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IMPROVING EFFICIENCY IN MANUFACTURING ENTERPRISES BY DIGITALIZING THE OCCUPATIONAL SAFETY MANAGEMENT SYSTEM

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Abstract

This article examines how digitalizing the occupational safety management system in manufacturing enterprises can enable faster and higher-quality organization of control, documentation, and analytical activities. Within the scope of the study, a survey was conducted among department/section heads and workers to assess the current practice of maintaining briefing journals, errors related to paper documentation, and the possibilities for transitioning to digital recordkeeping. The results showed that maintaining paper journals involves errors and that there are difficulties in locating documents and preparing reports. Based on the requirements for training employees in occupational safety and assessing their knowledge, as well as the requirements for organizing occupational safety activities, the article presents practical proposals for the step-by-step implementation of an electronic briefing journal and digital monitoring mechanisms in enterprises.

Keywords

occupational safety, occupational health and safety, management system, digitalization, electronic briefing journal, internal control, inspection.

Introduction.

Ensuring occupational safety and properly organizing occupational health and safety activities in manufacturing enterprises is of great importance for protecting employees' lives and health, ensuring the stable operation of production processes, and strengthening labor discipline. In the Republic of Uzbekistan, labor relations, the rights and obligations of employers and employees, and general norms related to working conditions are regulated by the Labor Code [1].

The effectiveness of occupational safety management largely depends on three factors: identifying and reducing hazardous factors; providing employees with instructions and training; and documenting and controlling these processes. International practice emphasizes that safety management should be viewed as an integral part of overall management, that the "plan–do–check–improve" approach should be implemented, and that records should be maintained reliably [2].

Guidelines developed by the International Labour Organization emphasize the need to manage occupational safety and health activities in enterprises as a "system." These guidelines identify the main areas of occupational safety management as establishing policies and commitments, planning, implementation, monitoring, and continuous improvement. They also consider hazard identification and assessment, employee training, internal control, and regular recordkeeping to be essential conditions for making well-founded management decisions [3]. This approach requires the systematic collection, organization, and analysis of occupational safety information in the enterprise, which makes the digitalization of processes even more relevant.

In practice, processes such as conducting and recording briefings, documenting training and knowledge assessment results, storing internal inspection materials, and preparing reports are often managed through paper journals and scattered documents. With such an approach, errors may occur in records; documents may become difficult to find quickly; preparing consolidated analytical information may take considerable time; and ensuring continuous control may become more complicated. Educational literature on occupational safety also notes that deficiencies in briefing and documentation processes may lead to the recurrence of hazardous situations during work activities [5].

Local studies devoted to the digitalization of occupational safety training and instructions indicate that digitalization is not merely converting a document into electronic form, but also systematizing the management of training and instruction processes, standardizing records, and strengthening control [6]. In addition, legal and conceptual approaches to assessing the knowledge of managers and specialists through digital technologies have been presented, emphasizing the importance of increasing transparency, reliably recording results, and creating an evidence-based database for inspections [7].

Accordingly, the purpose of this article is to present the practical effectiveness of digitalizing occupational safety management processes in a manufacturing enterprise based on survey results, and to substantiate practical proposals for introducing digital monitoring mechanisms through the electronic management of the instructions (briefing) journal.

Methodology.

A survey method was used to describe the current state of documentation and control within occupational safety management processes. The methodological basis relied on the provisions of the Labor Code, which sets out general requirements related to labor relations and working conditions [1].

The survey was conducted among two groups: department/section heads (20 respondents) and workers (20 respondents). This coverage made it possible to compare the views of managers who organize and supervise briefings with the views of employees who undergo the briefings.

The survey consisted of two blocks, each containing 16 questions.

- Managers' block: paper-journal recordkeeping practice, problems in conducting briefings, practical demonstrations, errors, inspection/audit, reporting, document loss, advantages of the electronic journal, and barriers to implementation.
- Workers' block: completion of briefings, signing, understanding, the opportunity to ask questions, practical demonstrations, rushed briefings, injuries and hazardous situations, errors in the paper journal and the possibility of formal signatures, and the speed of electronic monitoring.

