlari bo'yicha falsafa doktori (PhD), dotsent
"Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti" Milliy tadqiqot universiteti
Xikmatov Muhammad-Ali Fayzulla o'g'li,
2-bosqich magistranti,
"Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti" milliy tadqiqot universiteti

Annotatsiya. Maqolada mehnatni muhofaza qilishda avtomatlashtirish, texnologiyalarini raqamlashtirish va joriy etishning dolzarbligi hamda zarurligi baholanadi. Rossiya federatsiyasi qonunchiligining doimiy yangilanishi tufayli mehnatni muhofaza qilish bo'yicha mutaxassislar hozirda o'z tashkilotlarida yuqori darajada masuliyatga egadirlar. Mehnatni muhofaza qilishni boshqarish tizimining g'oyasi korxonalaridagi baxtsiz hodisalar sonini kamaytiradigan muhitni yaratishga yordam berishi kerak. Maqolada mehnatni muhofaza qilishni boshqarish tizimining yuqori darajada ishlashini ta'minlash uchun mehnatni muhofaza qilish tartib-qoidalarini avtomatlashtirish va raqamlashtirishning afzalliklari ko'rib chiqiladi.

Kalit so'zlar. Mehnatni muhofaza qilishni boshqarish tizimi, raqamlashtirish, jarohatlarni kamaytirish.

ЦИФРОВИЗАЦИЯ И АВТОМАТИЗАЦИЯ ОХРАНЫ ТРУДА КАК КЛЮЧЕВОЙ ЭЛЕМЕНТ СИСТЕМЫ УПРАВЛЕНИЯ БЕЗОПАСНОСТЬЮ ТРУДА

Хожиев Алиакбар Абдуманнопович,
Доктор философий по технический наук (PhD), доцент
Национальный исследовательский университет "Ташкентский институт инженеров ирригации и механизации сельского хозяйства"
Хикматов Мухаммад-Али Файзулла ўғли,
Магистрант 2 ого курс,
Национальный исследовательский университет "Ташкентский институт инженеров ирригации и механизации сельского хозяйства"

Аннотация. В статье оценивается актуальность и необходимость цифровизации и внедрения технологий автоматизации в охрану труда. В связи с постоянным обновлением законодательства Российской Федерации, специалисты по охране труда в настоящее время имеют высокие задачи в своих организациях. Идея системы управления охраной труда должна способствовать созданию среды, в которой снижается количество несчастных случаев на предприятиях. В статье будут рассмотрены преимущества автоматизации и оцифровки процедур работы по охране труда, чтобы обеспечить работу системы управления охраной труда на высоком уровне.

Ключевые слова. Система управления охраной труда, цифровизация, снижение травматизма.

Introduction. The research will delve into the transformational potential of labor protection digitalization and automation processes, highlighting the benefits such as enhanced risk assessment and management, improved real-time monitoring, and integration of wearable technologies. The study will also examine the challenges associated with these advancements, including privacy concerns, ethical considerations, and the need for upskilling the workforce to adapt to changing technological landscapes. Additionally, case studies will provide practical insights into successful implementations of labor protection digitalization and automation, emphasizing lessons learned and best practices. Furthermore, the research will explore emerging technologies in the field of labor protection, such as augmented reality, virtual reality, and the Internet of Things (IoT), to envision the future prospects and implications of digitalization and automation. Ethical considerations and human factors will also be discussed to ensure a balanced approach to technology adoption in the workplace. The study will conclude by summarizing the findings, emphasizing the significance of labor protection digitalization and automation processes as key components of the occupational safety management system. By comprehensively examining the research topic, this study aims to contribute to the growing body of knowledge in the field of occupational safety, while providing insights and recommendations for organizations seeking to embrace digitalization and automation to enhance labor protection and overall workplace safety.

In today's rapidly evolving technological landscape, the digitalization and automation of labor protection processes have emerged as crucial components of the occupational safety management system. The integration of digital tools and automation processes in the workplace has the potential to revolutionize occupational safety practices, significantly enhancing workplace safety and reducing the risk of accidents. This research aims to explore the significance, benefits, challenges, and future prospects of incorporating labor protection digitalization and automation processes in the occupational safety management system [1;2;3].

Occupational safety is of paramount importance in all industries and sectors, as it directly impacts the well-being and productivity of workers. Traditionally, occupational safety management systems have relied on manual processes, paper-based documentation, and periodic inspections to ensure a safe working environment. However, these conventional methods have limitations in terms of accuracy, efficiency, and real-time monitoring.

