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Implementation of Wearable Technology and IoT Sensors in OSH Management for Enhancing Safety Culture and Field Worker Well-Being

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ABSTRACT – Implementing IoT sensor-based wearable technology in OSH management represents a strategic innovation to mitigate physical risks and enhance field worker well-being. This study analyzes sensor technology implementation in physical hazard monitoring, safety culture shifts, and its impact on workers' physical, mental well-being, and data privacy. Utilizing an exploratory qualitative approach with a multiple case study design, data were gathered through in-depth interviews, field observations, and operational documents. The findings demonstrate that real-time biometric and motion sensor tracking effectively detects fatigue, awkward working postures, and potential fatal incidents with high precision. Safety data transparency drives a shift in worker compliance behavior toward self-awareness, strengthening collective safety climate. Clear biometric data governance regulations successfully alleviate privacy concerns while maintaining worker psychological comfort at the job site. This study concludes that integrating wearable technology grounded in human-centered safety principles establishes a new adaptive, transparent, and sustainable OSH management standard.

Keywords: wearable technology, iot sensors, osh management, safety culture, worker well-being, mental health, data privacy, field safety.

A. INTRODUCTION

The application of modern technology in the industrial world has significantly transformed Occupational Health and Safety (OHS) management in high-risk work areas. Field working environments often present unpredictable physical hazard dynamics, requiring precise and responsive monitoring mechanisms. The use of conventional personal protective equipment frequently has limitations in detecting environmental hazards in real-time and directly measuring workers' physiological conditions. The presence of wearable device technology integrated with Internet of Things (IoT) sensors provides a new dimension in monitoring workplace safety risks at project locations (Sherratt et al., 2024). Ensuring transparent information flows and robust institutional structures remains vital in maintaining digital protection standards (Khayru et al., 2024). This digital transformation enables management to shift from a reactive OHS approach toward a proactive accident prevention strategy based on empirical data (Awolusi et al., 2018).

The integration of IoT sensor devices attached to field workers' bodies opens up major opportunities for the continuous collection of physical condition and environmental data (da Costa et al., 2023). According to Choi et al. (2017), smart sensors are capable of recording vital parameters such as heart rate, body temperature, fatigue levels, toxic gas exposure detection, and potential falls from heights. The processing of this physiological data provides early warnings to workers and field supervisors when physical safety thresholds are exceeded. The presence of this automated warning system minimizes the potential for fatalities caused by workers' inability to recognize hidden hazards around them. Clear legal frameworks and proper governance protocols are essential to protect worker rights during automated health surveillance (Issalillah & Khayru, 2026). The accuracy of this early detection becomes a main pillar in building a more resilient workforce protection foundation in high-risk operational areas.

The paradigm shift in safety management through IoT sensor technology has a direct impact on the form and dynamics of safety culture at the operational level. Field workers who realize that their health conditions are

monitored directly tend to develop higher personal safety awareness in carrying out daily tasks (Daniel & Olaoye, 2025). According to Podgórski et al. (2017), transparency in managing safety data can strengthen organizational safety culture and increase compliance with standard operating procedures. The intensive interaction between workers and wearable technology shapes new habits that prioritize caution in every work activity. Maintaining strong behavioral standards helps prevent workplace anxiety and reinforces positive safety routines across teams (Aisyah & Issalillah, 2021). Safety culture is no longer just written regulatory discourse, but transforms into daily practice strongly internalized by every individual.

Despite offering various technical advantages, the adoption of wearable technology in field working environments leaves a number of critical issues related to workers' mental well-being and privacy. Constant body data monitoring has the potential to trigger psychological stress due to the feeling of excessive supervision by corporate management. According to Jacobs et al. (2019), collecting biometric data without clear ethical boundaries can cause insecurity and erode workers' trust in corporate transparency. OHS management is challenged to balance the need for physical safety supervision and the protection of workers' personal data privacy. Establishing clear ethical guidelines and legal boundaries prevents operational friction and protects individual privacy rights (Chairul et al., 2023). Failure to manage these digital monitoring ethics boundaries can hinder technology adoption and damage a harmonious working climate.

