

SMART SHOE FOR CONSTRUCTION WORKERS (SMARTES)

Nursyahirah Rosle¹, Amalinda Othman², Mohamad Daneil Hambali Mohd Bukhori³,
Mohamad Hamdan Othman⁴
^{1,2,3,4} *Universiti Teknologi MARA Perak*
Nursyahirah_rosle@yahoo.com

ABSTRACT:

Personal Protective Equipment (PPE), a pair of safety shoes, is very important in construction industry. There are many workplace accidents where foot injury is one of the highest type of injuries recorded. However, there are many workers who do not wear safety shoes during on-site work. This project of ours, presents a new version of smart shoes which come with the latest technology (SMARTES). This smart shoes will encourage people to wear safety shoes that can prevent them from foot-related injuries. The smart shoes also can make the work management system become more efficient. The new version of smart shoes will be more comfortable to wear and can reduce foot pain. Therefore, it will be designed to be user friendly and will not harm the users and they suitable for all users. The smart sensor shoes are designed to detect if there are any dangerous elements in the close proximity to the feet. So, the workers do not need to worry about any danger that will harm them because they will be alerted by the sensor system. In addition, the Radio Frequency Identification (RFID) smart tracking shoes, will allow the employers to monitor and track their workers' work speed at the construction site or the whereabouts of their workers.

Keywords: : Personal Protective Equipment (PPE), Safety Shoes, Technology in Construction, Smart Sensor, GPS Tracking.

INTRODUCTION

Smart technology is a technology that is capable to adapt automatically and modify behavior to fit environment, senses things with technology sensors; thus, providing data to analyze and infer from drawing conclusions from rules (Al-Nasrawi, July 2014). The objective of this research is to identify the issues and problem related to wearing safety shoes among construction workers. It is to identify the new features of smart shoes that are favored by the workers.

Safety shoes need to be worn every time in construction work. However, there are still many workers who are reluctant to wear safety shoes. Some of the problems are the shoes itself. Some of the safety shoes are heavy to wear and make it difficult for the workers to walk (Harmon, 2017). Besides, the steel toe cap also causes the shoes to become heavy and some steel toe cap become rusty and over time caused the feet to be infected with cuts. Safety shoes also do not have an aeration that makes workers feel uncomfortable when their foot are sweating (Marr SJ, Quine S., 2016). Foot sweat also occurs because of the hot humid environment that not suitable for our climate (Foot Comfort and Safety at Work : OSH Answers, 2015).

The inflexibility and the hard surface of the footwear of safety shoes are known to cause workers to experience difficulties in moving and running if there are emergency cases at their work places. Long period of standing also makes the worker feel uneasy to wear safety shoes for a long time (Harmon, 2017). It is a normal for people to have a different type of skin, but some of people may have an allergic to a certain fabric. So, from the issues related to the safety shoes worn by workers, it is important to study on more suitable safety shoes.

There are large number of fall injuries in construction work that have been reported (Slips Trips Falls, 2015). Most workers lack awareness when completing their work because they have to concentrate on their work rather than be concerned about the hazard of their job.

Hence, safety shoes with an ergonomic features coupled with smart sensor to detect danger is the kind of safety shoes for construction workers

METHODS

A critical review on readily available safety shoes in the market is used to identify the problems related with construction safety issues among the workers. To proceed with second stage, the factors and solution regarding about safety shoes in construction industries will be identified. “Smart Safety Shoes” does not only focus on how the innovation for the shoes but it also considers the ways to persuade workers to wear safety shoes. Nowadays, the safety shoes only have limited design characteristics that are not suitable for all skin types (Oldhand, 2017). With this smart safety shoes features, the number of injuries and accident among the construction workers will definitely be reduced.

RESULT AND DISCUSSION

It is important to study on more suitable safety shoes as the safety of all workers is very crucial. An additional device needs to be incorporated into the design of these shoes to make them smart. Therefore, it should not only be designed to be user friendly and comfortable but also smart enough to detect imminent danger. Table 1 shows the comparison between conventional safety shoes and the features for the smart shoes.

Tabulated data in figure 1 (GuardRite Low Price Working Protective Black Hammer Safety Shoes T-2089, n.d.) (Acid resistant safety boots, soft sole safety boots, steel toe safety boots, n.d.)

Table 1: Comparison of conventional safety shoes and new smart safety shoes

Features	Conventional Safety Shoes	New Smart Safety Shoes (SMARTES)
Material	Upper: Cow/ PU leather Inside: Airing mesh soles : PU injection Sole / Rubber / PVC	Upper: Fur skin leather Inside: Breathable mesh Soles: Rubber cast bottom Toe: Anti-smashing Metal head Midsoles: Thickening anti-piercing steel
Interior	<ul style="list-style-type: none"> ▪ Steel Toe cap above 200J ▪ Steel midsole anti-perforation 	<ul style="list-style-type: none"> ▪ Light steel toe ▪ Breathable Cushioning ▪ 3mm thickness midsole ▪ Steel midsole anti-perforation
Exterior	<ul style="list-style-type: none"> ▪ Water proof ▪ Anti-abrasion 	<ul style="list-style-type: none"> ▪ anti-puncture resistant 1100N ▪ non slip rubber sole ▪ reflective stripes ▪ anti-chemical sole
Sensor	-	<ul style="list-style-type: none"> ▪ RFID sensor ▪ Alarm sensor
Service Life	<ul style="list-style-type: none"> ▪ 2 Years 	<ul style="list-style-type: none"> ▪ 4 Years

CONCLUSION

As a conclusion, a safety issue on construction sites needs to be taken seriously. A pair of smart safety shoes can deter unnecessary accidents. The combination of safety procedure with the latest technology can benefit all construction workers. A safer construction sites will generate not only more income to the companies but also a sense of relief to the workers. Our recommendation is that these safety shoes need to be upgraded to achieve a good safety standard and they should also be comfortable to the wearers.

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