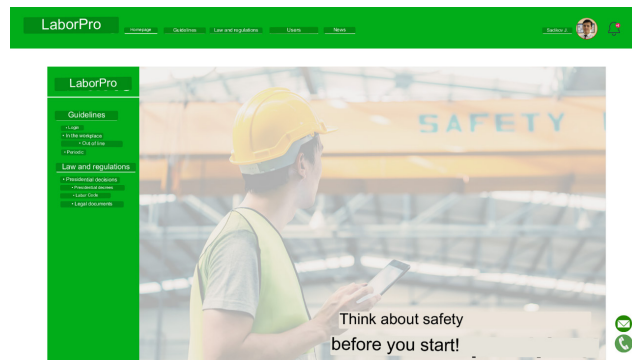


Fig .1. Digitized labor protection

With advancements in technology, the digitalization and automation of labor protection processes have become feasible and increasingly adopted by organizations worldwide. Digital tools such as risk assessment software, real-time monitoring systems, and wearable technologies have proven to be effective in enhancing workplace safety. Automation processes, including robotics, machine learning, and AI, have also shown promise in reducing human error and augmenting safety practices [7;8;10].

The primary objectives of this research are as follows:

To examine the significance of labor protection digitalization and automation processes in the occupational safety management system.

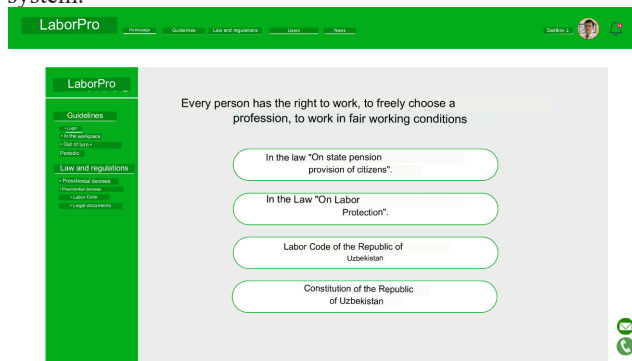


Fig .2. Database in the field of labor protection

- to explore the benefits of incorporating digital tools and automation in labor protection, such as improved risk assessment, real-time monitoring, and enhanced workplace safety.
- to identify the challenges and potential barriers in the adoption of labor protection digitalization and automation processes.
- to analyze case studies and real-world implementations of labor protection digitalization and automation to extract lessons

learned and best practices.

– to discuss the future prospects and implications of labor protection digitalization and automation processes, including emerging technologies and ethical considerations.

– to provide recommendations for organizations seeking to integrate labor protection digitalization and automation processes into their occupational safety management systems.

Methodology. To achieve the research objectives, a comprehensive methodology will be employed, consisting of the following steps[4;6;9]:

Literature Review: A thorough review of existing literature, including scholarly articles, research papers, industry reports, and relevant books, will be conducted to establish a theoretical foundation and identify key concepts, trends, and gaps in the field of labor protection digitalization and automation processes. **Case Studies:** Multiple case studies from different industries will be analyzed to gain practical insights into the implementation of labor protection digitalization and automation processes. These case studies will provide real-world examples of successful integration, challenges faced, and lessons learned. **Expert Interviews:** Interviews will be conducted with professionals, experts, and industry leaders in the field of occupational safety, digitalization, and automation. These interviews will provide valuable perspectives, opinions, and insights on the benefits, challenges, and future prospects of labor protection digitalization and automation processes. **Data Analysis:** The collected data from the literature review, case studies, and expert interviews will be analyzed and synthesized to identify key themes, trends, and findings related to labor protection digitalization and automation processes. **Findings and Recommendations:** Based on the analysis of the collected data, the research will present the findings, discuss their implications, and provide recommendations for organizations seeking to incorporate labor protection digitalization and automation processes into their occupational safety management systems. By employing a rigorous methodology encompassing literature review, case studies, and expert interviews, this research aims to provide a comprehensive understanding of the significance, benefits, challenges, and future prospects of labor protection digitalization and automation processes as key components of the occupational safety management system.

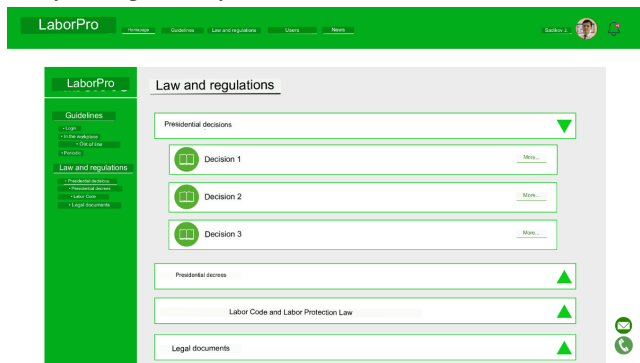


Fig. 3. Occupational Safety Management System Framework

The Occupational Safety Management System (OSMS) provides a systematic and structured approach to managing occupational safety within an organization. It serves as a framework for identifying, assessing, controlling, and continuously improving safety-related risks and hazards. The OSMS framework is often based on recognized standards such as ISO 45001 (Occupational Health and Safety Management Systems) and OHSAS 18001 (Occupational Health and Safety Assessment Series).

