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Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)
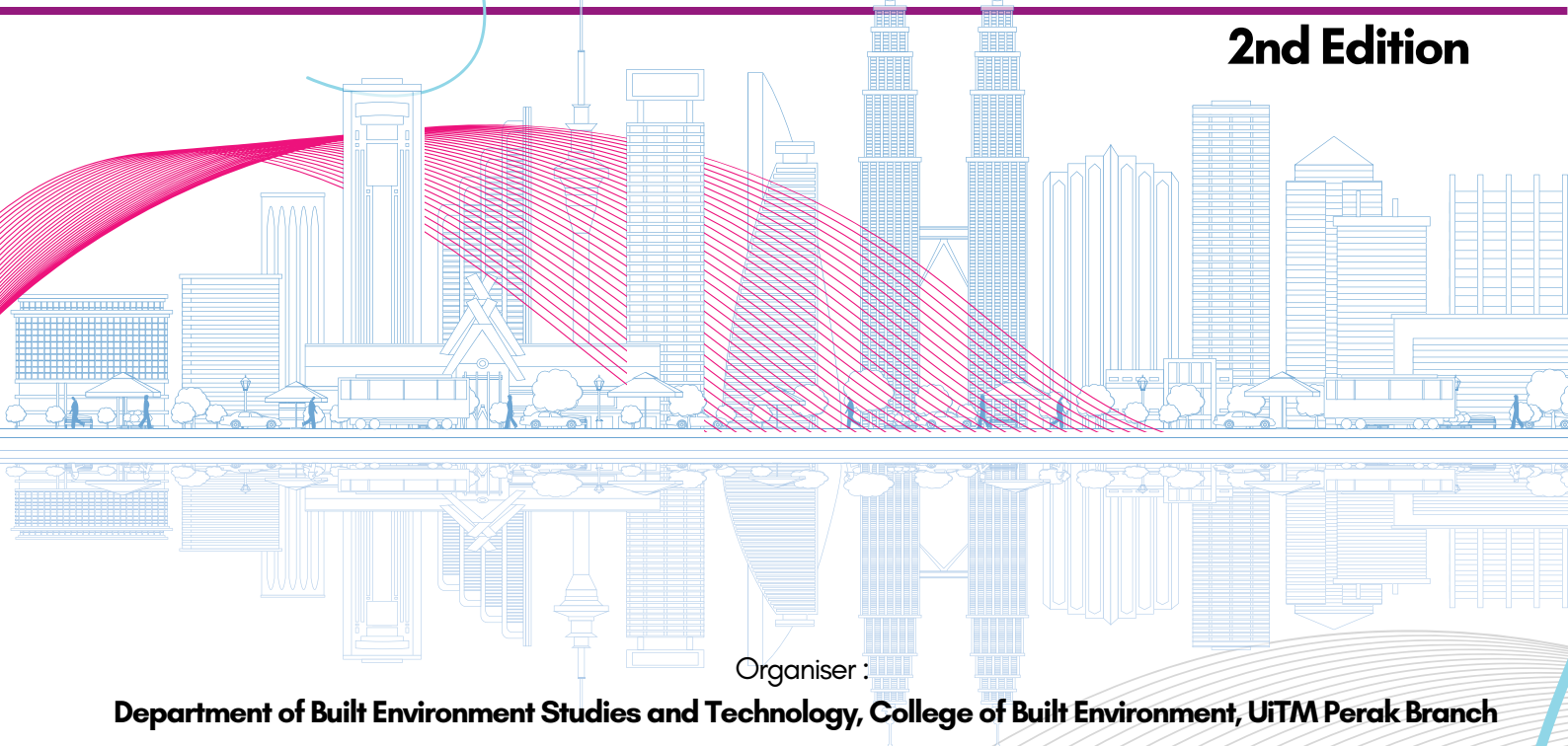### "Undergraduates' Digital Engagement Towards Global Ingenuity"

2nd Edition

UNIVERSITI TEKNOLOGI MARA | Cawangan Perak

e – Proceedings

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Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

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ACCIDENT WARNING SAFETY HELMET

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Abstract

In construction, worker safety is extremely important and the first line of defense against injuries is safety helmets. Unfortunately, their effectiveness can be compromised by improper usage. This study focuses on enhancing the existing safety helmets in the construction industry through a multifunctional helmet that has detection sensors aimed at minimizing accidents. The research also aimed at integrating eye protection and hearing protection into construction safety. The helmet's effectiveness was evaluated using various methods including literature reviews and simulations The current challenges were addressed by the "Smart Detection Safety Helmet" which has features such as simplification of inspection tasks and provision of important evidence in case of accidents which is beneficial to all the involved persons in constructions.

