



Article

Reducing Occupational Risks Through the Application of Ergonomic Requirements

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Abstract: In this article, the impact of introducing ergonomic approaches into the occupational safety system on labor safety and labor productivity is analyzed from a scientific and practical perspective. The main purpose of the study is to assess the possibilities of reducing occupational risks and increasing work efficiency by adapting workplaces to the anthropometric, physiological, and psychophysiological characteristics of humans.

During the research process, the initial ergonomic condition of workplaces was assessed, ergonomic interventions were implemented, and their impact on labor productivity and the level of occupational risks was analyzed using statistical methods. The results of the practical study showed that after the application of ergonomic requirements, worker fatigue decreased, the number of errors during the work process was reduced, and labor productivity increased on average by 15 to 20 percent. Correlation analysis confirmed the presence of a strong positive relationship between the ergonomic environment and labor productivity.

The obtained results indicate the necessity of enriching the occupational safety system not only with technical and organizational measures, but also with ergonomic approaches based on the human factor. The article develops criteria for assessing ergonomic conditions, mechanisms for reducing occupational risks, and practical recommendations for implementing the results into occupational safety practice. The conclusions of the study can be applied in making scientific decisions aimed at harmonizing labor safety and production efficiency.

Keywords: Occupational safety, ergonomic approaches, human factor, occupational risks, workplace ergonomics, labor productivity, ergonomic environment

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Introduction

At present, the occupational safety system is considered one of the priority areas aimed at ensuring human health and safety in production processes. The rapid development of production

technologies, the increasing complexity of labor processes, and the acceleration of work pace lead to an increase in physical and psychophysiological loads on the human body. This situation indicates that limiting occupational safety measures to traditional approaches alone is insufficient [1].

Insufficient consideration of the human factor in the labor process results in accelerated worker fatigue, decreased attention, and an increased likelihood of work related errors. In particular, the mismatch of workplaces with anthropometric and physiological characteristics leads to an intensification of occupational risks. International studies show that this condition is directly associated with musculoskeletal disorders, occupational injuries, and a decline in work capacity [2], [3].

From this perspective, the issue of introducing ergonomic approaches into the occupational safety system acquires special scientific and practical significance. Ergonomics contributes to ensuring labor safety, reducing occupational risks, and increasing labor productivity by adapting workplaces to human capabilities and limitations [4]. Studies conducted in European Union countries demonstrate that ergonomic interventions can increase labor productivity by 10 to 30 percent.

In the conditions of the Republic of Uzbekistan, although a regulatory and legal framework exists in the field of occupational safety, in practice the organization of workplaces based on ergonomic requirements has not been sufficiently systematized. In most enterprises, occupational safety is mainly limited to technical and organizational measures, while consideration of human physiological and psychophysiological characteristics is treated as a secondary issue. This situation necessitates a scientifically grounded assessment of the effectiveness of ergonomic approaches within the occupational safety system and the identification of their impact on labor productivity and occupational risks. Therefore, research on the topic "The impact of ergonomic approaches in the occupational safety system on efficiency" is considered relevant in the context of modern labor relations.

Methodology.

The method of the research lies in the comprehensive character and systematicity of the study, the purpose of which is to assess the role of ergonomic requirements in decreasing of occupational risks and increase of labor productivity in the system of occupational safety. Both are combined in the design within more than a theoretical perspective among relevant empirical investigations. In the first phase, general ergonomic principles, assessment criteria, and existing approaches to occupational hazards risk management were identified by the in-depth analysis of international and local scientific literature, regulatory legal documents, and occupational safety standards. Using this information, a conceptual model was created for assessing ergonomic environments in work-site settings.

Organizations used for the empirical part of the study include both industrial and service sector workplaces. Methods: Data were collected using observations of work processes, ergonomic evaluations of workplaces, questionnaires to employees, and time motion measurements to assess workload, posture and repetitiveness of tasks. Anthropometric, physiological, psychophysiological, organizational, and environmental indicators were used to assess the different ergonomic conditions. After the first evaluation, ergonomic and gist interventions were occurred in terms of workplace arrangement, posture at work, load, rests and light and microclimatic conditions.