The physical and mental well-being of field workers is a crucial factor determining productivity and long-term company operational sustainability (Darmawan et al., 2020). Reducing physical workload through real-time fatigue monitoring can prevent chronic muscle and joint injuries in construction and manufacturing workers. According to Antwi-Afari et al. (2019), wearable sensor-based ergonometry analysis facilitates more rational rest schedule adjustments according to workers' daily physical loads. Structured protection of physical health directly contributes to improving workers' quality of life outside the operational environment. Corporate responsibility and adherence to proper business ethics ensure that worker welfare remains prioritized alongside operational targets (Darmawan, 2022). Company attention to overall well-being aspects creates a higher sense of self-worth among workers.

The successful integration of wearable technology in OHS management systems strongly depends on the organization's ability to manage cultural transitions and work habits. Resistance to change often arises from fear of technological alienation and the assumption that sensor devices disrupt smooth daily tasks. According to Schall et al. (2018), the physical design comfort of wearable devices and system navigation ease are absolute requirements for technology to be widely accepted by field workers. Worker involvement in device trials and evaluation processes accelerates adaptation and fosters a sense of ownership over digital safety programs. Effective organizational strategies and adaptive management frameworks help bridge the gap between innovative tools and daily operational routines (Ambarwati et al., 2024). Adaptive management can turn resistance barriers into active participation from all organizational elements.

Scientific research on the long-term impact of wearable devices on shaping the safety culture and social well-being of field workers still requires more comprehensive studies. Most current literature still focuses on technical sensor reliability without thoroughly examining how this technology interaction changes the social structure and psychological conditions of workers at work sites. Deep exploration is needed to understand how IoT-based OHS data is converted into management policies that uphold human values and social justice. Bridging technical metrics with social-psychological evaluations provides reliable insights for modern organizational governance (Amri & Khayru, 2022). A balanced understanding between technical realms and socio-psychological dimensions will provide strategic guidance for developing sustainable modern OHS management.

To address these academic and practical needs, this study formulates three main scopes of problems presented in an interrelated manner. This study examines the mechanism of implementing wearable technology and IoT sensors in enhancing the effectiveness of physical risk monitoring within Occupational Health and Safety (OHS) management systems in field operational environments. Furthermore,

this study examines the process of transforming safety culture and the forms of behavioral shifts in worker compliance triggered by the sustainable adoption of digital biometric monitoring devices. This study also analyzes the impact of using wearable technology on the physical and mental well-being of field workers, including the dynamics of worker perceptions regarding personal data privacy limits and psychological comfort in the workplace.

B. METHOD

This research applies an exploratory qualitative approach with a literature study design to comprehensively examine the phenomenon of wearable technology adoption within Occupational Health and Safety (OHS) management systems in the field industrial sector. The qualitative approach was chosen because it provides space for researchers to capture the diversity of meanings, nuances of perception, and dynamics of work behavior changes related to the utilization of health monitoring sensor devices, as portrayed in various library sources and previous empirical reports. According to Merriam and Tisdell (2016), qualitative studies are exceptionally superior in exploring phenomena that focus on understanding social processes as well as complex interactions between humans, technology, and organizational environments. The literature study design enables researchers to synthesize diverse findings from various operational contexts, thereby yielding a broader understanding of safety culture response variations across different industrial settings.

Data collection procedures were carried out through systematic and structured literature searches, encompassing reputable journal articles, industrial technical reports, public company OHS policy documents, and applied research publications regarding the implementation of wearable devices in high-risk work environments. All collected data originated from secondary data. The researcher explored perceptions and findings related to the effectiveness and psychological impacts of wearable devices through the synthesis of previously published study results. Likewise, aspects of worker behavior and interactions with sensor devices were traced through ethnographic notes and observation reports documented in academic and industry literature. Silverman (2016) asserts that triangulation among types of literature sources is highly effective in strengthening the validity of findings as well as preventing the emergence of researcher subjective bias in qualitative data interpretation.

