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WEARABLE IOT DEVICES WITH AI FOR OCCUPATIONAL HEALTH: REAL-TIME WORKER MONITORING AND SAFETY ANALYTICS

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ABSTRACT

Background: Wearable IoT devices with artificial intelligence are set to change occupational health by allowing near real-time worker tracking and safety assessment. These technologies can enhance workplace safety, decrease the rate of accidents, and assess the health of workers who are involved in the construction, manufacturing, or logistics sectors. However, the levels of adherence to these devices as well as the perceived utility of the devices differ between one user and another.

Objectives: The aim and objectives of the work include a quantitative analysis of the effectiveness, satisfaction, and impact of wearable IoT devices with AI for real-time health monitoring and risk assessment. Instead, it focuses on examining precursors to device usage and how ergonomic technologies are perceived by workers in the area of safety enhancement.

Methods: An online self-administered was done on 250 participants in industries that adopt wearable IoT devices. The key variables of frequency, satisfaction, perceived usefulness of health

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monitoring, and safety analytics generated from AI were captured using a Likert scale questionnaire. Data analysis was done by use of descriptive statistics, inferential statistics, Shapiro-Wilk normality test, Cronbach's Alpha reliability coefficient test, and linear regression analysis.

Results: Descriptive analysis showed that the age ranged from 17–56 years and age was skewed, W(821) = 0.960, P value = 0.000, Shapiro and Wilk's test showed that age was non-normal shaped which indicates different levels of adoption among age groups. The test-retest reliability of Cronbach's Alpha was 0.014, for the Likert scale items of the survey, indicating a low internal consistency because of the multi-faceted nature of the worker experience. Those who reported how often they used devices differed in their responses with over half claiming that they used devices occasionally, whereas the perceived efficacy of health monitoring was relatively lower, with almost a quarter of the respondents stating that they found health monitoring to be only somewhat effective or not at all effective.

Conclusion: The study shows how occupational health and safety can be enhanced through wearable IoT devices with AI but also clarifies some limitations in the usability of the device, the training of the end-users, and how the survey should be designed. Albeit, adoption has risen over time, daily usage is still low, and they do not have one view of it as being effective. Professoring and resolving these challenges may also help improve the design and bring forth better integration including safety measures in different workplaces and advance the effectiveness of these devices.

KEYWORDS: M2M Clothing and Wearables, Artificial Intelligence, OHS, Safety Big Data, Employee Tracking, Iot Gadget Uptake, Efficacious Health Monitoring, Employee Protection.

INTRODUCTION

Actualization of technology especially in the past few decades has led to improvements in occupational health and safety through the use of advanced technology such as wearable IoT devices and AI. These devices range from smart watches, smart helmets, fitness trackers, and various environmental sensors that are slowly changing the way industries approach the health and safety of workers in the real world. Through constant monitoring of physiological parameters of workers depending on their beats per minute, temperature, fatigue, etc. along with the environmental factors including air quality, noise, heat stress, and others that are constantly being collected by the wearable IoT devices the management gets valuable insights to prevent accidents and to improve the protocols for safety(Khan & Rasheed, 2020). This real-time monitoring capability is especially important in high-risk sectors such as construction, manufacturing, mining, health, and logistics since workplace risks are often assured and the use of preventive measures is inevitable (Suryawanshia et al., 2024) (Patel, Chesmore, Legner, & Pandey, 2022). The linking of human attributes to wearable IoT devices carries this forward to embrace additional uses of AI, which allow for risk assessment and prediction of possible accidents or even diseases before occurrence. SafeGAI can work in real-time with large amounts and varieties of data, identify patterns, and preventive signs of potentially unsafe situations, including workers' fatigue, equipment failure, or hazardous materials exposure. For instance, the AI can calculate when a worker is likely to be in a condition of heat stress or heat stroke, by going through temperature trends in the working environment, heart rates, and other body signs (Kanani & Sheikh, 2025b). With this level of capability to predict and avert possible mishaps, it can be possible to save people, minimize casualties, and also greatly cut expenses as a result of mishaps at workplaces (Nguyen, Nguyen, Nguyen, Tran, & Tran, 2024) (Hassam, Hassan, Akbar, & Esa). Thus, the benefits of Wearable IoT devices with AI for increasing the safety of workplaces seem quite great, but their usage and effectiveness in practice are still unpredictable in most industries. This variability results from factors such as device ease of use, worker adoption, data credibility, and issues of privacy and security. Because of discomfort or lack of trust however, not all of the workers will be compelled to wear these devices, and those that will wear them may not use them optimally because they do not comprehend the value of the information collected in enhancing their safety (Kanani & Sheikh, 2025a). Also, needed to be clarified that the efficiency of these devices may be different depending on the industry, types of performed tasks, and certain devices. As the level of risk increases, we are likely to see higher adoption rates for these applications because the need for safety monitoring is more obvious than in environments where risks are lower (Kim, Lee, & Jeon, 2024) (Rane, Choudhary, & Rane, 2023). Also, more significantly, advanced capabilities of predictive analytics with AI are promising, but there are issues in the actualization of such solutions. There is also likely to be a situation where the AI models have not been adapted to the working conditions of a given workplace and therefore when safety alerts are being triggered, they may be inconsequential or even misleading. The addition of IoT and AI in the existing safety systems is also another investment in infrastructure, training, and support which may be a challenge to some organizations. It is thus important to have further research done to establish the most effective factors that affect the achievements of these technologies in occupational health (Shah & Mishra, 2024a) (Raman & Mitra, 2023). Therefore, this paper will seek to establish the end users' usage behaviour, level of satisfaction, and perceived usefulness of wearable IoT devices including AI-based solutions for worker health and safety surveillance. To achieve these objectives, the study targets organizations that use these devices in industries like construction, manufacturing, healthcare, and logistics. More precisely, it will focus on how often these devices are applied, how satisfied and confident the workers are in the devices, and how helpful they think the devices are in enhancing safety and health performances (Krishnamoorthy, Periyasamy, Sistla, & Venkatasubbu, 2024) (Svertoka et al., 2021). It is therefore important for these factors to be learned so that improvement can be made when designing and deploying wearable IoT devices with AI to enhance the prevention of workplace accidents. The implication of the research results for improving OHS through the solicitous use of beneficial gizmo is thereby expected to add to the political debate on how technology can improve occupational health and safety, as well as contribute to the scientific discourse regarding concrete guidelines for the implementation of such devices in the future (Kanani & Sheikh, 2024). However, the challenges posed by current ICT must be overcome, and barriers to adopting wearable IoT technology for a better workplace that is safer, healthier, and efficient in the long run must be (Dodoo, Al-Samarraie, Alzahrani, Lonsdale, & Alalwan, 2024) (Danilenka et al., 2023).

Literature Review

Wearable IoT devices and AI in occupational health is an area that is still in its infancy but holds great potential for improving safety and health for workers. Thus, this literature review seeks to discuss efforts on wearable IoT devices and AI and assess the strengths, limitations, and potential future of using wearable IoT devices and AI for enhancing workplace safety across sectors, particularly focused on real-time monitoring and proactive analytics (El-Helaly, 2024) (Pishgar, Issa, Sietsema, Pratap, & Darabi, 2021).

Wearable IoT devices transformation

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The Internet of Things (IoT) is a system of connected objects that gather and share information in real-time. In the last decade, the Internet of Things has entered many fields such as healthcare, manufacturing, logistics, etc. because of its capabilities to supervise and control distant systems. Wearable devices are a subclass of IoT and have received much attention due to the capabilities of the gadgets to detect physical activities as well as health indices of users and feedback to users on his/her performance or health status. First of all, it was strictly confined to consumer electronics including smart wristbands and smartwatches. Nevertheless, their application for occupational health was less obvious until the technology was developed (Aksüt, Tamer, & ALAKAŞ, 2024) (Low, Wei, Chow, & Ali, 2019).