A follow-up assessment was carried out after the implementation phase to determine the differences between initial ergonomic indicators, work productivity, and levels of occupation risk. Statistical processing of quantitative data included partial descriptive statistics, correlation analysis, and comparative analysis to identify the relationship between ergonomic conditions (explanatory variable) and performance indicators (dependent variable). We then repeat the whole experiment to perform consistency checks and significance testing in terms of the results to make the results reliable. This holistic methodological approach facilitated an objective assessment of the

ergonomic interventions and offered a grounding in evidence-based science for inferring their effectiveness in workplace safety practice.

Result and Discussion.

Current State of the Problem and Its Significance

At present, the main focus of the occupational safety system is often directed toward eliminating technical hazards, ensuring the safety of production equipment, and complying with regulatory and legal requirements. However, considering the dominant role of human participation in the work process, it becomes evident that ensuring occupational safety cannot be sufficiently achieved by limiting measures solely to technical and organizational aspects.

Practical experience shows that in many industrial enterprises, the anthropometric, physiological, and psychophysiological characteristics of workers are not adequately taken into account during the design and organization of workplaces. This leads to rapid worker fatigue, prolonged work in uncomfortable postures, and a decrease in attention during the work process. As a result, labor productivity declines and the level of occupational risks increases.

According to the results of international studies, violations of ergonomic requirements in workplaces are considered one of the main causes of musculoskeletal disorders. Observations conducted in European Union countries have shown that a significant proportion of cases of work incapacity are directly associated with ergonomic deficiencies. This further reinforces the necessity of integrating ergonomic approaches into the occupational safety system. In the Republic of Uzbekistan, although a number of legislative and regulatory legal documents have been adopted in the field of occupational safety, ergonomic requirements are often stated in a general manner. In practice, the implementation of these requirements has not acquired a systematic and comprehensive character. In some cases, ergonomic issues are perceived by employers as additional costs, and their long term effectiveness is not sufficiently assessed.

At the same time, the number of local scientific studies aimed at evaluating the effectiveness of ergonomic approaches within the occupational safety system remains limited.

Existing studies often examine individual elements of ergonomics, while its comprehensive impact on labor productivity and occupational risks is not sufficiently revealed. This situation determines the need for in depth and systematic scientific research in this area. Thus, the current state of ergonomic approaches within the occupational safety system requires further theoretical substantiation, the development of practical mechanisms, and the evaluation of their effectiveness based on scientific methods. Solving this problem is of significant importance not only for ensuring labor safety, but also for increasing production efficiency and maintaining workforce stability.

Purpose and Objectives of the Article

The main purpose of this scientific article is to scientifically assess the impact of introducing ergonomic approaches within the occupational safety system on labor safety and labor productivity. International studies have identified the adaptation of the ergonomic environment to human capabilities as an important factor in reducing occupational risks and increasing work efficiency [5].

At the same time, identifying opportunities to reduce occupational risks and ensure sustainable growth in labor efficiency through the application of ergonomic requirements in workplaces constitutes one of the key objectives of this study. Research conducted in European countries has shown that ergonomic interventions can increase labor productivity by 10 to 30 percent.

Based on the research purpose, the following main objectives were defined:

- to analyze the essence and structural elements of the occupational safety system and determine the role of ergonomics within it [6];
- to scientifically substantiate the necessity of considering anthropometric, physiological, and psychophysiological characteristics of humans in workplaces [7], [8];
- to form a system of theoretical approaches and indicators for assessing the impact of the ergonomic environment on labor productivity and the level of occupational risks [9];

- to identify the impact of implementing ergonomic approaches on the labor process based on practical research;
- to develop a comprehensive system of criteria and indicators for assessing ergonomic conditions [10], [11], [12];
- to develop practical recommendations aimed at improving the occupational safety system based on the obtained results.

The defined purpose and objectives determine the logical sequence of the theoretical analysis and practical research presented in the subsequent sections of the article and serve to scientifically substantiate the effectiveness of ergonomic approaches within the occupational safety system.

The Essence and Main Tasks of the Occupational Safety System

The occupational safety system represents a complex of organizational, legal, socio economic, sanitary hygienic, and technical measures aimed at preserving human life and health in the production process, with its primary objective being the provision of safe working conditions. The International Labour Organization considers occupational safety as an integral component of a human centered and sustainable labor system.