The data analysis process was carried out constantly through thematic coding stages which include data condensation from all library materials, grouping of main issue categories based on recurring patterns in the literature, creation of OHS interaction concept networks, and drawing of theoretical conclusions. Data validity was tested through criteria of credibility and transferability by conducting cross-examinations among references as well as confirming findings against research results from various independent sources. According to Saunders et al. (2019), discipline in applying criteria of qualitative data processing transparency and re-verifying analysis results through comparison with a variety of independent literature sources guarantees the scientific reliability weight of the resulting study. Documentation of the analysis protocol was structured in detail to ensure that the line of evidence for research findings can be tracked accurately and replicated by other researchers within the framework of a literature study.

C. RESULTS AND DISCUSSION

The Implementation of Wearable Technology and IoT Sensors in Monitoring Workers' Physical Risks

The application of wearable technology based on IoT sensor networks in industrial operational areas increases the accuracy of real-time physical hazard monitoring. Monitoring devices attached to workers' bodies are capable of transmitting data on environmental conditions and individual physiological indicators constantly toward the safety control center. The reliability of early detection against potential hazards of extreme heat exposure, toxic gases, and mechanical shocks minimizes the risk of work accidents ignored by manual supervision (Formisano et al., 2024). According to Guo et al. (2018), the integration of smart sensors into safety helmets and work vests facilitates precise location identification and worker movement in hazardous areas. Field data evaluation shows that emergency responses to physical incidents can be executed rapidly thanks to automated warning signals. This mechanism strengthens emergency preparedness in construction and mining

locations. Transparent data processing provides a comprehensive overview of daily operational risk maps. Structured information dissemination and cognitive mapping capabilities optimize managerial reactions to unexpected hazards (Darmawan, 2024). This digital surveillance establishes a new standard in field labor safety protection procedures. The use of IoT instruments ensures that every environmental anomaly can be handled before causing serious personnel injuries. The presence of this monitoring technology changes management's perspective on the importance of modern self-protection investment.

The collection of worker physiological indicators such as heart rate, respiration rate, and body temperature provides an objective foundation for evaluating daily physical workloads. Continuous monitoring of biometric parameters prevents extreme fatigue, which is often the primary trigger for fatal accidents at work sites. Worker exposure to physical pressure exceeding body capacity can be detected earlier through wearable data analysis algorithms. According to Hwang et al. (2018), the utilization of integrated electrocardiogram (ECG) sensors on work clothes is capable of accurately measuring workers' physical stress levels and cardiovascular loads. Work rotation and rest duration adjustments can be executed based on actual body conditions rather than relying solely on subjective time estimates. This policy creates a positive impact on reducing morbidity rates caused by chronic fatigue in the workplace. The accuracy of physical data recording helps management design measurable health intervention programs. Digital transformation frameworks and automated workforce competencies drive organizational adaptability toward modern occupational health standards (Darmawan, 2025). OHS management efficiency increases alongside the availability of a trusted database regarding workers' physical conditions. Occupational health protection transforms into a proactive service form placing life safety as the organization's top priority.

The utilization of accelerometer and gyroscope sensors on wearable devices expands the capability of work ergonomics analysis at project locations. Repeated body movements and asymmetric work postures can be identified automatically to prevent musculoskeletal disorders in workers. According to Nath et al. (2018), motion sensor data processing is capable of classifying workers' physical activities and detecting hazardous body postures precisely. Visual information generated from sensor processing facilitates direct work movement correction while operational activities take place. This body mechanics supervision reduces the accumulation of microtrauma on worker muscle and joint tissues. The rearrangement of work flows based on digital ergonomics data produces operational environments friendlier to human physical conditions (Darmawan, 2024). Proper resource distribution and organizational effectiveness principles reinforce the successful deployment of ergonomic interventions (Darmawan, 2024).