Responses were compiled by answer option and summarized as counts (number of respondents) and shares (percent). Separate bar charts were prepared for each question: 16 charts for managers and 16 charts for workers (32 charts in total) (Figures 1–32). When interpreting the results, comparisons were made with approaches emphasizing the "plan–do–check–improve" cycle in safety management, the importance of employee participation and training, and approaches to digitalizing instructions and knowledge assessment.

Results.

The responses to the survey questions were processed, and bar charts were prepared for each question. The charts are compiled in the appendices at the end of the article.

Among the managers, the practice of obtaining signatures in a paper journal after briefings was universal: all 20 respondents answered "Yes" (Figure 1). The main problems in conducting briefings were identified as "lack of time" (8 respondents, 40%) and "pressure from the work plan/production plan" (7 respondents, 35%) (Figure 2). Regarding whether there is enough time to provide practical demonstrations, 16 respondents (80%) answered "Yes" (Figure 3).

As an important aspect related to briefing quality, the situation where employees sign even without reading the instruction text was reported as “Yes” (5 respondents) and “Sometimes” (7 respondents) (Figure 4). For the question “Does the signature journal truly confirm an employee’s knowledge?”, the option “Partially” was chosen by 9 respondents (45%) (Figure 5).

Regarding problems in maintaining paper journals, 6 managers answered “Yes” and 6 answered “Sometimes” (a total of 60%) (Figure 6). Difficulties were also noted in quickly finding the journal for inspections/audits and in preparing reports (Figures 7–8). Document loss/damage was reported as “Yes” by 7 respondents and “Sometimes” by 4 respondents (a total of 55%) (Figure 9).

For Department/Section Heads (Managers)

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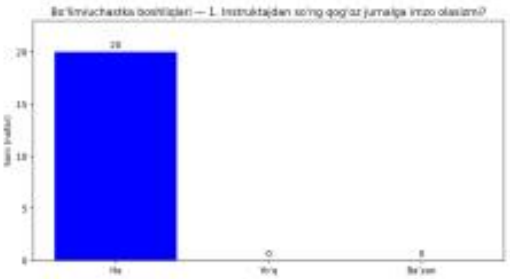