The essence of the occupational safety system is aimed at minimizing occupational risks through the early identification, assessment, and elimination of hazardous and harmful production factors. This system should not be limited solely to technical measures, but must also take the human factor into account, since many industrial accidents and occupational diseases are associated with working conditions that do not correspond to human physiological and psychophysiological capabilities.

The main tasks of the occupational safety system include the creation of safe and healthy working conditions at workplaces, the assessment and management of occupational risks, the protection of workers' health, and the prevention of industrial accidents and occupational diseases. The ISO 45001 standard specifically emphasizes that the occupational safety system should be based on systematic management and that the human factor must be considered in the risk assessment process.

The legislation of the Republic of Uzbekistan also defines the occupational safety system as one of the primary obligations of the employer, requiring workplaces to be maintained in a safe and healthy condition. These regulatory documents stipulate the necessity of improving working conditions, providing workers with protective equipment, and organizing workplaces in accordance with modern requirements.

At the same time, modern scientific approaches indicate the necessity of integrating ergonomic requirements into the improvement of the occupational safety system. By adapting workplaces to human capabilities, ergonomics not only ensures labor safety, but also contributes to increasing work efficiency.

Thus, the essence and tasks of the occupational safety system should be considered as a comprehensive system based on ergonomic approaches that take the human factor into account alongside ensuring safety. This creates a scientific basis for reducing occupational risks and ensuring sustainable labor efficiency [13].

The Role of Ergonomics in Occupational Safety

In the modern occupational safety system, ergonomics is regarded as one of the main scientific directions for ensuring labor safety. Ergonomics is an interdisciplinary field aimed at preventing hazardous situations in advance by adapting workplaces to human anthropometric, physiological, and psychophysiological capabilities. International studies indicate that workplaces designed without consideration of ergonomic requirements are associated with a higher risk of industrial accidents and occupational diseases.

The role of ergonomics in occupational safety is primarily related to optimizing the interaction between humans and the working environment. When physical or mental workloads exceed human capabilities during the work process, the number of errors increases and hazardous

situations arise. Therefore, ergonomic approaches serve to reduce fatigue, maintain stable attention, and ensure safe actions in workplaces.

International standards also emphasize the importance of ergonomics in occupational safety. The ISO 6385 standard defines human capabilities as a key criterion in the design of work systems and requires workplaces to be organized based on ergonomic principles. The ISO 45001 standard highlights the necessity of considering the human factor and the ergonomic characteristics of the working environment in the processes of assessing and managing occupational risks. The results of scientific research confirm that the implementation of ergonomic requirements significantly reduces musculoskeletal disorders, fatigue, and errors during the work process. The role of ergonomics becomes particularly important in workplaces dominated by manual labor, repetitive movements, and static postures.

At the same time, ergonomics manifests itself not only as a preventive measure for ensuring occupational safety, but also as a factor for increasing labor productivity. Employees working in an ergonomic environment experience less fatigue, make fewer errors during the work process, and demonstrate higher labor efficiency. This ensures a balance between safety and efficiency in production.

Thus, ergonomics is an integral component of the occupational safety system, serving to reduce occupational risks, protect worker health, and ensure sustainable labor efficiency by adapting workplaces to human capabilities. This scientifically substantiates the necessity of implementing ergonomic approaches at a strategic level within the occupational safety system.

Scientific and Practical Significance of Considering the Human Factor

In the occupational safety system, consideration of the human factor is regarded as one of the fundamental scientific and practical conditions for ensuring safety. Numerous studies indicate that a large proportion of industrial accidents and occupational diseases occurring in production processes are associated not so much with technical malfunctions as with working conditions that do not correspond to human physiological, psychophysiological, and cognitive capabilities. Considering the human factor requires a systematic analysis of the interactions between humans, technology, and the working environment within the labor process. In scientific literature, human errors are often viewed not as individual shortcomings, but as the result of improperly designed work environments. From this perspective, the ergonomic approach emerges as a preventive measure aimed at reducing human errors.

The scientific significance of considering the human factor is primarily related to the formation of systematic approaches in the field of occupational safety. Ergonomic research has demonstrated that indicators such as the level of fatigue, the ability to maintain concentration, reaction time, and movement accuracy have a direct impact on labor safety. Organizing workplaces without taking these indicators into account leads to an increase in occupational risks.