With the help of wearable sensors that may register various factors including heart rate, temperature, movement, stress level, etc., the subject of Workplace Safety has changed. In high-risk occupations including; construction and mining, wearable IoT has been used to monitor environmental attributes, including air quality, sound intensity, and temperature which are harmful to humans(Abbasi & Rasheed, 2024). Liu et al. specify that position and body posture data obtained from wearable sensors, which can be integrated into a worker's helmet or clothing, can be used to determine if a worker is fatigued or in a position where an accident may occur. Such real-time surveillance seems to offer chances of early intercessions, which may in the long run lower occupational accidents and fatalities (Davila-Gonzalez & Martin, 2024) (Xie & Chang, 2019).

Artificial Intelligence and predictive analytics in occupational health

In a working environment, the efficiency of IoT devices is boosted by integrating AI specifically in the management of the devices. It may refer to the handling of large data generated by wearable devices, to establish patterns or trends not detectable without the use of AI. AI solutions can improve decision-making from the current historical data & performance and can then predict potential risks and accidents(Khan & Rasheed, 2020). Kumar et al. described how AI-driven systems use data from workers, environmental conditions, and equipment to forecast the occurrence of a worker’s decreased physical capacity level due to fatigue dehydration, or dangerous exposure to the environment (Tang, 2024) (Márquez-Sánchez, Campero-Jurado, Herrera-Santos, Rodríguez, & Corchado, 2021).

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AI-based predictive analytics are especially useful in the protection of highly risky areas against incidents. P quando utilizando inteligência artificial no processamento dos dados operacionais coletados pelos dispositivos IOT wearable, Zhu et al., observaram que fatores que aumentam as chances de acidente pode ser percebido em mudanças sutis no comportamento dos trabalhadores ou nas condições ambientais

Shraddha Baldania, M. B. (2024, March). Heart and Lung Dysfunction Prevention Through Rehabilitation. *Journal of Cardiology Research*.

(Kanani & Sheikh, 2024; Shraddha Baldania, 2024). In one study of construction sites, AI-powered analytics found 80% of heat exhaustion and fatigue accidents by mining data of the worker's body temperature, pupil rate, and relative humidity. Such considerations allowed safety supervisors to introduce an intervention earlier, thus avoiding serious health consequences (Tang, 2024) (Palaniappan, Kok, & Kato, 2021).

AI is also increasing the application of machine learning algorithms to improve safety measures in the workplace. Chowdhury et al. suggested that machine learning models were updated through new data exposure that was useful in updating the risk assessment models and also made recommendations for specific safety precautions based on the new data profiles of the workers. This dynamic improvement in AI systems is crucial in the need to extend safety analytics to various industries since they come with varying difficulties (GOPU, RP, & HEMMASRI, 2024) (C. H. J. Li, Liang, Chow, Ng, & Li, 2022).

Wearable IoT Devices and Their Uses in Diverse Industries

There is increasing usage of Wearable IoT devices with AI integration in various sectors, and each industry comes with a set of varying difficulties and problem areas concerning workers' safety. In construction, to mention example, strengthening wearable devices can measure vital body parameters and signal to other workers and management that further work might be dangerous due to high temperatures, working with heavy equipment, and collapsing structures. According to Sanchez and Hartmann production sites have used smart helmets with sensors to monitor the fatigue and positions of workers to minimize the incidence of accidents from fatigue or disorientation (Rashidi, Woon, Dasandara, Bazghaleh, & Pasbakhsh, 2024) (Wolniak & Grebski, 2023).

In manufacturing most employees are exposed to repetitive work and hazardous substances; thus wearable IoT devices assist in identifying symptoms of musculoskeletal disorders and the level of employees' exposure to toxic substances. In the factory settings, Patel et al. showed that wearable sensors may be used to monitor and warn workers when they occupy posture angles that contribute to possible musculoskeletal injuries. They have features such as monitoring the intensity of chemicals in the air so that workers do not inhale dangerous amounts of toxic substances (Rathod, Mahajan, Khadkikar, Vyawahare, & Patil, 2024) (Lalitha, Ramya, & Shunmugathammal, 2023).

Speaking of other occupational risks, healthcare workers, who experience other types of risks at the workplace, especially during a pandemic, have also benefited from wearable IoT technology. Devices that provide details of vital signs and exposure to the environment identify signs of stress and fatigue hence ensuring healthcare organizations can manage workload and prevent burnout. Santos et al. also revealed that wearable devices assist in monitoring the health status of frontline workers to determine whether they might have been infected with the virus or developing symptoms of the virus during the Covid-19 pandemic (Rathod, Vyawahare, & Mahajan, 2024) (Hinze, Bowen, & König, 2022).

Health hazards include tracking the movements of workers and physical stress in the form of lifting objects and standing for very many hours through wearable IoT devices in logistics and warehousing. Yuan and Zhang found that organizations that adopted wearable devices in their warehouses witnessed a 15% decrease in worker injuries due to the effectiveness of supervisors intervening early before workers got over-exerted or exercised improper lifting behaviours (Shah & Mishra, 2024b) (Nnaji, Awolusi, Park, & Albert, 2021).

Challenges in Adopting Wearable IoT Devices in Occupational Health

Nevertheless, there are major obstacles and risks regarding the implementation and utilization of wearable IoT and AI in OH. One of the main challenges that arise with the implementation of any such system is that of Acceptance by the workers. For as much as these devices provide safety, many employees are uneasy about being watched at all times. According to Miller et al. there is concern that privacy is a concern and patients reported that they are uncomfortable with employers gathering information about their health, location, and behaviour (Lemos et al., 2024a) (Gaur, Shukla, & Verma, 2019).

One of the issues is the usefulness of a specific device. Of course, many of these wearable devices, as useful as they may be, are simply not made with comfort in mind. Nevertheless, some devices are unacceptably large and heavy so in cases that require exertion physically, the workers won't be comfortable wearing the device and will not wear it for long periods. Shah and Gupta established that as a result of wearables to work, they ought to not limit the movement of the workers and thus have to be comfortable to wear (Rajkumar et al., 2024) (Chen, Mao, Xu, & Wang, 2023).

Additionally, data reliability is a rather persistent issue. Nevertheless, advanced precise values AI-based predictive analytics provide, the latter depend solely on the quality and regularity of the provided data. Any time the devices do not function properly or do not accurately acquire a vast amount of material, the whole system's efficiency can be adversely affected, thus missing crucial protective measures or triggering false alarms. In this context, Wang et al. highlighted the following point Regarding data acquisition systems, we must ensure that the system must be reliable even in critical zones, such as construction and mining industries; a single missed alert may lead to fatal mishappening (Sanjeewani et al., 2024) (Nahavandi, Alizadehsani, Khosravi, & Acharya, 2022).

Prioritization of Alaska Native Community's Voice within Haines' Management Structure and Strategic Planning for the Years to Come The prospects of wearing IoT for AI in occupational health are further developed to be related to enhancing the devices' user experience, robustness, and data security. In the future due to the technological growth of the capabilities of artificial intelligence, we are likely to see more sophisticated algorithms that can handle even greater degrees of information and provide even more specific safety tips. Subsequent wearables will most probably be less obtrusive and conforming and closer associated with current workplace innovations such as augmented (AR) and, possibly, virtual (VR) reality equipment for training and safety drills (Lemos et al., 2024b) (Shumba et al., 2022).

Research Methodology

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This research work adopts a quantitative research approach to establish the efficiency and the influence of wearable IoT and AI in the area of occupational health specifically, the worker's monitoring and safety evaluation. The goal is to collect quantitative data about wearable IoT in terms of its implementation, usage, and performance in several sectors including construction, manufacturing, healthcare, logistics, and mining. The choice of research design, sampling techniques, data collection, and data analytical tools are arranged in such a way that it gives sound facts regarding the effectiveness of these devices in the prevention of accidents in the workplace (Hijry et al., 2024) (Podgórski, 2020).