The key components of an Occupational Safety Management System typically include:

- a. Policy and Leadership: Establishing a clear occupational safety policy, defining roles and responsibilities, and ensuring strong leadership commitment to safety.
- b. Planning: Identifying hazards, assessing risks, setting objectives, and developing strategies and action plans to mitigate risks and improve safety performance.
- c. Implementation: Executing the plans through resource allocation, training, communication, and establishing safety procedures and protocols.
- d. Evaluation and Measurement: Monitoring and measuring safety performance, conducting inspections and audits, and analyzing data to identify areas for improvement.
- e. Management Review: Regularly reviewing the effectiveness of the OSMS, evaluating compliance, and making necessary adjustments.
- f. Continuous Improvement: Implementing corrective and preventive actions, promoting a culture of safety, and actively seeking opportunities for innovation and enhancement.

Technology plays a crucial role in advancing occupational safety practices. It has the potential to enhance efficiency, accuracy, and effectiveness in various aspects of safety management. The integration of technology in occupational safety can bring about several benefits, including:

- a. Risk Assessment and Management: Digital tools and software applications facilitate more efficient and comprehensive risk assessments, enabling organizations to identify hazards, evaluate risks, and prioritize control measures. Technology can automate the process, improving data analysis and decision-making.
- b. Real-time Monitoring and Alert Systems: Sensor-based technologies and real-time monitoring systems enable continuous surveillance of work environments, equipment, and employee behaviors. These systems can detect abnormal conditions, trigger alarms, and provide instant alerts, allowing for immediate intervention and accident prevention.
- c. Data Analytics and Predictive Modeling: Advanced data analytics and predictive modeling techniques can analyze large datasets, identify patterns, and predict potential safety hazards. By leveraging technology, organizations can proactively address safety risks and implement preventive measures.

d. Training and Education: Technology offers innovative methods for delivering training and education on occupational safety. Virtual reality (VR) and augmented reality (AR) simulations provide realistic training scenarios, allowing workers to practice safety procedures and improve their skills

in a controlled environment.

e. Communication and Reporting: Digital platforms and mobile applications facilitate effective communication and reporting of safety incidents, near-misses, and hazards. This enables timely response and corrective actions, as well as the collection of valuable data for analysis and improvement.

f. Automation and Robotics: Automation processes and robotics can reduce human error, enhance productivity, and eliminate or minimize hazardous tasks. Robots can perform repetitive, physically demanding, or dangerous tasks, allowing workers to focus on higher-level safety responsibilities.

Results and discussion. In conclusion, technology plays a vital role in the occupational safety management system by improving risk assessment, real-time monitoring, data analysis, training, communication, and automation. Integrating technology into occupational safety practices can enhance workplace safety, reduce accidents, and foster a culture of safety within organizations. By embracing technological advancements, organizations can proactively address safety challenges and ensure the well-being of their workforce. Labor protection digitalization refers to the use of digital tools, technologies, and systems to enhance the management of occupational safety and protection measures in the workplace. It encompasses a wide range of applications, including risk assessment and management, real-time monitoring, reporting systems, and the integration of wearable technologies. Labor protection digitalization aims to leverage technological advancements to improve safety practices, reduce workplace hazards, and ensure the well-being of employees.

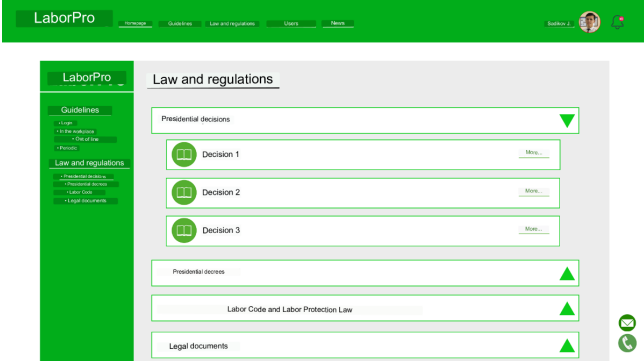


Fig.4. Labor Protection Digitalization

Digital tools play a significant role in enhancing risk assessment and management processes in labor protection. These tools leverage technology to streamline and automate various aspects of risk assessment, such as identifying hazards, evaluating risks, and implementing control measures. Examples of digital tools used for risk assessment and management include: Risk assessment software: These tools provide a structured approach to identify, assess, and prioritize workplace hazards. They often include features for recording and analyzing data, generating reports, and tracking the effectiveness of control measures. Data analytics platforms: Advanced data analytics platforms utilize algorithms and statistical techniques to analyze large datasets related to occupational safety. These platforms can identify patterns, trends, and correlations, providing valuable