Keyword: *Safety helmet, Protection, Accidents*

1. INTRODUCTION

Construction is rated to be one of the high hazard industries in Malaysia. This is because it has temporary nature and high rates of fatalities or accidents. Safety helmets, made from impact-resistant materials, are important safety gear for the employees. They are also essential for all workers in the workplace, failure to which attract penalties. Some of the common workplace hazards are noise pollution, eye and ear injuries, and facial injuries. This paper reviews the performance of a multi-functional helmet with a detection sensor for accidents in a construction site, introduces the approach of face and hearing protection, and explores its marketability in the construction industry. Research Question is How wearable technology safety helmets, eye protection, and hearing protection in general adopted to mitigate construction-site accidents. SDG 3 relates to the protection of labour rights, safety at work, and occupational safety in construction. It achieves sustainable economic growth through creativity, efficiency, and advanced technology, while reducing environmental impact and minimizing waste dumping.

2. LITERATURE REVIEW

There are many hazards found on construction sites which results in a lot of risks. Among them include falls, electric shocks and breaking of electric wires, mechanical problems caused by machines that are too heavy or too large and the use of dangerous chemicals. The safety of workers can be compromised by noise or clutter while fallen workers from heights may lose their lives. In addition, fires may cause loss of property and life loss. People can suffer severe injuries or even long-term diseases if they don't wear ear plugs or protective glasses.

3. METHODOLOGY

Construction innovation involves multiple participants, reduces costs, improves quality, and is environmentally friendly. Research on innovation is essential for corporate success and industry advancement.
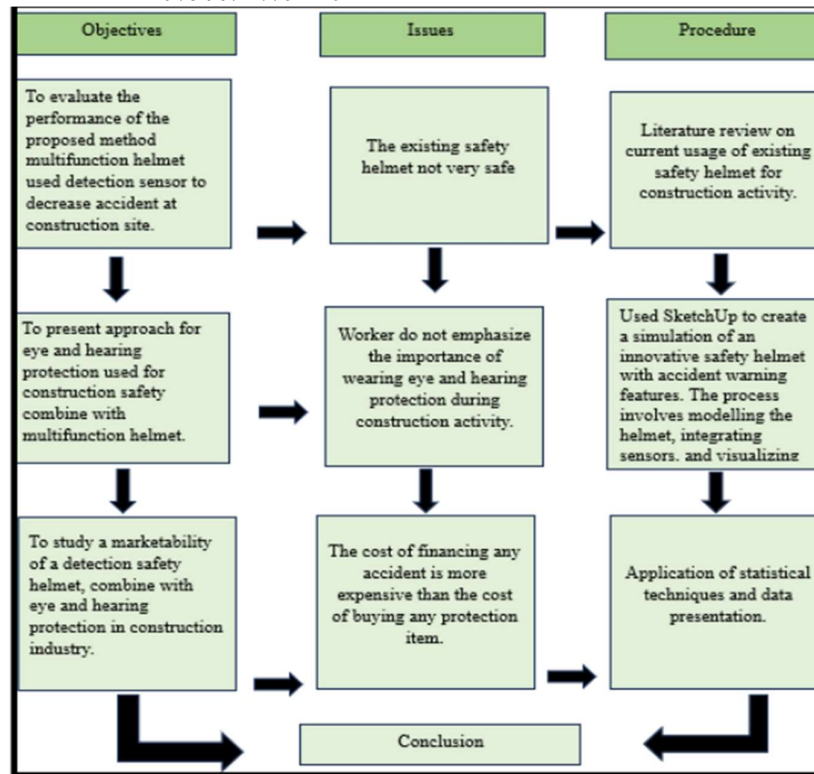
Figure 1: Framework process

The final report was on the integration of IoT technology into safety helmets for worker and accident detection, as well as providing an approach for eye and ear protection. SketchUp was used to perform a simulation on how to create a new and innovative design of a safety helmet. Literature review, laboratory experiment, and desk research study were proposed to be implemented during data collection. Data analysis was used to discover relevant information, propose conclusions, and to aid in decision-making

4.   RESULT AND DISCUSSION
Advanced safety helmets present a major challenge in construction. Some defects found in the helmets these days include poor features on safety and comfort. Further innovation in safety helmet design is necessary to solve these issues, including the use of an IoT system with smoke sensors and crash or fall detection sensors to help lower accidents at construction sites. It offers promising returns in civil construction through wearable technology, where improved workplace well-being and productivity can rise by 3.5% and 8.5%, respectively. The author's aim is to transform the safety helmet by integrating an IoT security system, face shield, and hearing protection. IoT networks facilitate communication between devices and the cloud, and sensors like smoke detectors can identify accidents, track the locations of workers, and ensure fire safety. In this paper, a proposed safety helmet has been designed with the help of 3D sketching and visualization software called Sketchup.
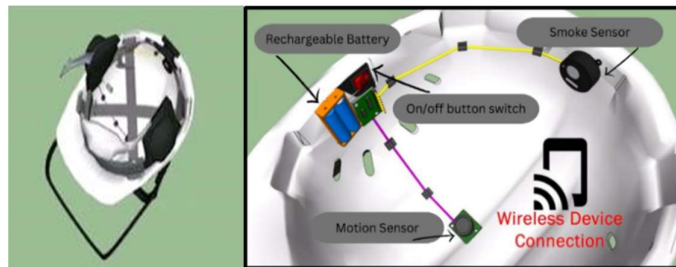
Figure 2: The design of safety helmet

Figure 3: Inside of safety helmet

The construction safety helmet uses motion and smoke sensors to enhance safety in hazardous environments. Motion sensors trigger alarms, alerting workers or supervisors, while smoke sensors monitor noxious gases, providing warnings against fires and smoky conditions. These technologies can be integrated into evacuation procedures. Nylon strap chin covers provide secure fits, stability, and comfort, reducing head injury risks.