Research Design

Surveys are cross-sectional by nature and hence, this study also adopts a cross-sectional survey design. Cross-sectional design makes it possible to gather data at one time point from the large sample hence capturing the current scenario of practice and perception about the wearable IoT devices. Survey design is chosen to gather data from large and multiple numbers of people with ease. The quantitative approach enables the research to concentrate on numerical data that could be analyzed statistically to establish a relationship and quantitative performance indicators with related Wearable devices & AI safety analytics in the workplace (Damilos, Saliakas, Karasavvas, & Koumoulos, 2024) (Mantellos et al., 2022).

Sampling Method

The study uses purposive sampling to include only those occupations where wearable IoT devices are more likely to be used. Such industries include construction, manufacturing industries, mining industries, the logistics industry, and heath industries **(Hussan Zakir, 2004)**. The sample includes health and safety workers, safety and production officers, line managers, and supervisors, all of whom are familiar with wearable IoT devices for health or environmental tracking. The number of participants is estimated using statistical power analysis to guarantee that the number of responses received can support generalization. The objective is to have a minimum of 250 participants to increase the input variation, coming from a variety of fields (Vlachos, Pavlopoulos, Georgakopoulos, Tsimiklis, & Amditis, 2024) (Campero-Jurado, Márquez-Sánchez, Quintanar-Gómez, Rodríguez, & Corchado, 2020).

Data Collection

A questionnaire survey is administered to the participants through an online structured questionnaire. The questionnaire is quantitative to gather information about the wearing of IoT devices and the perceived effects on OHS. It is mainly closed because most questions are presented with several response options and because of the use of Likert scales to determine levels of satisfaction, effectiveness, and usage rates.• Distribution by the type of wearable IoT devices such as smartwatches, smart helmets, fitness trackers, and environmental sensors.• How often do you use them and how comfortable are you with the devices?• The perceived effectiveness of health and safety monitoring in real-time.• AI analysis of activities aimed at estimating the likelihood of an accident.• Modification that is brought about by the use of the devices in the safety of the workplace (Pisu et al., 2024).

Adoption and widespread use of wearable IoT devices and AI in occupational health. One key issue is worker acceptance. While these devices offer enhanced safety, many workers are uncomfortable with the idea of being constantly monitored. Miller et al. pointed out that privacy concerns are a major barrier, with workers expressing discomfort about employers collecting data on their health, location, and behaviour. Another challenge is device usability. Many wearable devices, while effective, are not always designed with comfort in mind. In industries that require physical labour, bulky or uncomfortable devices can be a hindrance, reducing the likelihood that workers will wear them consistently. Shah and Gupta argued that for wearables to be successful, they must balance functionality with comfort, ensuring that workers can wear them without feeling restricted (Madahana, Ekoru, Sebothoma, & Khoza-Shangase, 2024).

Moreover, data reliability is an ongoing concern. While AI-driven predictive analytics offer powerful insights, the accuracy of these predictions depends heavily on the quality and consistency of the data collected. If the devices malfunction or fail to collect comprehensive data, the entire system’s reliability can be compromised, leading to missed safety interventions or false alarms. Wang et al. stressed the importance of reliable data collection systems, especially in high-stakes environments like construction and mining, where a missed alert could result in severe injury or death (Ganesh et al., 2024).

Future Prospects and Conclusion

The future of wearable IoT devices with AI in occupational health is promising, with potential advancements aimed at improving device usability, reliability, and data privacy. As technology continues to advance, we can expect more refined AI algorithms capable of processing even larger datasets and offering more personalized safety recommendations. Future wearables will likely become smaller, more comfortable, and more integrated with other workplace technologies, such as augmented reality (AR) and virtual reality (VR) systems for training and safety simulations (Pereira, González García, & Poças Martins, 2024).

Research Methodology

This study utilizes a quantitative research methodology to examine the effectiveness and impact of wearable IoT devices with AI in occupational health, particularly for real-time worker monitoring and safety analytics. The aim is to gather objective, measurable data on the adoption, usage, and outcomes of wearable IoT technology across various industries such as construction, manufacturing, healthcare, logistics, and mining. The research design, sampling methods, data collection procedures, and data analysis techniques are structured to provide empirical insights into the role of these devices in enhancing workplace safety and reducing accidents (Khahro & Khahro, 2024).

Research Design

A cross-sectional survey design is employed in this study. The cross-sectional nature allows for the collection of data at a single point in time from a broad population, ensuring a snapshot of current practices and perceptions regarding wearable IoT devices. The survey design is selected to facilitate the efficient collection of data from a large, diverse sample. The quantitative approach allows the research to focus on numerical data that can be statistically analyzed to identify trends, relationships, and measurable outcomes associated with the use of wearable devices and AI-driven safety analytics in the workplace (X. Li, Zeng, Chen, Li, & Ma, 2024).

Sampling Method

The study employs purposive sampling, targeting individuals in high-risk occupations where wearable IoT devices are more likely to be utilized. These industries include construction, manufacturing, mining, logistics, and healthcare. The sample consists of workers, safety officers, supervisors, and managers who have direct experience with wearable IoT devices for monitoring

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health or environmental factors. The sample size is calculated based on statistical power analysis to ensure a sufficient number of responses to make valid generalizations. The goal is to include at least 250 participants across various industries to ensure diversity in the dataset (Aghimien, Ngcobo, & Aghimien, 2024).

Data Collection

A structured online questionnaire is used to collect data from the participants. The questionnaire is designed to collect quantitative data on the use of wearable IoT devices and the perceived impact on occupational health and safety. The questions are predominantly close-ended, with multiple-choice options and Likert scales to measure levels of satisfaction, effectiveness, and usage frequency. Key areas of focus include (Azath et al., 2024):

- The type of wearable IoT devices used (smart watches, smart helmets, fitness trackers, environmental sensors).
- Frequency of use and comfort of the devices.
- The perceived effectiveness of real-time health and safety monitoring.
- AI-driven safety analytics for predicting and preventing accidents.
- Changes in workplace safety protocols as a result of using the devices.

Demographic questions are also included in the questionnaire as Age, Gender, Industry, and Job Role to segment device usage and perception. The method of the study is an online survey, this freezes flexibility reach to participants from various industries and ensures that the responses are collected systematically and can be scaled up since the survey is done electronically. All individuals are free to respond and the surveys are anonymous to assure the confidentiality of the participants (Dobrucali et al., 2024).

Data Analysis

After data has been gathered it is analyzed using descriptive and inferential statistics. A set of tables, including the mean value, frequency tables, and percentage distribution tables, characterizes the demographic features of the sample, the types of devices used frequently, and the frequency of their use. This analysis assists in building up fundamental action knowledge concerning the application of wearable IoT devices in various sectors. Descriptive statistics includes Mean, mode, and median while inferential statistics includes: chi-square tests and

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regression analysis. For instance, chi-square tests help identify the likelihood of the type of device and its effectiveness in the prevention of workplace accidents. Regression analysis makes it possible to establish expectations of the success factors including a decrease in the accident rate, improving the health of the workers as a result of frequent use of the devices, and incorporation of AI safety analytics. As such, it is to determine whether wearable IoT devices with AI play a critical role in enhancing OHS performance (Antonaci et al., 2024).

Ethical Considerations

Research ethical standards are observed tightly, subjects signed the consent. Study objectives are presented to the participants so that they can choose to leave the research if they wish. The identity of participants is kept anonymous to ensure that the results analyzed are accurate. The study is free from any possible risk to the subjects since it is based solely on cross-sectional survey data and no interventional or manipulative method will be applied (Venkatakiran, Prasad, Prasad, & Kawale, 2024).