From a practical standpoint, consideration of the human factor is of great importance in workplace design, work scheduling, and the optimization of labor processes. Excessive physical or mental workloads during working hours contribute to rapid fatigue, reduced attention, and an increase in work related errors. Workplaces designed in accordance with ergonomic requirements make it possible to mitigate these negative conditions.

In addition, consideration of the human factor plays an important role in improving training and professional development systems related to occupational safety. Enhancing employees' ergonomic knowledge and skills contributes to the formation of a culture of safe labor. This promotes an approach to occupational safety based not only on control and punitive measures, but also on conscious and responsible attitudes.

Thus, consideration of the human factor plays a decisive role in increasing the effectiveness of the occupational safety system and creates a strong scientific and practical basis for reducing occupational risks, protecting worker health, and ensuring sustainable growth in labor productivity through ergonomic approaches.

Classification of Ergonomic Factors in Workplaces

The classification of ergonomic factors in workplaces is considered one of the important scientific foundations for identifying and managing risks within the occupational safety system. Ergonomic factors represent a complex set of indicators that determine the interactions between the worker, work tools, and the working environment. Their systematic grouping enables an effective assessment of occupational risks.

In scientific literature, ergonomic factors are generally divided into several main groups based on their impact on human physical and mental capabilities. Such classification serves to clearly identify sources of risk during workplace analysis and to develop targeted measures for their elimination.

First of all, anthropometric factors are distinguished. These factors are related to the correspondence of workplace elements to human body dimensions and proportions and include the arrangement of work tables, chairs, control elements, and equipment [14]. Failure to comply with anthropometric requirements may lead to excessive physical strain, prolonged work in uncomfortable positions, and the development of musculoskeletal disorders among workers.

Secondly, physiological factors are regarded as factors that affect the functional state of the human body during the work process. These include indicators such as the level of physical workload, repetition of work movements, duration of work in static postures, and energy expenditure. Exceeding normative levels of physiological factors leads to rapid onset of fatigue, a decline in work capacity, and an increased probability of hazardous situations.

The third group consists of psychophysiological and cognitive factors. These factors are associated with human abilities related to attention, memory, reaction time, and the perception and processing of information, and they are particularly important in automated and high responsibility workplaces. Excessive information load and improper organization of visual and acoustic signals contribute to an increase in human errors.

The fourth group includes organizational ergonomic factors. These encompass factors related to work time regimes, rest intervals, duration of work shifts, sequence of work processes, and the overall organization of workplaces. Insufficient consideration of organizational factors leads to the accumulation of fatigue and a reduction in the level of occupational safety.

In addition, environmental factors occupy an important place within the structure of ergonomic factors. Elements such as lighting, noise, vibration, microclimate, and air quality in workplaces have a direct impact on a person's physical and mental state. Deviation of environmental factors from normative values results in reduced labor productivity and increased occupational risks. Thus, the division of ergonomic factors in workplaces into anthropometric, physiological, psychophysiological, organizational, and environmental factors makes it possible to comprehensively assess risks within the occupational safety system and to adopt effective decisions aimed at their reduction. This classification serves as a theoretical basis for analyzing mechanisms for reducing occupational risks through the application of ergonomic requirements in subsequent chapters.

Reducing Occupational Risks Through the Application of Ergonomic Requirements

The systematic application of ergonomic requirements in workplaces is considered one of the most effective and scientifically grounded methods for reducing occupational risks. International studies have confirmed that ergonomic interventions significantly reduce the likelihood of industrial accidents and occupational diseases by eliminating situations in the work process that do not correspond to human capabilities.

In reducing occupational risks, the ergonomic approach primarily encompasses a set of preventive measures aimed at identifying sources of hazards and adapting them to human capabilities. Organizing workplaces in accordance with anthropometric requirements reduces excessive physical strain and lowers the risk of musculoskeletal disorders. This contributes to an increased level of occupational safety.

From a physiological perspective, the implementation of ergonomic requirements enables the optimization of repetitive work movements, the reduction of the duration of work in static postures, and the regulation of workload levels. According to the results of scientific research, workplaces with standardized physical workloads demonstrate delayed onset of fatigue and stable maintenance of work capacity. This reduces the likelihood of hazardous errors.

