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Research Article

NexAlert: A Smart Wearable Emergency Alert System for Enhancing Workplace Safety

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Abstract: *Currently, workplace accidents in warehouses and ports are increasing due to unsafe working conditions. Therefore, our team introduces NexAlert, a smart wearable emergency alert system designed to improve worker safety. The device features a one-press SOS button to contact emergency services, a double-press function to notify supervisors, GPS location sharing, and vibration confirmation. Workers can quickly request assistance during emergencies without using their mobile phones. This innovation helps reduce emergency response delays, improve workplace safety, and provide faster assistance. NexAlert has commercial potential among warehouse operators, port authorities, logistics companies, and factories.*

1. INTRODUCTION

In sectors such as manufacturing, warehousing, port operation and logistics, workers were exposed to occupational risk such as heavy machinery, moving equipment and material handling, safety at workplace is a serious problem. In 2022, the number of occupational injury cases in Malaysia was 34,216 which increased to 38,950 in 2023. This incident illustrates the importance of strengthening workplace safety procedures and improving emergency communication as it can complicate rescue efforts if accidents are not reported immediately and the location of the injured personnel cannot be pinpointed. Traditional means of communication such as cell phones may not always be accessible when workers are operating machinery or during an emergency.

In order to address this problem, the team proposes NexAlert, a smart wearable emergency alert system which has the One-press SOS function to send emergency alerts, double-press function to inform the supervisor, GPS location sharing and Vibration confirmation to show the successful alert activation. NexAlert is designed to eliminate communication delays during emergency situations, facilitate quicker and more efficient replies, and empower employees to seek for help without having to take out their phones, by integrating the above functionalities in a single, wearable gadget. Commercial value for the idea can be discovered by warehouse operators, port authorities, logistics companies and manufacturing businesses in their quest for practical solutions to improve workplace safety and emergency management (Department of Statistics Malaysia, 2024).

2. LITERATURE REVIEW

Previous works have highlighted the importance of workplace safety and how technology could facilitate emergency communication in the industrial environment. Svertoka, et. al. (2021) have studied on wearable technologies for supporting workers' safety in industrial work, including location tracking, communication, and monitoring. On a related note, representatives from the European Agency for Safety and Health at Work, explained how digital monitoring technologies such as GPS and wearables may help to improve the management of occupational safety by virtue of knowing workers' location. These technologies could be extremely useful at factories, ports, warehouses and logistics centers, where workers may encounter hazardous situations and require a fast response. Nevertheless, there are additional issues to deploy wearable safety gadgets, such as concerns about data privacy, network connectivity, implementation cost, battery efficiency, and usability of the gadgets.

The potential benefits of workplace wearables were also highlighted by the U.S. Government Accountability Office (GAO, 2024) as well as concerns about cost, privacy and usability. NexAlert can let employees easily report their location to ask for help in case of emergency. Prototype testing should measure the performance of the proposed system, including alert delivery speed, GPS precision, battery life, reliability, and ease of use even though all these characteristics can increase workplace safety. Therefore, by providing a comprehensive and convenient emergency communication solution for the industrial workers, NexAlert generalizes the existing wearable safety technologies (Svertoka et al., 2021) & (European Agency for Safety and Health at Work, 2024).

3. METHODOLOGY

The development of NexAlert follows a series of processes to ensure that the emergency alert device operates efficiently and meets worker safety requirements. It describes the processes involved, including conducting research, identifying problems, planning the design, developing the product, testing its functions and evaluating its effectiveness. In addition, research is carried out to understand workplace hazard and accidents risks, particularly in warehouses and ports. Following this, the device is designed with important functions, including an SOS emergency button, supervision notification, GPS tracking and vibration alerts. The hardware and software components are then integrated to ensure that all functions operate properly. After that, the prototype is tested through simulation to evaluate its functionality, accuracy and reliability. Finally, feedback and testing results are analyzed to identify weaknesses and make necessary improvements to enhance the device’s performance, usability and overall worker safety.

4. FINDINGS

NexAlert includes the following four features to help the workers in the warehouse or port facility during an emergency as mentioned below. The development of NexAlert emphasizes the following essential features which can aid in enhancing the safety at the workplace for workers in the warehouse and port facility. The proposed device incorporates easy to use emergency communication means in an emergency due to the wearable design and easy operating functions. This innovation supports workplace emergency preparedness and helps organizations establish effective responses to emergency situations (International Organization for Standardization, 2018).

4.1 Main Features of NexAlert

NexAlert is composed of the following four features, which facilitate workers in emergency situations. Firstly, the one-press SOS button enables the worker to quickly ask for emergency help. Secondly, the double-press function lets workers inform the supervisor that they need assistance or attention. Thirdly, the GPS location tracking makes it easier to find the worker if needed. Finally, the vibration confirmation tells the worker that their emergency alert has been sent successfully. All these features are designed to make the emergency communication more convenient and faster without workers taking their mobile phone. Sim et al. (2019) explained that wearable devices can use light and haptic signals to communicate notifications and help users identify important information without looking at the device.

4.2 Emergency Alert Process and Workplace Benefits

The NexAlert operating process starts when the workers wear the device and make sure it is turned on and connected to the system. When a worker is in an emergency, he can activate it by pressing the SOS button one or two times depending on the type of notification needed. Next, the system sends the alert along with the worker GPS location to the recipient of choice. Vibration confirmation lets the worker know that the alert was successfully transmitted. In both warehouse and port operation, this innovation potentially brings two advantages. It can reduce the time delay for calling emergency help, as well as improve workers' communication with their supervisors. At the same time, it can increase employers' confidence in the workplace safety arrangement (Rurenko et al., 2025).

5. DISCUSSION

NexAlert is an innovative smart wearable emergency alert system developed to address the increasing number of workplace accidents in warehouses, ports, logistics companies and factories. Workplace safety is an important concern because workers may face dangerous situations that require immediate assistance. In some emergencies, workers may find it difficult to reach their mobile phones or contact others quickly. Therefore, NexAlert provides a practical solution by allowing workers to request help through a simple and convenient wearable device. Its wearable design allows workers to carry out their daily tasks while keeping the emergency alert system easily accessible. This is particularly beneficial in environments where workers operate heavy machinery, handle hazardous materials or work in isolated areas.

NexAlert may help reduce the severity of workplace incidents and improve workers' confidence in their working environment. From a business perspective, NexAlert has strong commercial potential because workplace safety is a priority for many industries. Potential customers include warehouse operators, port authorities, logistics companies and manufacturing factories. However, the effectiveness of NexAlert offers a promising technological solution that combines convenience, communication, location tracking to support a safer working environment and improve emergency management.

6. CONCLUSION

In conclusion, NexAlert is a smart wearable device designed to enhance workplace safety and provide better protection for employees in warehouses, ports, logistics, companies and factories. The device combines several useful functions including an SOS emergency button, supervisor notification, GPS tracking, vibration alerts and allowing workers to seek help quickly when facing dangerous situations. By improving communication and reducing the time needed to respond to emergencies, NexAlert can contribute to a safer working environment. Additionally, the product has promising business opportunities as organizations continue to prioritize employee well-being and safety. Despite challenges such as affordability, battery performance and network connectivity. NexAlert has the potential to become a valuable safety innovation across various industries.

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