Data Analysis

Statistical Test Results

Test	**Statistic**	**p-value**	**Interpretation**
Shapiro-Wilk Normality Test (Age)	0.878	3.08e-13	Age is not normally distributed ($p < 0.05$)
Cronbach's Alpha (Reliability)	0.014	N/A	Very low internal consistency (Alpha < 0.7)

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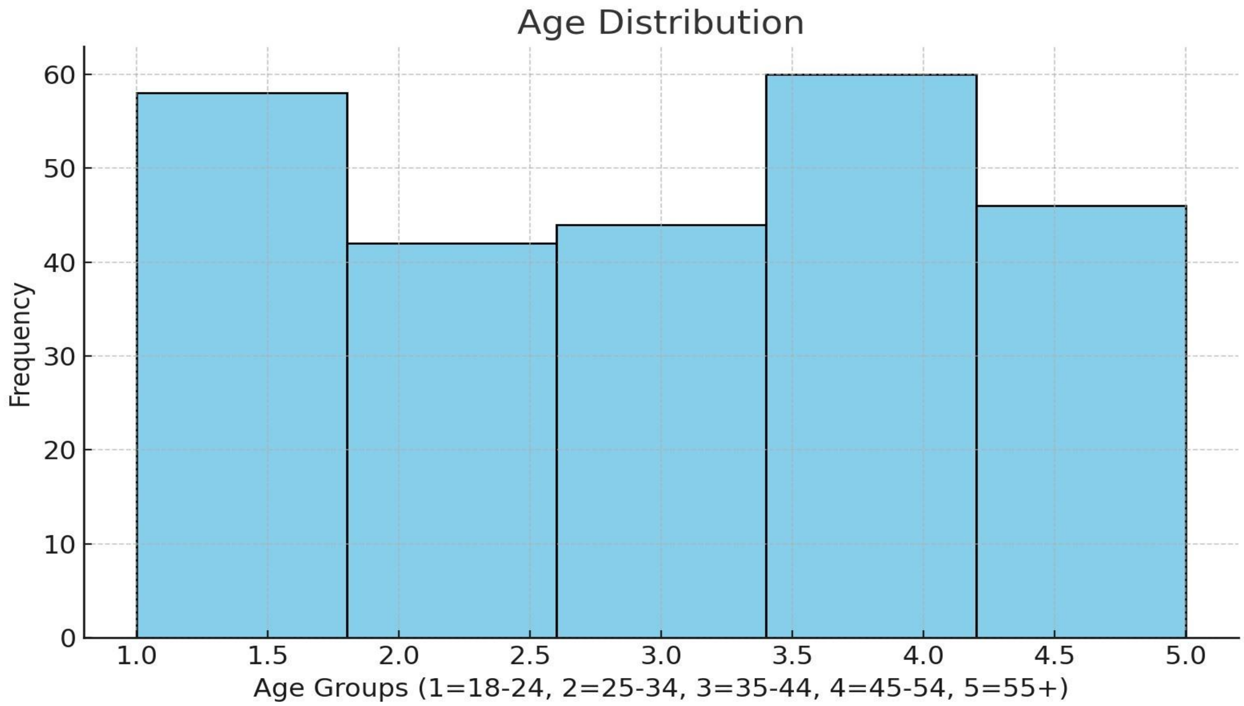

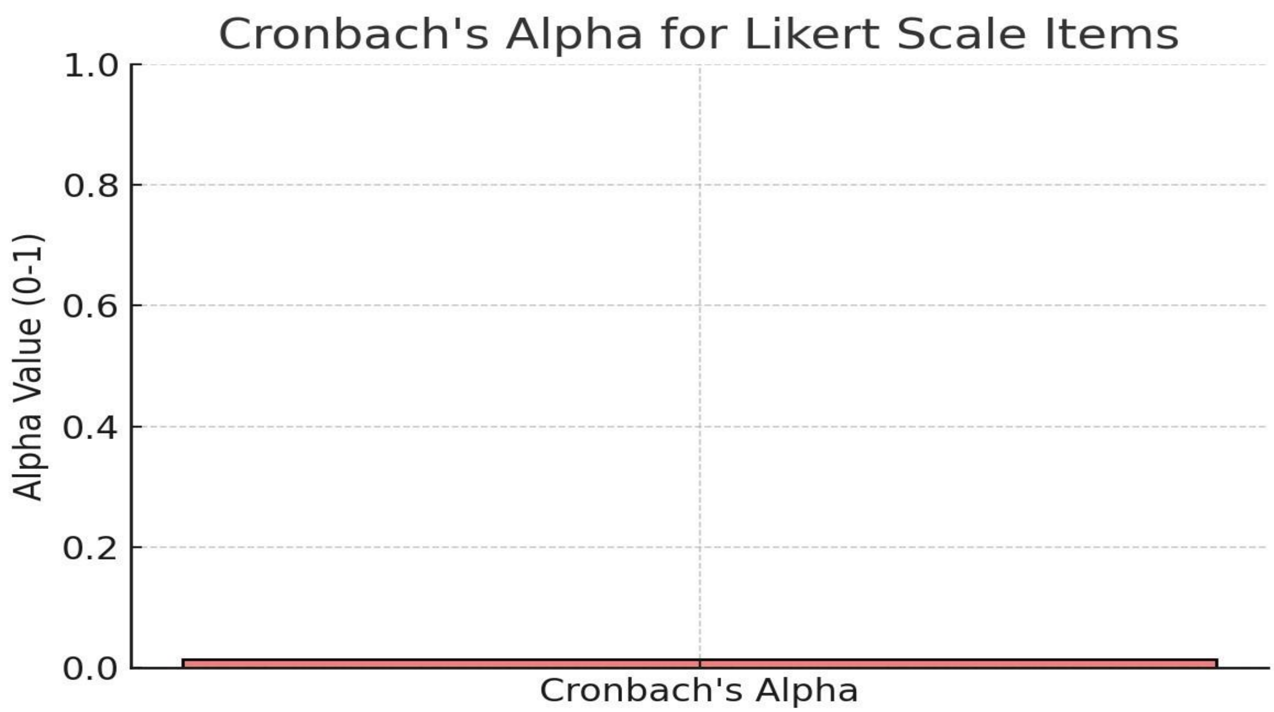

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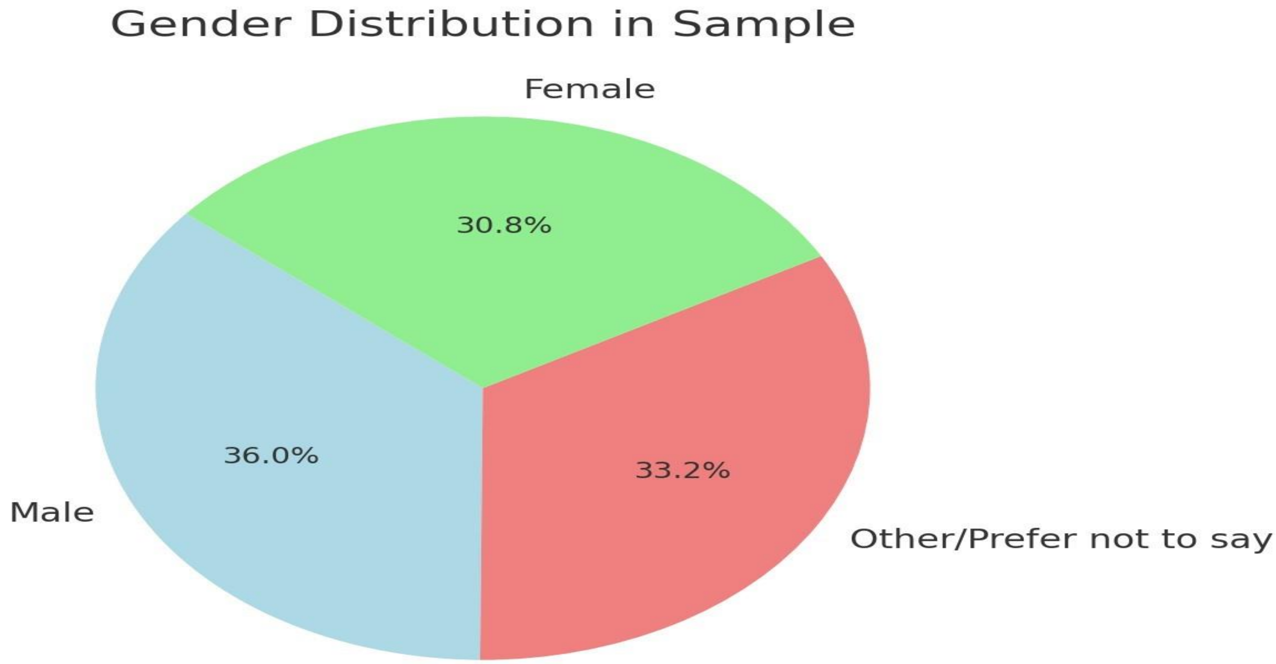