Figure 1. Signing the paper journal after the briefing

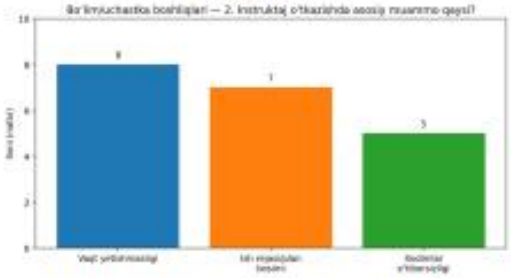

Figure 2. Main problem in conducting the briefing

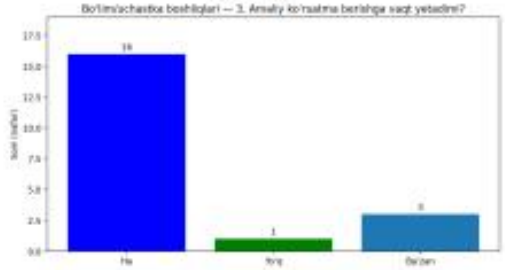

Figure 3. Whether there is enough time for practical demonstration

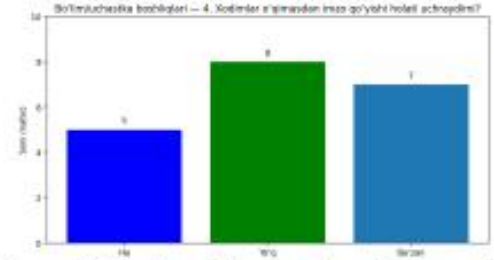

Figure 4. Signing without reading the instruction text

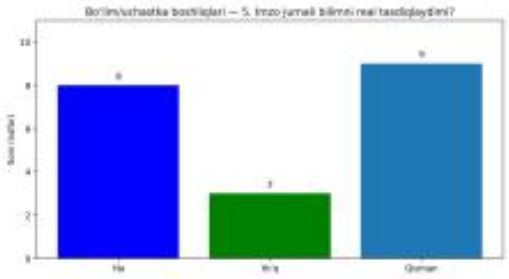

Figure 5. Whether the signature journal
ıly confirms
ıowledge

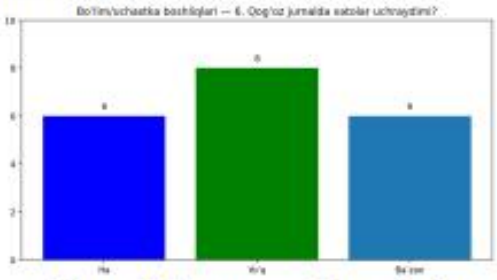

Figure 6. Occurrence of errors in the paper journal

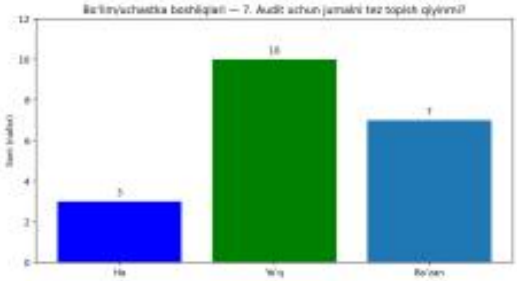

Figure 7. Difficulty of quickly finding the journal for inspection/audit

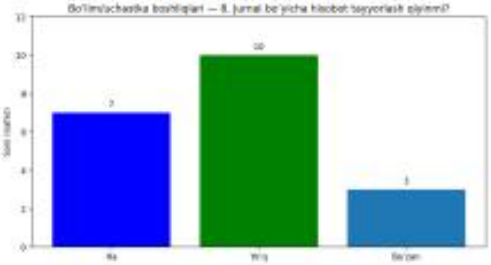

Figure 8. Difficulty of preparing reports based on the paper journal

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Figure 9. Cases of loss or damage of the journal

Figure 10. Reviewing briefing topics after an accident

Figure 11. What workplace injuries are mainly related to in the section

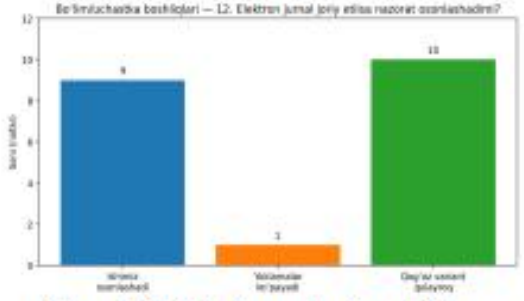

Figure 12. Whether control would become easier if an electronic journal is introduced

Figure 13. Whether an electronic journal would reduce errors found in paper journals

