

# 2021-2022 GRANT RECIPIENT REPORT

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**THE UNIVERSITY OF TEXAS AT SAN ANTONIO  
DON B. DAILY SAFETY GRANT**

The main purpose of this project is to investigate the factors impacting the implementation of Internet of Things (IoT)-based wearable sensing devices (WSDs) for worker safety and health management in the steel manufacturing industry. The objectives of the proposed research project are to: review and identify potential factors impacting the implementation of IoT-based WSDs for safety and health management in steel manufacturing, evaluate employee perception of the factors impacting the implementation of IoT-based WSDs, conduct testing of commercially available IoT-based WSDs, and propose strategies for implementing IoT-based WSDs for worker safety and health monitoring in steel manufacturing.

Steel manufacturing plants are characterized by different types of hazards and precarious working conditions with a high probability to harm employees. Incident reports in steel manufacturing indicate that much improvement is needed to reduce and ultimately remove injuries and illnesses experienced by workers in steel manufacturing plants. Studies indicate that wearable sensing devices based on the Internet of Things (IoT-based WSDs) have the potential to prevent such mishaps and improve worker safety and health performance by proactively sensing hazards in the work environment and providing real-time information about safety and health risks to personnel. Despite the pervasiveness of these devices in sectors such as healthcare, sports and fitness, some high-risk industrial sectors including the steel industry which can directly benefit from the potential of these devices are yet to start taking advantage of these benefits.

A need also exists to examine how this category of emerging technologies can be implemented for safety and health management in the steel industry. The main purpose of this research project is to evaluate the factors impacting the implementation success of IoT-based WSDs for worker safety and health management in the steel industry.

First, an integrative literature review was conducted to compile the factors (both drivers and barriers) that have the potential to influence the successful implementation of IoT-based WSDs for safety and health monitoring in steel manufacturing. This step involved a survey of different variables influencing the implementation of innovative technologies either positively or negatively such as the inputs (resources to be utilized to initiate the process), enablers (factors facilitating the process), and barriers (factors inhibiting the process).

A total of 24 success factors were identified from the review. A survey was then designed and administered to employees in steel manufacturing to evaluate their perception of the factors influencing the successful implementation of IoT-based WSDs for safety and health



monitoring. The data obtained from the survey will be analyzed using different descriptive and inferential statistics. Technology, industry, environment, organization and individual factors including privacy and security of data will be assessed. Furthermore, experimental testing of candidate commercially available IoT-based WSDs will be conducted to determine their ability to sense or detect hazards or unsafe conditions or worker behavior to provide early warning alerts for accident prevention. The preliminary experiment testing procedure and user experience survey have been designed and the necessary human subjects research protocol approval has been obtained. Data obtained from the experimental testing will be analyzed and the results of these experimental trials will be incorporated into the implementation strategies for steel manufacturing plants. Based on the results of the aforementioned tasks, a set of best practices guidelines will be proposed on how to effectively implement IoT-based WSDs for safety and health management in the steel manufacturing industry. The findings of the project are expected to help practitioners and stakeholders in the effective implementation of cutting-edge technologies such as IoT-based WSDs to improve the safety and health performance of workers in the steel industry. ◆