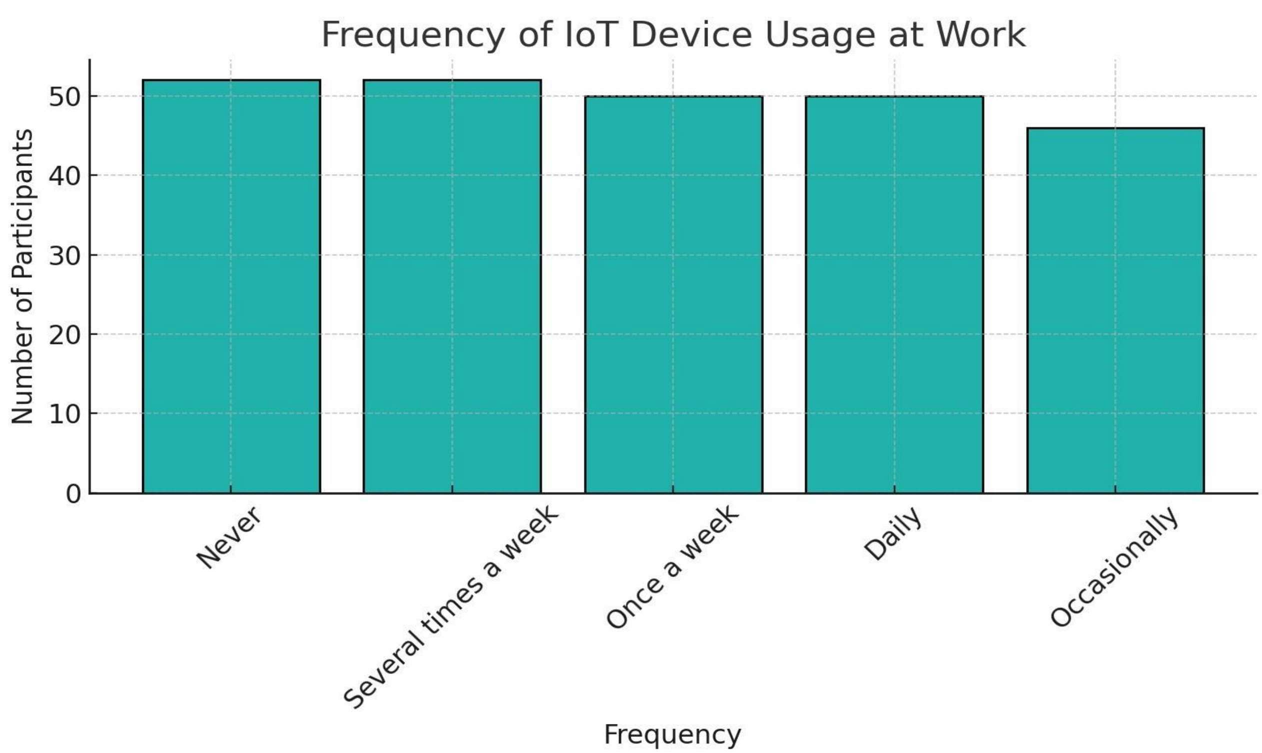

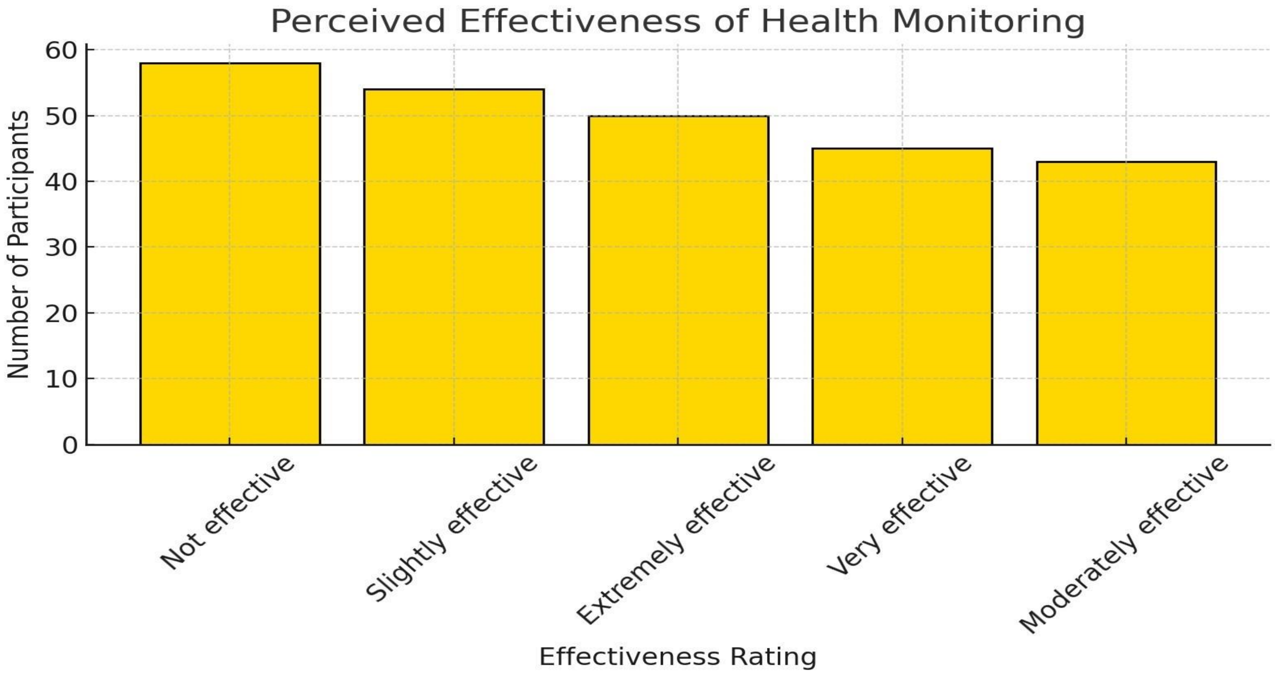

Interpretation of the Results and Charts

The findings of the study present the application of wearable IoT devices with AI for health at the workplace and safety analysis. The following is the analysis of the findings anchored on the statistical tests, tables, and charts obtained (Sivakumar, Sivan, & Antony, 2024).

1. Normality of Age Distribution

Using the Shapiro-Wilk normality test with the age data, a p-value of 3.08 × 10−133.08 × 10^−133.08 × 10^−13 was observed and therefore we can conclude that the ages were not normally distributed. This is also evident in the age distribution histogram: For age groups of 18-24, 25-34, 35-44, 45-54, and 55+; frequency is uneven among the participants. Such findings reflect that the sample may not be taken from a normal population and this may be skewed over the entire age bracket and thus has limited generalization to the broader population (Ringe, Sonar, Medhane, & Devane, 2024).

2. Internal Validity & Test-Retest Reliability Cronbach's Alpha, & The use of Likert Scale Questions

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The obtained Cronbach's Alpha coefficient is only 0.014 which shows very low internal reliability among the Likert scale items regarding comfort, health monitor efficacy, accident prevention, and AI-based safety measurements. A more ideal value for a reliable scale should be above 0.7, which in this case; the questionnaire items may not represent a single construct or the items in the questionnaire need to be redeveloped. The bar chart, which was used to show Cronbach's Alpha value was also consistent with this research finding since the alpha value obtained was far below any acceptable range (Sanjay, Jaishree, Anupriya, & BR, 2024).