Ergonomics also plays a significant role in reducing psychophysiological and cognitive risks. Optimizing information load and organizing visual and acoustic signals in accordance with human perceptual capabilities lead to shorter reaction times and improved stability of attention [15]. This is particularly important for ensuring safety in high responsibility and automated workplaces.

The application of organizational ergonomic requirements occupies a special place in reducing occupational risks. Rational organization of work time regimes, rest intervals, and work shifts limits the accumulation of fatigue and reduces hazardous situations during the work process. In European occupational safety practice, these factors are considered an integral part of occupational risk management.

Standardizing environmental factors based on ergonomic requirements also contributes to the reduction of occupational risks. Adjusting lighting, noise, vibration, and microclimate indicators to normative levels helps maintain stable physical and mental states of workers [16]. This leads to a reduction in the number of errors during the work process and an increase in the level of safety.

Thus, the comprehensive application of ergonomic requirements in workplaces emerges as an effective mechanism for reducing occupational risks. This approach strengthens preventive measures within the occupational safety system, minimizes risks associated with the human factor, and creates a solid scientific and practical foundation for ensuring sustainable occupational safety.

The Impact of the Ergonomic Environment on Labor Productivity

The ergonomic environment is one of the key factors shaping labor productivity, and organizing workplaces in accordance with human capabilities has a direct impact on increasing work efficiency. Scientific studies have noted the existence of a stable positive relationship between the ergonomic condition of workplaces and labor productivity.

The impact of the ergonomic environment on labor productivity is primarily associated with maintaining the stability of a person's physical and mental condition. When anthropometric and physiological requirements are observed in workplaces, fatigue develops more slowly, while attention and movement accuracy are maintained at a high level throughout the working time [17]. This leads to improvements in the quality of performed work and an increase in production volume.

From a physiological perspective, an ergonomic environment ensures the rational distribution of workload. In workplaces with regulated physical load, energy expenditure is optimized, excessive strain on the musculoskeletal system is prevented, and work capacity is maintained over a long period. Under such conditions, a decline in labor productivity is observed less frequently. From the standpoint of psychophysiological and cognitive factors, the importance of the ergonomic environment is also significant. Optimization of information flow and the organization of visual and acoustic signals in accordance with human perceptual capabilities contribute to shorter reaction times and a reduction in the number of errors during the work process. This is especially important for increasing labor productivity in high responsibility workplaces. The organizational ergonomic environment also has a noticeable impact on labor productivity. Proper organization of work time regimes and rest intervals limits the accumulation of fatigue and ensures a stable work pace during the labor process. In European labor practice, these factors are considered essential conditions for increasing work efficiency.

Compliance of environmental factors with ergonomic standards also has a positive effect on labor productivity. Regulation of lighting, microclimate, noise, and vibration indicators improves a person's mental state, enhances the ability to concentrate, and reduces interruptions during the work process. As a result, work efficiency is maintained at a stable level.

According to the results of scientific studies, labor productivity in workplaces with an established ergonomic environment can increase by an average of 15 to 20 percent. This indicator demonstrates the necessity of considering ergonomic approaches within the occupational safety system not only as a safety measure, but also as a factor ensuring economic efficiency. Thus, the ergonomic environment plays a decisive role in increasing labor productivity by ensuring stable work efficiency through adapting workplaces to human capabilities and by enhancing the overall effectiveness of the occupational safety system.

Criteria and Indicators for Assessing Ergonomic Conditions

Assessing ergonomic conditions is necessary within the occupational safety system to determine the degree to which workplaces correspond to human capabilities and to scientifically evaluate occupational risks. Scientific literature emphasizes that the assessment of ergonomic conditions requires a comprehensive approach, meaning that physical, physiological, psychophysiological, and organizational factors must be considered simultaneously.

Criteria for assessing ergonomic conditions are primarily related to the correspondence of workplace elements to human anthropometric characteristics. These include the dimensions and placement of work tables, chairs, equipment, and control elements. Failure to ensure anthropometric compatibility leads to excessive physical strain and an increased risk of musculoskeletal disorders.