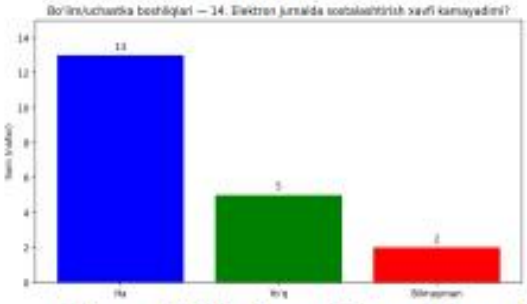

Figure 14. Whether an electronic journal would reduce the risk of falsification

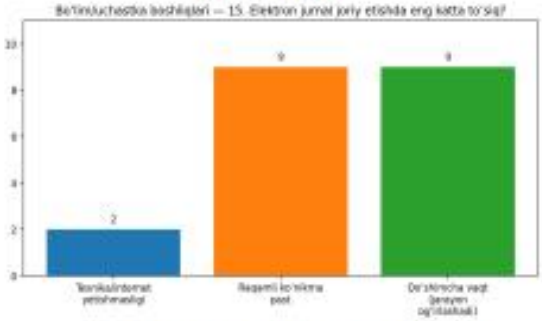

Figure 15. The biggest barrier to implementing an electronic journal

Figure 16. Whether an electronic journal would make analysis easier

For Workers

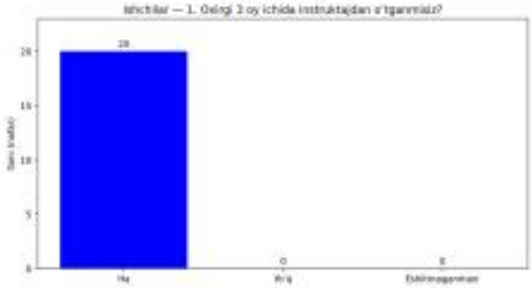

Figure 17. Having received a briefing within the last 3 months

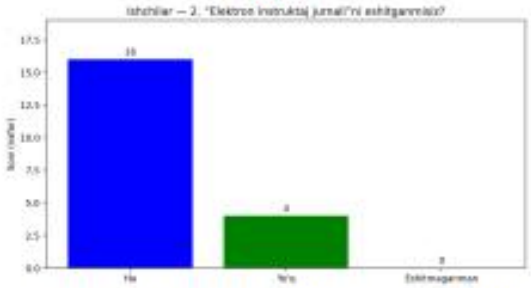

Figure 18. Having heard about an electronic briefing journal

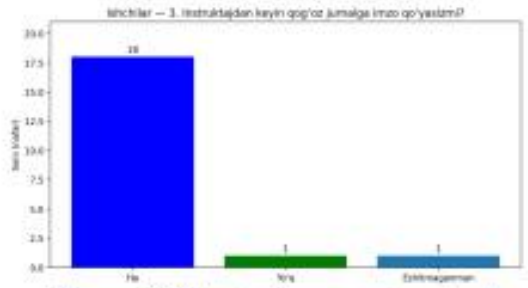

Figure 19. Signing the paper journal after the briefing

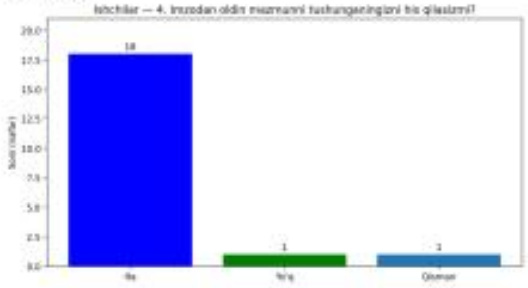

Figure 20. Understanding the content before gning

Figure 21. The supervisor explains the briefing verbally

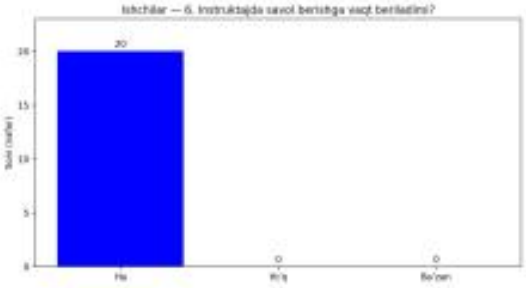

Figure 22. Time is allocated for questions d arifications

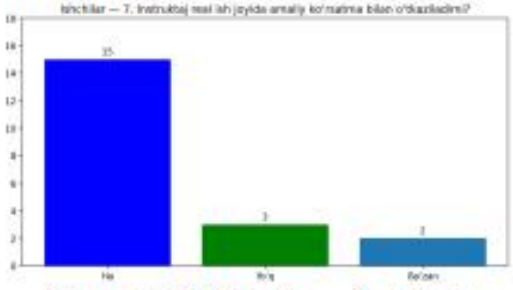

Figure 23. Briefing is conducted at the tual workplace with practical monstration