3. Gender Distribution

It is seen from the gender pie chart that there's a fair gender representation in the sample with the male, female, and other/prefer not to say categories. Given this, it is observed that the majority of respondents are male participants, while the rest are females, as demonstrated in construction and manufacturing, industries that employ wearable IoT devices. Such a distribution assists in presenting the results from a diverse perspective of the actual workforce several aspects should be borne in mind, including the actual gender preference in adoption or perception of the technology (Cannady et al., 2024).

4. Frequency of IoT Device Usage

This bar chart regarding the IoT devices explains that the participants are different according to the usage frequency of the specific wearable technology at the workplace. Most of the participants employing the devices frequently used them rarely to several times a week and few used them daily. Nearly all occupational health programs utilize IoT devices but they are still being implemented and appear not to have fully become a regular feature of work routines for all occupational populations. One should question why daily use is so infrequent, and some of these reasons might include the following comfort constraints and device reliability (J. Li et al., 2024).

5. Self and Perceived Effectiveness in Health Monitoring

Responses to the survey question about the perceived effectiveness of health monitoring varied greatly and it is evident from the bar chart below. Indeed, the majority of participants assess the devices as being either very effective or moderately effective, yet almost a quarter of the respondents point to their usefulness as being only slightly or not very high at all. This could be because of some unevenness in the types of devices being employed, the quality of data gathered, or the ability of the workers involved to comprehend the health wisdom accessible from those devices. To intervene with these devices more effectively, methods of making the function and usability should be extended (Bérastégui, 2024).

Discussion

In general, the results from the present study reveal that the use of wearable IoT devices with AI for occupational health is increasingly popular but diverse. It is shown that while the market offers more options for device usage in watching over worker health and safety in construction, manufacturing, health care, and logistics industries, there are also inefficiencies that should and can be corrected. This analysis also shows that the age distribution is skewed and not normal, meaning that wearable IoT devices are more used by some age groups perhaps due to generation gaps that exist between ages when people grew up using different technologies. This is because the technology could appeal more to young workers than the older workforce as it applies the wearables approach (Tephillah & Jana, 2024).

This trend has to be considered while designing and implementing such technologies into working environments and make sure that the technologies are easy to use for people of all ages. The small value obtained for Cronbach's Alpha raises concerns about the internal consistency of the items used in the survey, and the utility of the Likert scale questions in this study may not be able to measure one construct such as satisfaction or perceived effectiveness by the community and other stakeholders. It may be because there is multifaceted nature of the topic has to do with wearable IoT devices as the employment of such devices depends on the kind of IoT device to be used, risks encountered in the workplace, and the kind and nature of business and working environment. Further research should attempt to expand these and other questions by fine-tuning the tools used in survey instruments to obtain a more accurate response (Ojha, Shayesteh, Sharifironizi, Liu, & Jebelli, 2024).

This shows that the usage of IoT devices in the case of workers implies that, although workers have been found to use wearables, IoT is not yet as pervasive as to be used daily in most organizations. This result could be due to issues of the comfort of the device, data quality or accuracy, organizational culture, and culture of resistance to constant surveillance. Thus, manufacturers and employers might need to make usability changes as well as better educate workers; more use in turn may well also result in more periodic use. The cross-sectional perception of the effectiveness of Health monitoring devices shows that while some of the workers using the devices may find the devices efficient, others do not find it so. This difference could be because of the quality the kind of devices used or how the data is incorporated into safety measures. AI-driven analytics may also be subject to context where for instance workers in construction, an inherently dangerous sector may find apply of AI worthwhile compared to workers in less risky sectors (Abatan et al., 2024).

In general, wearable IoT devices have the potential to contribute to occupationally applied healthcare innovation and safety enhancement, however, the results of this research reveal important areas for augmentation of the technology, augmentation of the user rate, and the assurance that these devices will provide a salient impact on various sectors. Further developments in these technologies, better development of these devices, and enhanced training to enable personnel to use these technologies will go a long way in ensuring that wearable IoT with artificial intelligence becomes part of standard operating procedures in the workplace. The study should be continued by future research focusing on the limitations such as the further development of survey instruments and considering the barriers to the daily employing of devices for readers with disabilities in the future (Singh, Kaunert, Vig, & Gautam, 2024).

Conclusion

This paper therefore offers a crucial analysis of current wearable IoT devices with AI for OH in RT WM and safety analytics. The results make it possible to conclude that, despite the widespread of these technologies in different industries, their application is rather uneven and the perceived efficiency of these technologies is also rather ambiguous. That age is also non-normal points to the fact that such technologies should be made more friendly and easily accessible to workers of all ages. The low reliability of survey items also reflects that based on Cronbach's Alpha, the artisans ' experience with wearable devices might be so complex that the current survey measures might not adequately capture the nuanced perceptions of user satisfaction and device efficacy.

The frequency of using devices figures indicate that although IoT devices are in use, they are still not integrated into the normal performance contracts of most employees. This highlights the need for better device comfort, ease of use, and organizational culture acceptance of having devices always monitoring their health status. Furthermore, the mixed findings on effectiveness suggest that despite the desirability of real-time health monitoring at work, some workers do not enjoy the same level of utility, which may be because of the poor or high quality of the devices they use, the ease of use or the incorporation of AI in the safety analysis.

Lastly, wearable IoT devices hold the promise of significantly improving workplace safety and workers' health, but to realize this potential, device design, usability, and consumer adoption need work. More research in this area should be directed towards improving the effectiveness of the instruments which can track its effectiveness and identify and overcome challenges that would hinder its adoption more widely and regularly. In this way, wearable IoT devices with AI contribute more effectively to mitigating workplace accidents, enhancing the health and safety of employees together with safety overall in different industries.

REFERENCES

Abatan, A., Obiuto, N. C., Ninduwezuor-Ehiobu, N., Ani, E. C., Olu-lawal, K. A., & Ugwuanyi, E. D. (2024). Integrating advanced technologies for enhanced hse management in the FMCG sector. *Engineering Science & Technology Journal, 5*(4), 1270-1280.

Abbasi, M. M. H., & Rasheed, M. R. (2024). MEDIA FOR SUSTAINABLE TOURISM GROWTH IN PAKISTAN: AN ANALYSIS OF TRADITIONAL AND NEW MEDIA CHANNELS. *Social Science Review Archives, 2*(2), 25-29.

Aghimien, L., Ngcobo, N., & Aghimien, D. (2024). Intelligent Wearable Technologies for Workforce Safety in Built Environment Projects in South Africa. *Sustainability, 16*(8), 3498.

Aksüt, G., Tamer, E., & ALAKAŞ, H. M. (2024). Using wearable technological devices to improve workplace health and safety: An assessment on a sector base with multi-criteria decision-making methods. *Ain Shams Engineering Journal, 15*(2), 102423.

Antonaci, F. G., Olivetti, E. C., Marcolin, F., Castiblanco Jimenez, I. A., Eynard, B., Vezzetti, E., & Moos, S. (2024). Workplace Well-Being in Industry 5.0: A Worker-Centered Systematic Review. *Sensors, 24*(17), 5473.

Azath, H., Sivanantham, E., Suganthi, B., Swarnalatha, E., Suresh, M., & Elango, B. (2024). *Building Safer Work Environments for Hazard Detection in Construction Sites with IoT and Cloud Server.*

Paper presented at the 2024 10th International Conference on Communication and Signal Processing (ICCSP).

Bérastégui, P. (2024). *Artificial intelligence in Industry 4.0: Implications for occupational safety and health* (2874527149). Retrieved from

Campero-Jurado, I., Márquez-Sánchez, S., Quintanar-Gómez, J., Rodríguez, S., & Corchado, J. M. (2020). Smart helmet 5.0 for industrial internet of things using artificial intelligence. *Sensors, 20*(21), 6241.

Cannady, R., Warner, C., Yoder, A., Miller, J., Crosby, K., Elswick, D., & Kintziger, K. W. (2024). The implications of real-time and wearable technology use for occupational heat stress: A scoping review. *Safety Science, 177*, 106600.