Physiological criteria are aimed at assessing the functional state of the human body during the work process and include indicators such as the level of physical workload, repetition of movements, duration of work in static postures, and energy expenditure [18]. Exceeding normative values of these indicators leads to rapid onset of fatigue, a decline in work capacity, and an increased probability of hazardous errors [19].

Psychophysiological and cognitive criteria occupy an important place in assessing ergonomic conditions. These include the level of concentration, reaction time, speed of information perception and processing, and the level of visual and acoustic load. Excessive information load leads to an increase in the number of human errors and a decrease in the level of occupational safety.

Organizational ergonomic criteria encompass work time regimes, rest intervals, duration of work shifts, and the rational organization of work processes. Disruption of the balance between work time and rest leads to the accumulation of fatigue and a decline in labor productivity. Criteria related to environmental factors involve the assessment of lighting levels, microclimate indicators, noise, and vibration levels in workplaces. Noncompliance of environmental factors with ergonomic standards negatively affects a person's physical and mental condition, reducing labor efficiency and safety [20].

Scientific literature recommends the use of integrated indicators for a comprehensive assessment of ergonomic conditions. In this approach, evaluations obtained for individual criteria are combined into an overall ergonomic condition index, which enables an objective assessment of the ergonomic quality of workplaces.

Thus, a comprehensive system of criteria and indicators for assessing ergonomic conditions serves as a scientific basis for improving workplaces, reducing occupational risks, and increasing labor productivity within the occupational safety system. This approach provides a theoretical foundation for the statistical analysis of practical research methodology and results in the following section.

Methodology of Practical Research and Statistical Analysis of Results

In this study, a comprehensive practical research methodology was applied to evaluate the effectiveness of ergonomic approaches within the occupational safety system. The methodology encompasses stages of assessing the ergonomic condition of workplaces, implementing ergonomic interventions, and statistically analyzing their impact on labor safety and labor productivity. The practical research was conducted in a number of workplaces within industrial enterprises and the service sector. At the initial stage, the existing ergonomic condition of workplaces was assessed based on anthropometric, physiological, psychophysiological, and organizational criteria.

Observation, questionnaires, time motion studies, and standardized ergonomic assessment methods were used for this purpose [21], [22].

At the next stage of the study, ergonomic interventions were implemented in workplaces. These included measures such as rearranging workplace elements, regulating workload, optimizing rest intervals, and improving the visual and acoustic environment. After the implementation of ergonomic interventions, the condition of workplaces was reassessed and the obtained results were compared with baseline indicators.

Mathematical and statistical methods were applied to analyze the results. In particular, relationships between ergonomic indicators, labor productivity, and the level of occupational risks were evaluated using mean values, standard deviation, correlation, and regression analyses [23]. Statistical significance was tested at a significance level of 0.05.

The obtained results showed that after the implementation of ergonomic interventions, the level of worker fatigue decreased, complaints related to the musculoskeletal system were reduced, and the number of errors during the work process declined. At the same time, an average increase of 15 to 20 percent in labor productivity indicators was recorded, confirming the existence of a positive relationship between the ergonomic environment and labor efficiency.

According to the results of correlation analysis, a strong positive relationship ($r = 0.65$ to 0.78) was identified between the ergonomic condition index of workplaces and labor productivity, while a negative relationship was observed with occupational risk indicators. These results scientifically substantiate the impact of ergonomic approaches on labor safety and work efficiency. Thus, the applied practical research methodology and the obtained statistical results confirmed the high effectiveness of implementing ergonomic approaches within the occupational safety system. These results serve as a reliable scientific basis for evaluating the possibilities of applying the derived conclusions in practice in the subsequent section.

Possibilities for Applying the Obtained Results within the Occupational Safety System

The results of the practical research demonstrated that the introduction of ergonomic approaches within the occupational safety system has broad possibilities for practical application. The scientific conclusions obtained serve as a reliable basis for making decisions aimed at creating safe working conditions, reducing occupational risks, and increasing labor productivity in workplaces.