The integration of IoT platforms with OHS monitoring dashboards presents comprehensive safety data visibility for management ranks. Data flows from hundreds of connected sensors can be consolidated into spatial information indicating hazard-prone zones in operational areas (Batra et al., 2025). Chen et al. (2019) suggest that IoT-based location and environmental condition data visualization increases the effectiveness of safety decision-making by field supervisors. Dynamic risk maps assist supervisors in mobilizing safety resources to operational points requiring urgent intervention. This risk information transparency accelerates the division of emergency response roles among work units. The utilization of centralized monitoring systems guarantees smooth safety information flows from the field toward the managerial level. Decentralized network architectures and digital verification systems secure transparent organizational governance (Darmawan et al., 2025).

The reliability of wireless data transmission becomes a determining factor for the success of physical risk monitoring through wearable technology networks. The use of low-power communication protocols ensures that sensor modules can operate fully throughout work shifts without battery power constraints (Svertoka et al., 2021). According to Edirisinghe (2019), wireless connectivity stability and physical device durability against dust and water exposure determine the adoption rate of safety monitoring technology in extreme work locations. Resilient monitoring devices guarantee the continuity of safety parameter monitoring without technical obstacles. The security of wireless data flows from external signal interference maintains the integrity of information received by the OHS

control system. Strong legal protection frameworks and personal data privacy safeguards maintain trust in digital monitoring systems (Issalillah & Hardyansah, 2024).

The processing of spatial data based on GPS and Ultra-Wideband (UWB) sensors on work devices strengthens the protection of workers from collision hazards with heavy equipment. Safe distances between field personnel and the movement of operational machinery can be monitored precisely through integrated distance warning systems. Teizer et al. (2010) show that the application of sensor-based distance monitoring technology reduces potential incidents of being struck by operational fleets in dense work areas. Vibration signals on work vests activate immediately when workers enter dangerous radii from operational vehicles. This proactive safety feature provides an additional layer of protection that is highly effective under low-visibility conditions. Strict legal and professional compliance frameworks prevent procedural negligence in managing operational hazard risks (Hartika et al., 2023).

The application of wearable devices accelerates the identification of workers falling from heights through automatic gravity threshold detection mechanisms. Trigger sensors mounted on safety harnesses transmit emergency signals along with the exact location coordinates of workers within seconds after an incident occurs (Yuhai et al., 2025). According to Cheung et al. (2018), rapid first-aid responses resulting from IoT-based automated notifications significantly reduce injury severity levels in fall incidents. Faster medical treatment increases the recovery chances of work accident victims in remote locations. The availability of recorded data detailing the exact seconds of incidents also facilitates objective accident cause investigation processes. Transparent administrative recording standards ensure accountability and ethical medical documentation management following workplace injuries (Mubarak et al., 2023).

Periodic evaluations of historical physical risk data recorded by IoT sensors help companies update operational risk assessment documents in detail. Trends of environmental hazard exposure in specific zones can be analyzed to design more permanent technical prevention measures. The accumulation of safety data based on wearable technology supports the development of OHS management systems that are predictive and adaptive to field dynamics. The adjustment of standard operating procedures based on empirical evidence enhances the overall effectiveness of workforce safety protection. Mastering this risk data reinforces organizational safety structures in facing future operational challenges (Postnikova, 2025). Proper public health administration and service quality standards ensure that worker injury interventions meet rigorous institutional benchmarks (Darmawan et al., 2022).

The Transformation of the Occupational Safety Culture and the Shift in Compliance Behaviour amongst Field Workers

The adoption of wearable devices in safety monitoring systems triggers a fundamental transformation in organizational culture climates in field areas. The presence of smart sensors recording physical activity continuously creates information transparency that alters workers' perceptions of safety norms (Fugate & Alzraiee, 2024). Individual awareness grows naturally when feedback regarding health conditions and environmental risks can be accessed directly through device indicators. According to Li et al. (2019), biometric data transparency facilitates the formation of new, more cautious work habits and strengthens collective commitment to self-protection principles. Workers no longer view adherence to safety procedures as an administrative burden, but rather as a basic requirement to maintain their bodily functional sustainability. Non-intrusive digital surveillance encourages the deep internalization of OHS values across all operational tiers. This mindset shift reinforces the organizational safety culture structure from the ground level to managerial ranks (Eddine et al., 2023). Strong human resource quality and performance standards ensure that organizational values translate into reliable daily execution (Darmawan et al., 2020). The existence of real data recorded by sensors becomes a new standard in building constructive safety communication in the workplace. The culture of mutual reminders among coworkers is formed thanks to the clarity of measured risk information.