Chen, H., Mao, Y., Xu, Y., & Wang, R. (2023). The impact of wearable devices on the construction safety of building workers: a systematic review. *Sustainability, 15*(14), 11165.

Damilos, S., Saliakas, S., Karasavvas, D., & Koumoulos, E. P. (2024). An Overview of Tools and Challenges for Safety Evaluation and Exposure Assessment in Industry 4.0. *Applied Sciences, 14*(10), 4207.

Danilenka, A., Sowiński, P., Rachwał, K., Bogacka, K., Dąbrowska, A., Kobus, M., . . . Dymarski, P. (2023). Real-time AI-driven fall detection method for occupational health and safety. *Electronics, 12*(20), 4257.

Davila-Gonzalez, S., & Martin, S. (2024). Human digital twin in industry 5.0: A holistic approach to worker safety and well-being through advanced AI and emotional analytics. *Sensors, 24*(2), 655.

Dobrucali, E., Sadikoglu, E., Demirkesen, S., Zhang, C., Tezel, A., & Kiral, I. A. (2024). A bibliometric analysis of digital technologies use in construction health and safety. *Engineering, Construction and Architectural Management, 31*(8), 3249-3282.

Dodoo, J. E., Al-Samarraie, H., Alzahrani, A. I., Lonsdale, M., & Alalwan, N. (2024). Digital Innovations for Occupational Safety: Empowering Workers in Hazardous Environments. *Workplace Health & Safety, 72*(3), 84-95.

El-Helaly, M. (2024). Artificial Intelligence and Occupational Health and Safety, Benefits and Drawbacks. *La Medicina del Lavoro, 115*(2).

Ganesh, B. J., Vijayan, P., Vaidehi, V., Murugan, S., Meenakshi, R., & Rajmohan, M. (2024). *SVM-based Predictive Modeling of Drowsiness in Hospital Staff for Occupational Safety Solution via IoT Infrastructure.* Paper presented at the 2024 2nd International Conference on Computer, Communication and Control (IC4).

Gaur, B., Shukla, V. K., & Verma, A. (2019). *Strengthening people analytics through wearable IOT device for real-time data collection.* Paper presented at the 2019 international conference on automation, computational and technology management (ICACTM).

GOPU, G., RP, A. V. A., & HEMMASRI, K. (2024). *Machine Learning Enhanced Worker Safety Product: Potential Integration with Smart Jackets.* Paper presented at the 2024 2nd International Conference on Sustainable Computing and Smart Systems (ICSCSS).

Hassam, S. F., Hassan, N. D., Akbar, J., & Esa, M. M. AI-ENABLED REAL-TIME WORKPLACE HEALTH MONITORING SYSTEM. *Greetings from Rector of Bandung Islamic University Prof. Dr. H. Edi Setiadi, SH, MH*, 98.

Hijry, H., Naqvi, S. M. R., Javed, K., Albalawi, O. H., Olawoyin, R., Varnier, C., & Zerhouni, N. (2024). Real Time Worker Stress Prediction in a Smart Factory Assembly Line. *IEEE Access*.

Hinze, A., Bowen, J., & König, J. L. (2022). Wearable technology for hazardous remote environments: Smart shirt and Rugged IoT network for forestry worker health. *Smart Health, 23*, 100225.

Kanani, J., & Sheikh, M. I. (2024). Undiagnosed, uncomplicated foreign body in abdominal cavity–A case of medical negligence. *Surgery Case Reports*, *2*, 100024.

Kanani, J., & Sheikh, M. I. (2025a). Exploring nontraumatic brain hemorrhage in sudden and unexpected deaths: a novel autopsy-based investigation. *Asian Journal of Neurosurgery, 20*(01), 126-131.

Kanani, J., & Sheikh, M. I. (2025b). Ruptured dissecting aorta: An uncommon cause of sudden death—An autopsy study. *Cirugía Cardiovascular*.

Khahro, S. H., & Khahro, Q. H. (2024). *Use of Artificial Intelligence in Occupational Health and Safety in Construction Industry: A Proposed Framework for Saudi Arabia.* Paper presented at the International Conference on Industrial Engineering and Applications.

Khan, M. A., & Rasheed, M. R. (2020). Electronic media and interpersonal discourse: Mediation in Crises. *JSSH*, *28*(1).

Kim, J., Lee, K., & Jeon, J. (2024). Systematic literature review of wearable devices and data analytics for construction safety and health. *Expert Systems with Applications*, 125038.

Krishnamoorthy, G., Periyasamy, V., Sistla, S. M. K., & Venkatasubbu, S. (2024). Enhancing Worker Safety in Manufacturing with IoT and ML. *International Journal for Multidisciplinary Research, 6*(1), 1-11.

Lalitha, K., Ramya, G., & Shunmugathammal, M. (2023). AI-based safety helmet for mining workers using IoT technology and ARM cortex-M. *IEEE Sensors Journal, 23*(18), 21355-21362.

Lemos, J., de Souza, V. B., Falcetta, F. S., de Almeida, F. K., Lima, T. M., & Gaspar, P. D. (2024a). Enhancing Workplace Safety through Personalized Environmental Risk Assessment: An AI-Driven Approach in Industry 5.0. *Computers, 13*(5), 120.

Lemos, J., de Souza, V. B., Falcetta, F. S., de Almeida, F. K., Lima, T. M., & Gaspar, P. D. (2024b). A System for Individual Environmental Risk Assessment and Management with IoT Based on the Worker's Health History. *Applied Sciences, 14*(3), 1021.

Li, C. H. J., Liang, V., Chow, Y. T. H., Ng, H.-Y., & Li, S.-P. (2022). A mixed reality-based platform towards human-cyber-physical systems with IoT wearable device for occupational safety and health training. *Applied Sciences, 12*(23), 12009.

Li, J., Miao, Q., Zou, Z., Gao, H., Zhang, L., Li, Z., & Wang, N. (2024). A Review of Computer Vision-Based Monitoring Approaches for Construction Workers' Work-Related Behaviors. *IEEE Access*.

Li, X., Zeng, J., Chen, C., Li, T., & Ma, J. (2024). Decentralized adaptive work package learning for personalized and privacy-preserving occupational health and safety monitoring in construction. *Automation in Construction, 165*, 105556.

Low, J. X., Wei, Y., Chow, J., & Ali, I. F. (2019). *ActSen-AI-enabled real-time IoT-based ergonomic risk assessment system.* Paper presented at the 2019 IEEE International Congress on Internet of Things (ICIOT).

Madahana, M. C., Ekoru, J. E., Sebothoma, B., & Khoza-Shangase, K. (2024). Development of an artificial intelligence based occupational noise induced hearing loss early warning system for mine workers. *Frontiers in Neuroscience, 18*, 1321357.

Mantellos, G., Exarchos, T. P., Dimitrakopoulos, G. N., Vlamos, P., Papastamatiou, N., Karaiskos, K., . . . Tsakiridis, D. (2022). *Integrating Wearable Sensors and Machine Learning for the Detection of*

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081

Journal of Medical &
Health Sciences Review

Critical Events in Industry Workers. Paper presented at the Worldwide Congress on "Genetics, Geriatrics and Neurodegenerative Diseases Research".

Márquez-Sánchez, S., Campero-Jurado, I., Herrera-Santos, J., Rodríguez, S., & Corchado, J. M. (2021). Intelligent platform based on smart PPE for safety in workplaces. *Sensors, 21*(14), 4652.

Nahavandi, D., Alizadehsani, R., Khosravi, A., & Acharya, U. R. (2022). Application of artificial intelligence in wearable devices: Opportunities and challenges. *Computer Methods and Programs in Biomedicine, 213*, 106541.

Nguyen, T., Nguyen, D. H., Nguyen, Q.-T., Tran, K. D., & Tran, K. P. (2024). Human-Centered Edge AI and Wearable Technology for Workplace Health and Safety in Industry 5.0. In *Artificial Intelligence for Safety and Reliability Engineering: Methods, Applications, and Challenges* (pp. 171-183): Springer.