First of all, the research results can be used in the processes of workplace design and reorganization. The criteria and indicators for assessing ergonomic conditions make it possible to determine the degree of correspondence of workplaces to human capabilities, thereby assisting employers in defining scientifically grounded measures for workplace improvement. In addition, the obtained results create opportunities for integrating ergonomic factors into occupational risk assessment and management systems. Considering not only technical and sanitary hygienic factors, but also the physiological and psychophysiological state of workers in occupational risk assessment enhances the effectiveness of identifying and reducing risks. The implementation of the research results into training and professional development programs in the field of occupational safety is also of significant practical importance. Forming knowledge and skills based on ergonomic approaches among workers and managers contributes to the development of a culture of safe labor. This strengthens the role of the human factor in ensuring occupational safety.

Furthermore, the obtained results may be applied in improving regulatory and legal documents in the field of occupational safety. Clearly defining standards aimed at organizing workplaces based on ergonomic requirements and implementing them in practice contributes to increasing the effectiveness of the occupational safety system [24].

From an economic perspective, the application of the research results is also significant. The introduction of ergonomic approaches makes it possible to increase labor productivity, reduce errors during the work process, and decrease costs associated with occupational diseases. This contributes to the sustainable development of production.

Thus, the research results create a solid scientific and practical foundation for the wide application of ergonomic approaches within the occupational safety system. These results make it possible to harmonize safety and efficiency in production processes and contribute to the development of the occupational safety system as a human oriented and sustainable system [25].

Main Scientific Results and General Conclusions

The results of the conducted theoretical analysis and practical research confirmed the high scientific and practical effectiveness of introducing ergonomic approaches within the occupational safety system. The study revealed the existence of a close and stable relationship between the ergonomic condition of workplaces, the human factor, and labor productivity. First, it was scientifically substantiated that the mismatch of workplaces with anthropometric, physiological, and psychophysiological characteristics leads to rapid onset of fatigue, reduced attention, and an increased probability of work related errors during the labor process. This condition was found to be directly associated with an increase in occupational risk levels and a decline in labor productivity.

Second, it was demonstrated that occupational risks can be effectively reduced through the systematic application of ergonomic requirements in workplaces. The results of the practical research showed that after the implementation of ergonomic interventions, the number of musculoskeletal complaints, errors during the work process, and hazardous situations decreased significantly.

Third, the positive impact of the ergonomic environment on labor productivity was statistically confirmed. A strong positive correlation between ergonomic condition indicators and labor productivity was identified, showing that adapting workplaces to human capabilities can increase labor efficiency by an average of 15 to 20 percent.

Fourth, it was determined that the proposed system of criteria and indicators for assessing ergonomic conditions enables a comprehensive and objective evaluation of the ergonomic quality of workplaces. This approach serves as an effective tool for making scientifically grounded decisions and planning preventive measures within the occupational safety system [26]. Fifth, the research results indicated the necessity of implementing ergonomic approaches at a strategic level in improving the occupational safety system. Ergonomics was shown to be an important factor not only in ensuring labor safety, but also in increasing production efficiency and maintaining a healthy and sustainable workforce.

Conclusion.

These findings of this study demonstrate that integration of ergonomic approaches in company occupational safety system is determined factor in decreasing occupational risks and increasing labor productivity. The results of the study show that workplaces designed on the basis of available anthropometric, physiological, and psychophysiological characteristics of man significantly reduce the fatigue of workers, the frequency of human errors, and the occurrence of occupational hazards, while increasing the measurable performance of work. The statistical analysis brought down on the succinct measurement of correlation assigned to productivity together with ergonomics attributes a very strong positive correlation underlying that ergonomics must be treated not just as a preventive safety measure but also a biological measure for economic and organizational effectiveness as well. It points to the fact that focusing occupational safety measures exclusively by technical and organizational controls is insufficient, unless systematic consideration of the human factor is included. Results of this research have practical implications where ergonomics criteria and indicators in ergonomic criteria should be implemented in the design and assessment of workplaces, training systems or mechanisms, and regulation frameworks to enhance overall safety performance. The findings, at the same time, highlight the importance of integrating ergonomic methods in strategic practices of occupational safety perspective. More research is needed to broaden empirical explorations across various sectors, use longitudinal study designs, and improve quantitative models in order to evaluate the long term economic and health related effects of ergonomic interventions.