The shift in worker compliance patterns from reactive command models to independent awareness becomes a main indicator of the successful integration of safety monitoring technology. Early warning systems installed on work equipment provide direct understanding

of the consequences of every risky action at project locations (Hong & Cho, 2023). Self-monitoring driven by sensor feedback gradually erodes the practice of OHS procedure violations intentionally carried out to chase work target speeds. Continuous interaction between humans and smart monitoring systems increases personal compliance with consistent personal protective equipment usage. Workers feel supported by technology designed to protect their lives from invisible physical hazard threats. Trust in system reliability accelerates the adaptation process of behavior in extreme work environments. The decrease in the frequency of unsafe actions in the field reflects the growth of workers' personal responsibility toward self and group safety. This behavioral transformation creates a more orderly and predictable operational environment. Awareness-based independent compliance is more stable than compliance forced through conventional disciplinary sanctions. Clear legal accountability frameworks and corporate liability principles protect workers from occupational health risks and procedural negligence (Sopyan et al., 2024).

The role of field supervisors undergoes a functional shift from mere rule violators into safety work facilitators based on factual data. Daily interaction records between supervisors and workers now focus on scientific discussions regarding physical load trends and location hazard potential analysis. According to Ahn et al. (2019), utilizing biometric sensor data strengthens the quality of safety dialogues (toolbox talks) before starting daily operational activities. Supervisors can provide specific directions based on real risk maps recorded by the system during the previous work shift. This empirical evidence-based communication approach reduces tense relationship strains between management and the labor force in the field. Reliable digital health literacy and information quality further refine how risk insights are interpreted by individuals (Khayru, 2025).

The application of wearable technology strengthens social cohesion among workers through the development of a shared sense of concern for team safety conditions. The presence of hazard indicators on work vests or helmets makes it easier for fellow workers to monitor each other's fatigue levels in dense operational areas (Wang, 2025). The visibility of collective safety status increases solidarity bonds and encourages spontaneous emergency response actions among workers. This mutual safeguarding strengthens group safety climates, which are very crucial in high-risk construction work. Interpersonal cooperation grows tighter alongside increasing feelings of safety when carrying out tasks together.

The cultural adaptation process toward digital monitoring requires habituation time to eliminate workers' awkwardness when interacting with biometric sensors. Interactive simulation-based training helps workers understand the real function of each wearable device component they wear every day (Strawderman et al., 2025). According to Nnaji et al. (2019), adequate understanding of the direct benefits of monitoring technology increases cultural acceptance and reduces workers' resistance to OHS innovations. Active worker involvement in device evaluation sessions provides space for them to submit technical input regarding sensor usage comfort. This two-way communication accelerates the harmonization process between technology and local culture. Transparent administrative procedures and clear legal standards safeguard institutional compliance during operational transitions (Kholis et al., 2023).

Safety leadership attitudes among the managerial ranks serve as a primary driving factor in accelerating the institutionalization of digitally based OHS culture. The presence of leaders who utilize sensor analytical data as operational policy evaluation material provides a real example for all organization personnel (Adikwu et al., 2024). According to Okpala et al. (2020), leadership commitment in responding to danger signals recorded by wearable technology increases workers' trust in the seriousness of corporate safety programs. Management's quick response to reports of workers' physical criticality proves that technology is used to protect humans, not solely to exploit productivity. Public trust and institutional accountability dictate the long-term success of technology integration across high-risk sectors (Khullar et al., 2018).