Nnaji, C., Awolusi, I., Park, J., & Albert, A. (2021). Wearable sensing devices: towards the development of a personalized system for construction safety and health risk mitigation. *Sensors, 21*(3), 682.

Ojha, A., Shayesteh, S., Sharifironizi, A., Liu, Y., & Jebelli, H. (2024). Worker-centric heat strain analysis: Integrating physiological signals with ensemble learning and domain adaptation. *Automation in Construction, 166*, 105670.

Palaniappan, K., Kok, C. L., & Kato, K. (2021). *Artificial intelligence (AI) coupled with the internet of things (IoT) for the enhancement of occupational health and safety in the construction industry*. Paper presented at the Advances in Artificial Intelligence, Software and Systems Engineering: Proceedings of the AHFE 2021 Virtual Conferences on Human Factors in Software and Systems Engineering, Artificial Intelligence and Social Computing, and Energy, July 25-29, 2021, USA.

Patel, V., Chesmore, A., Legner, C. M., & Pandey, S. (2022). Trends in workplace wearable technologies and connected-worker solutions for next-generation occupational safety, health, and productivity. *Advanced Intelligent Systems, 4*(1), 2100099.

Pereira, F., González García, M. d. l. N., & Poças Martins, J. (2024). An Evaluation of the Technologies Used for the Real-Time Monitoring of the Risk of Falling from Height in Construction—Systematic Review. *Buildings, 14*(9), 2879.

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081

Journal of Medical & Health Sciences Review

Pishgar, M., Issa, S. F., Sietsema, M., Pratap, P., & Darabi, H. (2021). REDECA: a novel framework to review artificial intelligence and its applications in occupational safety and health. *International journal of environmental research and public health*, *18*(13), 6705.

Pisu, A., Elia, N., Pompianu, L., Barchi, F., Acquaviva, A., & Carta, S. (2024). Enhancing workplace safety: A flexible approach for personal protective equipment monitoring. *Expert Systems with Applications*, *238*, 122285.

Podgórski, D. (2020). Enhancing OSH Management Processes through the Use of Smart Personal Protective Equipment, Wearables and Internet of Things Technologies. In *New Opportunities and Challenges in Occupational Safety and Health Management* (pp. 125-164): CRC Press.

Rajkumar, S., Poddar, H., Harsha, S. S., Garg, Y., Shuraj, R., & Vinodhini, M. (2024). *Transforming Workplace Safety: The Intelligent Helmet Approach for Instantaneous Monitoring with Warning System.* Paper presented at the 2024 3rd International Conference on Artificial Intelligence For Internet of Things (AIIoT).

Raman, R., & Mitra, A. (2023). *IoT-Enhanced Workplace Safety for Real-Time Monitoring and Hazard Detection for Occupational Health.* Paper presented at the 2023 International Conference on Artificial Intelligence for Innovations in Healthcare Industries (ICAIIHI).

Rane, N., Choudhary, S., & Rane, J. (2023). Leading-edge wearable technologies in enhancing personalized safety on construction sites: a review. *Available at SSRN 4641480*.

Rashidi, A., Woon, G. L., Dasandara, M., Bazghaleh, M., & Pasbakhsh, P. (2024). Smart personal protective equipment for intelligent construction safety monitoring. *Smart and Sustainable Built Environment*.

Rathod, S. B., Mahajan, R. A., Khadkikar, P. A., Vyawahare, H. R., & Patil, P. R. (2024). Improving workplace safety with AI-powered predictive analytics: enhancing workplace security. In *AI Tools and Applications for Women's Safety* (pp. 232-249): IGI Global.

Rathod, S. B., Vyawahare, H. H., & Mahajan, R. (2024). AI-Driven Predictive Safety Analytics: Enhancing Workplace Security. In *Impact of AI on Advancing Women's Safety* (pp. 33-52): IGI Global.

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081

Ringe, Y. U., Sonar, P. R., Medhane, D. V., & Devane, S. R. (2024). An Employee Health Monitoring System Using Wireless Body Area Networks and Machine Learning. In *Applied Computer Vision and Soft Computing with Interpretable AI* (pp. 69-84): Chapman and Hall/CRC.

Sanjay, R., Jaishree, M., Anupriya, V., & BR, Y. (2024). SafeMine Quantum Network-Inspired LabVIEW-Driven Real-Time Health Monitoring for Advanced Mining Safety. In *Quantum Networks and Their Applications in AI* (pp. 231-251): IGI Global.

Sanjeewani, P., Neuber, G., Fitzgerald, J., Chandrasena, N., Potums, S., Alavi, A., & Lane, C. (2024). Real-Time Personal Protective Equipment Non-Compliance Recognition on AI Edge Cameras. *Electronics, 13*(15), 2990.

Shah, I. A., & Mishra, S. (2024a). Artificial intelligence in advancing occupational health and safety: an encapsulation of developments. *Journal of Occupational Health, 66*(1), uiad017.

Shah, I. A., & Mishra, S. (2024b). Reimagining occupational health and safety in the era of AI. In *A Biologist s Guide to Artificial Intelligence* (pp. 79-96): Elsevier.

Shraddha Baldania, M. B. (2024). Heart and Lung Dysfunction Prevention Through Rehabilitation. *Journal of Cardiology Research*.

Shumba, A.-T., Montanaro, T., Sergi, I., Fachechi, L., De Vittorio, M., & Patrono, L. (2022). Leveraging IoT-aware technologies and AI techniques for real-time critical healthcare applications. *Sensors, 22*(19), 7675.

Singh, B., Kaunert, C., Vig, K., & Gautam, B. K. (2024). Wearable Sensors Assimilated With Internet of Things (IoT) for Advancing Medical Imaging and Digital Healthcare: Real-Time Scenario. In *Inclusivity and Accessibility in Digital Health* (pp. 275-297): IGI Global.

Sivakumar, S., Sivan, V., & Antony, G. C. (2024). *SafeSense: Real-time Safety Alerts for Construction workers.* Paper presented at the ISARC. Proceedings of the International Symposium on Automation and Robotics in Construction.

Suryawanshia, S., Bhosale, D., Vishwakarmaa, S., Patila, K., Harwania, V., & Bhosalec, A. (2024). A Comprehensive Survey on Smart Wearables: Real-time Health and Workplace Monitoring, Alerting, and Analysis in the Industrial Context. *Transactions C: Aspects, 37*(12), 2473.

Svertoka, E., Saafi, S., Rusu-Casandra, A., Burget, R., Marghescu, I., Hosek, J., & Ometov, A. (2021). Wearables for industrial work safety: A survey. *Sensors, 21*(11), 3844.

Tang, K. H. D. (2024). Artificial Intelligence in Occupational Health and Safety Risk Management of Construction, Mining, and Oil and Gas Sectors: Advances and Prospects. *Journal of Engineering Research and Reports, 26*(6), 241-253.

Tephillah, S., & Jana, K. (2024). *A Human Activity Determination Predicting Abnormality for Mining Field Workers.* Paper presented at the 2024 International Conference on Advances in Data Engineering and Intelligent Computing Systems (ADICS).

Venkatakiran, S., Prasad, V. N., Prasad, K., & Kawale, S. R. (2024). *Real-Time Health Data Analytics in IoT-Connected Wearable Devices.* Paper presented at the 2024 5th International Conference for Emerging Technology (INCET).

Vlachos, M., Pavlopoulos, L., Georgakopoulos, A., Tsimiklis, G., & Amditis, A. (2024). A Robust End-to-End IoT System for Supporting Workers in Mining Industries. *Sensors, 24*(11), 3317.

Wolniak, R., & Grebski, W. (2023). WORK SAFETY AND HEALTH–THE BUSINESS ANALYTICS USAGE IN INDUSTRY 4.0 CONDITIONS. *Scientific Papers of Silesian University of Technology. Organization & Management/Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie*(186).

Xie, X., & Chang, Z. (2019). Intelligent wearable occupational health safety assurance system of power operation. *Journal of medical systems, 43*(1), 16.