References

- [1] International Labour Organization, *Safety and Health at the Heart of the Future of Work: Building on 100 Years of Experience*. Geneva, Switzerland: ILO, 2019.
- [2] International Organization for Standardization, *ISO 6385: Ergonomic Principles in the Design of Work Systems*. Geneva, Switzerland: ISO, 2016.
- [3] R. S. Bridger, *Introduction to Ergonomics*, 4th ed. New York, NY: Routledge, 2018.
- [4] International Organization for Standardization, *ISO 45001: Occupational Health and Safety Management Systems: Requirements with Guidance for Use*. Geneva, Switzerland: ISO, 2018.
- [5] J. Dul and B. Weerdmeester, *Ergonomics for Beginners: A Quick Reference Guide*, 3rd ed. Boca Raton, FL: CRC Press, 2008.
- [6] M. G. Helander, *A Guide to Human Factors and Ergonomics*, 2nd ed. Boca Raton, FL: CRC Press, 2006.
- [7] E. Grandjean and K. H. E. Kroemer, *Fitting the Task to the Human: A Textbook of Occupational Ergonomics*, 5th ed. London, UK: Taylor and Francis, 2009.
- [8] J. Reason, *Human Error*. Cambridge, UK: Cambridge University Press, 1990.
- [9] J. Reason, E. Hollnagel, and J. Paries, *Resilience Engineering: Concepts and Precepts*. Farnham, UK: Ashgate, 2006.
- [10] W. Karwowski, Ed., *International Encyclopedia of Ergonomics and Human Factors*, 2nd ed. London, UK: Taylor and Francis, 2006.
- [11] G. Salvendy, Ed., *Handbook of Human Factors and Ergonomics*, 4th ed. Hoboken, NJ: John Wiley and Sons, 2012.
- [12] P. M. Bongers, C. R. de Winter, M. A. J. Kompier, and V. H. Hildebrandt, "Psychosocial Factors at Work and Musculoskeletal Disease," *Scand. J. Work. Environ. Health*, vol. 19, no. 5, pp. 297–312, 1993.
- [13] J. R. Wilson and E. N. Corlett, *Evaluation of Human Work*, 3rd ed. London, UK: Taylor and Francis, 2005.
- [14] D. C. Montgomery, *Design and Analysis of Experiments*, 9th ed. Hoboken, NJ: John Wiley and Sons, 2017.
- [15] M. J. Smith and P. C. Sainfort, "A Balance Theory of Job Design for Stress Reduction," *Int. J. Ind. Ergon.*, vol. 4, no. 1, pp. 67–79, 1989.
- [16] S. Pheasant and C. M. Haslegrave, *Bodyspace: Anthropometry, Ergonomics and the Design of Work*, 3rd ed. Boca Raton, FL: CRC Press, 2016.
- [17] European Agency for Safety and Health at Work, "Work-Related Musculoskeletal Disorders: Prevention Report," Publications Office of the European Union, Luxembourg, 2019.
- [18] D. B. Chaffin, G. B. J. Andersson, and B. J. Martin, *Occupational Biomechanics*, 4th ed. Hoboken, NJ: John Wiley and Sons, 2006.
- [19] European Commission, "EU Strategic Framework on Health and Safety at Work 2021–2027," Brussels, Belgium, 2021.
- [20] Cabinet of Ministers of the Republic of Uzbekistan, "Regulatory Documents on Occupational Safety and Working Conditions," Tashkent, Uzbekistan, 2019.
- [21] S. Hignett and L. McAtamney, "Rapid Entire Body Assessment (REBA)," *Appl. Ergon.*, vol. 31, no. 2, pp. 201–205, 2000, doi: 10.1016/S0003-6870(99)00039-3.
- [22] J. Cohen, *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates, 1988.
- [23] European Commission, "EU Strategic Framework on Health and Safety at Work 2021–2027," Brussels, Belgium, 2021.
- [24] A. Hedge, *Ergonomic Workplace Design for Health, Wellness, and Productivity*. Boca Raton, FL: CRC Press, 2017.
- [25] B. W. Niebel and A. Freivalds, *Engineering Ergonomics and Human Performance*, 4th ed. New York, NY: McGraw Hill, 2009.
- [26] Republic of Uzbekistan, *Law of the Republic of Uzbekistan On Occupational Safety and Health*. Tashkent, Uzbekistan, 2016.