Figure 24. Briefings are conducted in a rushed manner

Figure 25. Having suffered an injury during work activity

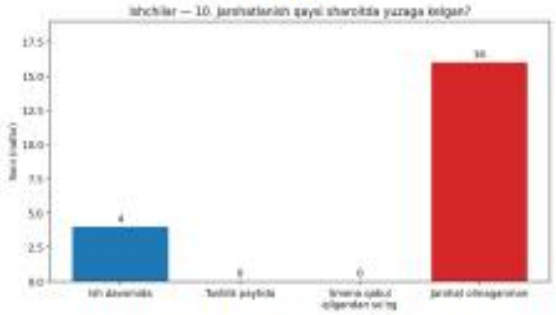

Figure 26. Conditions under which the injury occurred

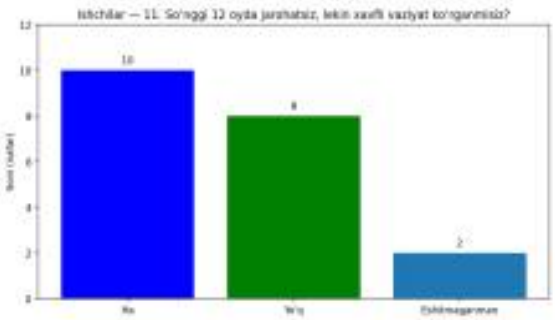

Figure 27. Having observed a hazardous situation in the last 12 months (without injury)

Figure 28. Occurrence of errors when filling out the paper journal

Figure 29. Risk of loss/damage of the paper journal

Figure 30. Possibility of a formal signature

Figure 31. If there is an electronic journal, quickly seeing who has/has not received a briefing

Figure 32. Impact of maintaining a paper urnal on workplace accidents

Regarding attitudes toward an electronic briefing journal, 9 respondents (45%) stated that "our work will become easier," while 10 respondents (50%) stated that "paper is more convenient" (Figure 12). Nevertheless, 16 respondents (80%) believed that an electronic journal would reduce errors found in paper journals (Figure 13), 13 respondents (65%) believed it would reduce the risk of falsification (Figure 14), and 16 respondents (80%) believed it would simplify analysis (Figure 16). The largest implementation barriers were identified as low digital skills (9 respondents) and additional time/workload (9 respondents) (Figure 15).

In the workers' group, 20 respondents (100%) reported that they had received a briefing within the last three months (Figure 17). Ten respondents (50%) reported having observed a hazardous situation (no injury, but a dangerous incident) (Figure 27). Regarding errors when filling out the paper journal, 11 respondents (55%) answered "Yes" and 2 respondents (10%) answered "Sometimes" (Figure 28). For the question "Is it possible that signatures are formal?", 6 respondents (30%) answered "Yes" and 3 respondents (15%) answered "I don't know" (Figure 30). If an electronic journal were available, 14 respondents (70%) agreed that it would be possible to quickly see who has and who has not received a briefing (Figure 31).

Discussion.

The results show that paper-based recordkeeping is widely used; however, there are documentation errors, a risk of document loss, and time losses during inspections and reporting. The HSE approach to safety management emphasizes that maintaining accurate records and continuously improving the system through inspections is important. The ILO guidelines also state that, at the enterprise level, the planning–implementation–monitoring–improvement cycle is a fundamental principle for continuous improvement of the management system [3].

The possibility of "formal signatures" in relation to briefing quality indicates the risk that records may be limited to signatures only. To reduce this risk, training, employee involvement, and elements of continuous learning are important. OSHA recommendations likewise identify employee training, ensuring employee participation, identifying and assessing hazards, and regularly reviewing program effectiveness as key elements [4].