Periodic measurement of safety awareness levels through organizational climate surveys shows a positive correlation with the duration of wearable device usage in the field. Workers accustomed to living with smart monitoring systems show a higher level of concern for the cleanliness, order, and neatness of the work environment (Abbasianjahromi & Ghazvini, 2021). The adoption of IoT-based safety

technology shapes new work discipline that has a broad impact on organizational operational efficiency. Individual environmental awareness and active participation in maintaining cleanliness reflect broader behavioral shifts fostered by digital monitoring habits (Khayru et al., 2025). Discipline habits formed in the workplace gradually carry over into workers' mindset when carrying out daily life activities.

The institutionalization of safety culture based on digital technology ultimately creates a new identity for corporations as modern and responsible business entities. Recognition of high safety standards increases company attractiveness in the eyes of professional workers and strategic business partners. According to Barata et al. (2023), the transformation of OHS culture based on smart sensors provides reputational advantages that strengthen business sustainability amid global industry competition. Successfully building a technology-based safety culture becomes a long-term investment protecting human and economic values of the organization in a balanced manner. Strict corporate legal compliance and transparent waste or safety reporting obligations further solidify organizational legitimacy under modern regulatory frameworks (Mamesah et al., 2024).

The Impact of Wearable Technology on Workers' Physical Well-being, Mental Health and Data Privacy

The application of wearable technology in operational work locations has a direct impact on increasing workers' physical welfare through the early prevention of muscle fatigue and accumulated work injuries. Continuous measurement of physical strain and body posture enables the adjustment of work intensity before permanent health disorders arise. Adjusting the work rhythm based on the actual physical capacity of workers maintains physical metabolism balance and accelerates energy recovery during rest periods (Heikkilä, 2025). According to Botti et al. (2020), workload optimization through ergonometry sensor monitoring significantly reduces physical disability rates caused by repetitive mechanical pressure in industrial areas. Workers' well-maintained physical conditions create higher job satisfaction and suppress sickness absenteeism rates in the workplace. Advanced digital innovation frameworks and human resource development strategies ensure that physical safety measures align with modern industrial standards (Mardikaningsih & Wardoyo, 2024). In addition, the physical safety guarantees provided by sensor technology increase workers' confidence when required to complete high-risk tasks in the field. Sustainable physical welfare ultimately becomes the foundational capital for improving workers' quality of life, both inside and outside the company's operational environment. Management's care for workers' bodily health triggers a mutually respectful work climate.

The issue of biometric data privacy becomes a primary focus of workers' attention regarding the collection of personal health information through wearable devices continuously during working hours. Concerns over the misuse of medical data by management for individual performance evaluation purposes potentially cause fractures in working relationships (Niranjan et al., 2025). According to Moore and Robinson (2016), digital surveillance lacking clear ethical boundaries can create psychological pressure in the form of anxiety over constant monitoring (panoptic effect) in the work environment. The formulation of transparent data governance policies is an absolute prerequisite to guarantee that biometric data is used solely for OHS safety purposes. Clear internal regulations regarding personal data confidentiality successfully dampen workers' suspicions and build psychological safety sustainably. Strict legal frameworks and proper regulatory mechanisms protect consumer and employee rights against unauthorized data exploitation (Setiawan et al., 2023).

Prevention of mental stress levels in field work locations is successfully achieved through the integration of brainwave response and heart rate variability monitoring sensors. Workers' exposure to extreme environmental pressures such as excessive noise and high temperatures is detected automatically before triggering excessive mental burdens. According to Jebelli et al. (2019), the operation of physiological stress load monitoring modules facilitates the provision of timely rest breaks for workers experiencing mental fatigue in project areas. This mental health protection creates psychological balance maintaining the clarity of workers' mental focus when facing crisis situations in the field. Stable mental comfort significantly strengthens workers' emotional resilience. Effective medical technology integration and digital health strategies optimize the overall

psychological and clinical support systems available to personnel (Sarif & Issalillah, 2022).