insights for risk management and decision-making. Modeling and simulation tools: Modeling and simulation tools allow for the virtual representation of workplace environments and scenarios. These tools enable organizations to simulate and assess the impact of potential hazards, evaluate control measures, and optimize safety protocols. Real-time Monitoring and Reporting Systems: Real-time monitoring and reporting systems employ digital technologies to continuously monitor the workplace environment, equipment, and employee activities. These systems can detect and report potential hazards, deviations from safety protocols, or abnormal conditions, enabling immediate response and intervention. Key components of real-time monitoring and reporting systems include: Sensor-based technologies: Sensors and IoT devices can be deployed to monitor various parameters such as temperature, air quality, noise levels, and machine performance. These sensors provide real-time data, which can be analyzed to identify safety risks and trigger alerts when predefined thresholds are exceeded. Camera surveillance systems: Cameras equipped with intelligent video analytics can monitor work areas to detect unsafe conditions or behaviors. They can identify potential risks, such as unauthorized access to restricted areas, lack of personal protective equipment, or unsafe work practices. Incident reporting and communication platforms: Digital platforms and mobile applications facilitate efficient reporting of safety incidents, near-misses, and hazards. These platforms enable employees to report incidents in real-time, ensuring prompt notification, investigation, and resolution.

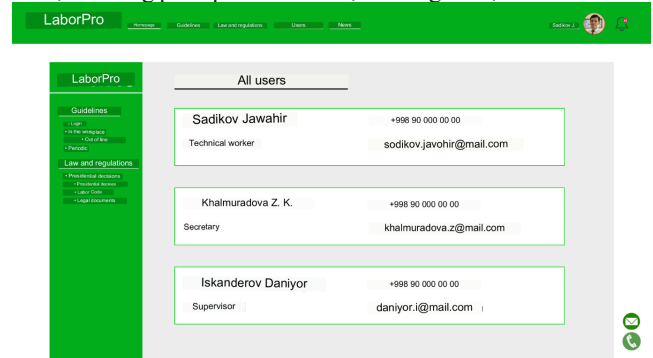


Fig.5. Integration of Wearable Technologies

Wearable technologies have gained prominence in labor protection, providing real-time data and feedback to workers while enhancing their safety. These devices can be integrated into personal protective equipment (PPE) or worn as standalone devices. Some examples of wearable technologies in labor protection include:

- a. Smart helmets: Helmets equipped with sensors can monitor vital signs, detect impacts or falls, and provide alerts in hazardous situations. They can also provide hands-free communication and access to safety information.
- b. Smart vests: Vests embedded with sensors can track workers' movements and postures, detect fatigue or excessive physical strain, and provide reminders to maintain safe behaviors or take breaks.
- c. Smart glasses: Glasses with augmented reality (AR) capabilities can provide workers with real-time safety

instructions, hazard warnings, and access to digital information relevant to their tasks.

From the case studies mentioned above, several lessons can be learned and best practices identified for the implementation of labor protection digitalization and automation processes:

Leadership commitment: The commitment and support of organizational leaders are crucial for the successful implementation of digitalization and automation initiatives. Leaders should promote a culture of safety, allocate resources, and actively participate in the planning and implementation processes. **Stakeholder involvement:** Engaging workers, safety officers, and other relevant stakeholders in the decision-making process fosters ownership, improves acceptance, and ensures the successful integration of digitalization and automation. **Regular communication and training sessions** help address concerns and ensure smooth adoption. **Incremental implementation:** Gradual implementation of digitalization and automation processes allows organizations to learn from pilot projects, identify challenges, and make necessary adjustments. This phased approach minimizes disruption and allows for continuous improvement. **Data privacy and security:** Organizations must prioritize data privacy and security when implementing digitalization and automation processes. Robust security measures, compliance with relevant regulations, and transparent communication about data usage are essential to maintain trust and confidence. **Continuous evaluation and improvement:** Regular evaluation

of the implemented digitalization and automation initiatives helps identify gaps, assess effectiveness, and make necessary refinements. Organizations should establish mechanisms for feedback, monitoring, and ongoing improvement to ensure that safety goals are consistently met.

By learning from these case studies and adopting best practices, organizations can successfully implement labor protection digitalization and automation processes, leading to enhanced occupational safety, improved efficiency, and a positive safety culture.

Conclusion. The findings of this research have significant implications for occupational safety management. They emphasize the importance of embracing digitalization and automation as strategic approaches to enhance safety practices. Organizations should consider integrating digital tools, real-time monitoring systems, and wearable technologies into their safety management systems. Furthermore, they should explore the deployment of robotics, machine learning, and AI technologies to optimize safety outcomes and improve decision-making processes.

The research highlights the need for strong leadership commitment, stakeholder involvement, and a phased approach to implementation. It underscores the importance of addressing privacy and security concerns, providing adequate training and support, and fostering a positive safety culture that embraces collaboration between humans and machines.

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