Local approaches to digitalizing instructions and training strengthen the interpretation of the results. Muradov. S (2024) notes that digitalizing instructions makes it possible to systematize the process, standardize records, and strengthen control [6]. This is also evident in the survey results: 80% of managers indicated that an electronic journal would reduce errors and make analysis easier. Muradov. S (2024) also highlights the legal foundations of digital knowledge assessment and the advantages of reliably recording results [7], which practically supports the idea of adding short knowledge checks (tests) after briefings to reduce the likelihood of "formal signatures."

The fact that 50% of workers reported having observed a hazardous situation (Figure 27) indicates the need to strengthen "early reporting and recording" mechanisms. Within the HSE and ILO approaches, such indicators are assessed as signals to enhance "active monitoring" and preventive measures [3].

One of the most important issues in assessing the impact of digitalization on management is the "quality of records" and the "speed of control." In the HSE approach to occupational safety management, the effectiveness of control and monitoring systems is directly linked to reliable records, regular inspections, and defining corrective measures for identified shortcomings and monitoring their implementation. Therefore, the presence of errors and the risk of document loss in paper journals can be considered a practical basis for introducing a digital recordkeeping system.

The implementation barriers identified (low digital skills and additional workload) (Figure 15) indicate that digitalization should be introduced gradually and in a simplified manner. In this

process, providing employee training and ensuring participation, as well as managing instructions in a unified way, are important.

These barriers (low digital skills and additional time/workload) also show that the principles of "simplicity" and "step-by-step implementation" should be prioritized when organizing digitalization. Within the HSE and ILO approaches, it is also noted that the management system must fit real practice, responsibilities should be clearly assigned, and processes should be monitored regularly [3]. Therefore, it is advisable to introduce an electronic instructions journal first with minimal functions (coverage tracking, search, mandatory fields, automatic date/time), and then expand it with enhanced analytical and internal control capabilities.

Conclusion and Practical Recommendations.

The survey results show that when working with paper journals there are errors (60% among managers; 65% "yes/sometimes" among workers), a risk of document loss (55% among managers; 65% "yes" among workers), and a possibility of "formal signatures." At the same time, attitudes toward the advantages of an electronic briefing journal are positive: 80% of managers stated that errors would decrease and analysis would become easier, and 70% of workers agreed that it would be possible to quickly see who has and who has not received a briefing.

For practical implementation, the following sequence is recommended (consistent with the HSE/ILO cycle and OSHA elements):

- Electronic instructions (briefing) journal: mandatory fields, automatic date/time, employee identification, quick search, and department-level reporting.
- Short knowledge checks after briefings: reducing the risk of "formal signatures" through tests/mini-questions.
- Recording hazardous situations: maintaining a plan of measures to report, analyze, and reduce recurrence.
- Internal inspections and indicators: analyzing coverage, problem areas, and preventive measures by departments/sections.
- Skills development: short training sessions and a simple interface to overcome the barrier of low digital skills.

The main practical benefit of introducing an electronic instructions (briefing) journal is the standardization of records, reduction of errors through mandatory fields and automatic date/time, strengthening control through search and rapid reporting, and increasing the ability to make management decisions based on evidence. In addition, adding short knowledge checks after briefings can reduce the risk of "formal signatures" and improve the practical effectiveness of training.

The success of digitalization is not limited to technical tools; it depends on employee participation, the quality of training, the development of digital skills, and organizing the process without excessive additional workload. OSHA recommendations emphasize the importance of engaging employees and ensuring the continuity of training. Therefore, step-by-step implementation of an electronic instructions journal (starting with minimal functions and then expanding analytical and internal control modules) is considered the most appropriate approach.

As a result, the step-by-step introduction of an electronic instructions journal and digital monitoring mechanisms is expected to increase the speed of documentation and control in occupational safety management, reduce errors, expand the ability to identify hazardous situations early, and have a positive impact on production efficiency.

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