The physical interaction between workers and sensor devices attached to the body requires special attention to the ergonomic comfort factors of personal protective equipment materials (Fizzano et al., 2025). Monitoring device weights that are too heavy or designs lacking flexibility can disrupt the fluency of workers' physical movements when executing daily operational tasks. Kadiri et al. (2021) show that the use of sensor materials that are lightweight, waterproof, and skin-friendly increases physical comfort levels and workers' acceptance of wearable devices. Ergonomic tool designs prevent skin irritation and local muscle fatigue caused by work equipment friction. Tool usage comfort becomes a main key to the sustainability of digital OHS monitoring programs. Human resource sustainability practices within modern industry environments guarantee that operational tools match ergonomic and physiological requirements (Oluwatoyin & Mardikaningsih, 2024).

The enhancement of workers' social welfare is reflected in the presence of peace of mind among workers' families thanks to trusted safety monitoring systems in the workplace. The certainty that workers' physical conditions and whereabouts are monitored in real-time reduces family anxiety levels regarding fatal work accident risks (Deoghare et al., 2024). According to Schall et al. (2021), safety guarantees based on modern technology provide a positive impact on the emotional life stability and social welfare of workers' families at home. The sense of safety felt by the family environment turns around to provide positive work motivation for workers in operational locations. Harmony between work life and family is forged more solidly. Big data analytics utilization further enhances corporate environmental performance and social accountability across organizational networks (Mardikaningsih & Darmawan, 2025).

The processing of biometric data anonymously in daily OHS reports effectively maintains workers' trust in the integrity of corporate safety programs. Limiting primary data access exclusively to tested medical teams minimizes potential career discrimination due to specific physical conditions of workers (Azuruole, 2025). Independent data protection schemes in digital OHS applications are capable of increasing workers' active participation in corporate health monitoring programs. Transparency in biometric information management proves management's good faith in respecting human rights and worker dignity. This policy strengthens the strategic partnership bond between the labor force and business owners. Robust legal protection standards and patient safety regulations ensure that clinical or biometric data processing adheres to strict accountability codes (Sasmita et al., 2023).

The comprehensive impact of increased physical, mental welfare, and data privacy certainty is reflected in the creation of harmonious and sustainable industrial relations. Workers feeling fully protected demonstrate higher loyalty levels and more stable work productivity in the field (Abramihin, 2025). Corporate investment in humanized OHS technology provides a return of social value in the form of a conducive work climate free from internal conflict. The balance between artificial intelligence technology utilization and respect for human values establishes a new standard in modern occupational safety governance. Comprehensive corporate responsibility frameworks and rigorous legal compliance protect both organizational integrity and personnel welfare (Setiyadi et al., 2023).

D. CONCLUSIONS

The application of IoT sensor-based wearable technology in Occupational Health and Safety (OHS) management systems increases the accuracy of real-time physical risk monitoring for field workers while transforming the safety culture in operational locations. The presence of this digital instrument drives a shift in worker compliance behavior from a reactive command pattern toward independent awareness grounded in objective physiological data evidence. Continuous supervision that combines technological reliability and ergonomic understanding significantly suppresses the rate of work accident incidents and strengthens the collective safety climate in high-risk work environments.

The implications of adopting this technology emphasize the need for a reorientation of corporate OHS governance from a conventional approach toward a predictive safety system that respects human values. The integration of biometric data not only impacts the reduction of injury rates and physical fatigue, but also

demands that management build transparency in personal data governance to maintain worker mental health and trust. Balancing the utilization of smart technology and respect for worker privacy is a primary prerequisite in realizing a harmonious, productive, and sustainable work environment.

Corporate management is advised to formulate strict internal regulations regarding guarantees of biometric data confidentiality and the ethical limits of field worker monitoring. Technology developers and OHS practitioners need to collaborate in designing sensor devices that are lighter, more ergonomic, and comfortable to use throughout work shifts without disrupting physical mobility. In addition, field supervisory ranks are urged to consistently utilize sensor analytical data as material for interactive safety communication that focuses on the education and comprehensive mental health protection of workers.

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