Figure 4: Performance of smoke sensor

When the smoke sensors are detecting the presence of smoke particles in the sensors can trigger alarms or alerts in real-time. These alerts can notify workers, site supervisors, and emergency response teams promptly, enabling quick evacuation and intervention before the fire spreads.
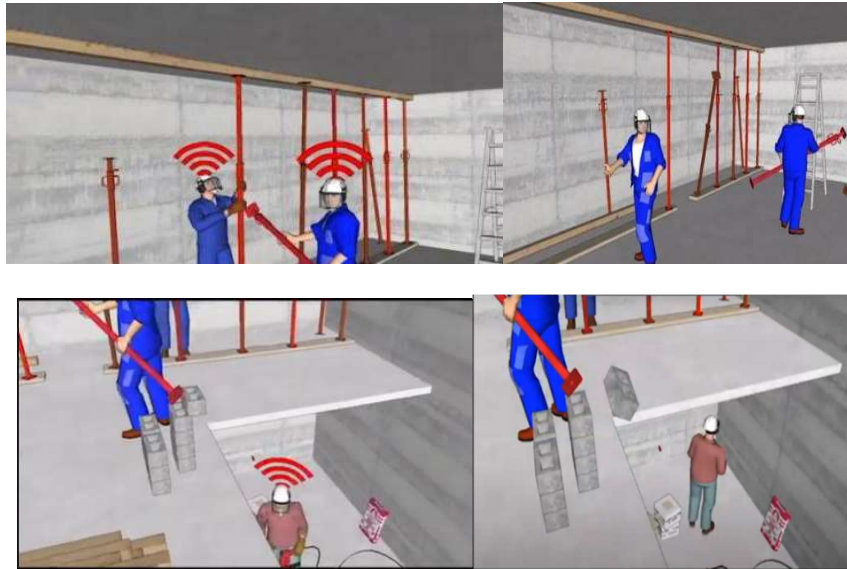
Figure 5: Performance of motion sensor

When the motion sensor detects any movement inside their range of vision, generating alarms to dissuade prospective burglars or unauthorised staff after hours. In addition to security, motion sensors improve safety by lighting dark areas, lowering the danger of accidents. They also help to monitor building progress by measuring movement and activity in specific zones, which provides useful information for project management.

Figure 4: Device connection

IoT set-ups need device connections to be monitored for proper functioning, initialization, registration, heartbeat monitoring, fault detection, recovery, integrity of data, integration into the event processing systems, performance optimization, and scalability. Due to this continuous monitoring, performance can be optimized and improved in the infrastructure. Smoke sensors and motion sensors are crucial in the early detection of fire and security; they also network into the building site to efficiently communicate on matters concerning safety.

5. CONCLUSION

It's a first-of-its-kind industry solution that will guarantee workers' and facilities' safety by using advanced technology in a helmet for hearing, face, and motion detection with smoke detection. This shall help avoid injuries, issues relating to impulses, and lifestyle diseases such as respiratory problems. Using IoT technology, it picks up data from the environment and activities of workers, hence increasing preventive measures on safety and improving protocols with time. Its data driven and increased operational efficiency.

Acting as a decision-making tool in the workplace for safety purposes, the helmet can give a remote signal to local authorities when necessary. This study recommends further research on innovation products by fully understanding innovation concepts included are alternative marketing tactics to promote innovation and develop special apps connected to site supervisors or the safety officer in understanding the product. Construction Command provides a video surveillance, access control, environmental sensor security platform that scales to ensure comprehensive monitoring to better protect workers and operational safety.

6. ACKNOWLEDGMENT

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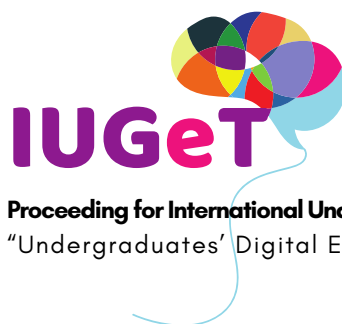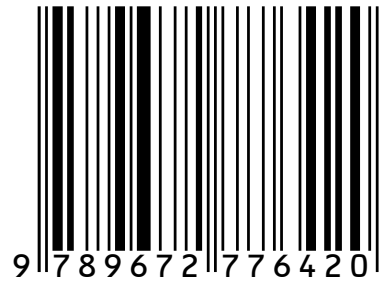
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