THE INCREASED IMPORTANCE OF WEARABLE TECHNOLOGIES IN CONSTRUCTION

GOCONTRACTOR

Introduction

Wearable devices are becoming more popular in our world where the Internet of Things (IoT) is embedded everywhere in our lives. While wearables such as smartwatches and fitness trackers are common accessories used by the general public, wearable technologies are now becoming more popular in the industrial workplace environment.

In the construction industry, a safe working environment is essential and can be improved using wearables, preventing an injury from recurring or even happening in the first place. An increase in productivity is another benefit and could save a lot of money in the long-term. Being more prone to injury and only working on certain projects for a short amount time, wearable technologies are especially important for contractors to incorporate into their work routine.

Importance of Wearable Technologies for Contractors

According to the US Bureau of Labor Statistics, 40% of annual injuries occur within the first year of employment. Contractors are more prone to injury for a number of reasons:

- Safety orientation or training is no longer required before temporary work begins.
- Not in contact with or aware of the responsibility of other workers on-site, e.g. who to contact in the event of an emergency.
- Unaware of the complete layout of the site and where accidents are most likely to happen.

Some contractors may feel as if they are starting from scratch on each new project, with customized building codes being used on most of them. Important benefits of wearable technologies include real-time communication with more experienced workers, on-site for longer.

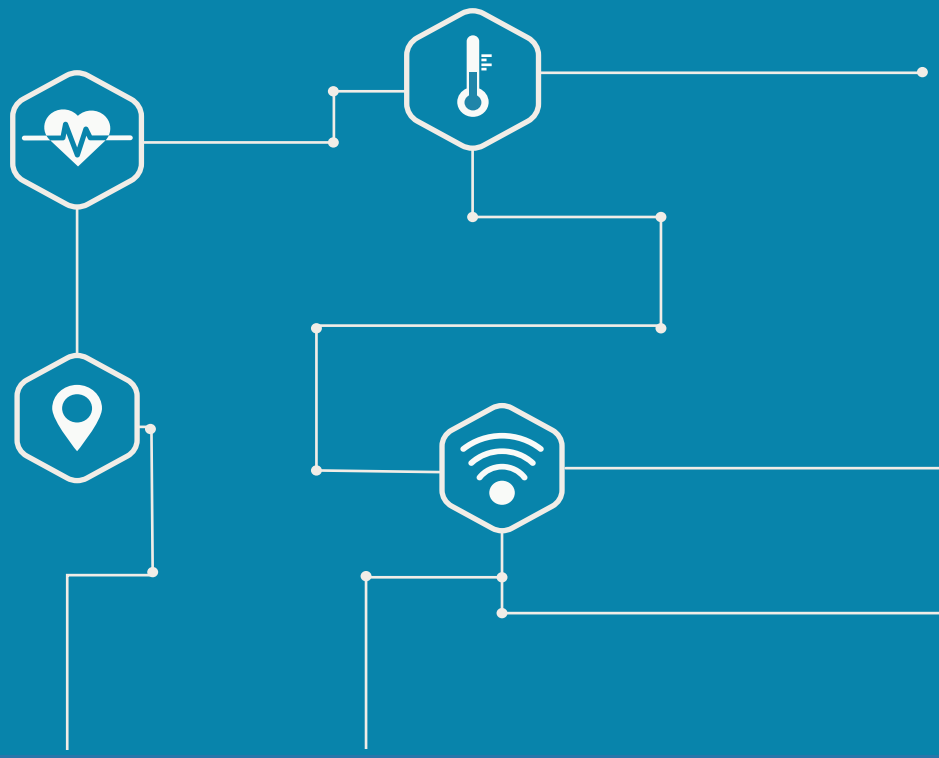
Benefits of the Most Popular Wearable Technologies

Increasing productivity and improving safety standards are the most important benefits of introducing wearable technologies into the construction industry. These benefits can be obtained in a number of ways:

Real-Time Data

Having access to real-time data the moment something happens is an important advantage of using wearable technology. Often attached to vests and hats, sensors are able to track:

- Heart rate
- Location
- Body Temperature
- Movement (perhaps an odd lack of)



If movement has quickly stopped in an open area where work wouldn't usually take place, then this location can be pinpointed and inspected straight away. One of the construction industry's top wearable technologies with this function is the Redpoint Positioning Badges and Tags.

Redpoint Positioning Badges and Tags: Containing a Global Positioning System (GPS), construction workers wearing these small, robust badges and tags can be detected from any location and tracked using a mobile app. The constant monitoring of stress levels, heart rate and body temperature can also indicate whether they are feeling faint or overheated.

If the worker notices any problems such as faintness or exhaustion, they can press an attached emergency button, immediately alerting anyone that they are connected to. This could prevent an accident such as fainting or heat stroke, (common in hot countries such as Australia), warning someone of the signs straight away.

Sensors can also warn workers of external environmental risks such as toxic gases or high temperature. Certain areas can be pre-designated as dangerous, with a warning audio system automatically ringing loudly and flashing LED lights to alert them straight away.

Images: Redpoint Positioning™

Real-Time Communication

The Occupational Safety and Health Administration (OSHA) has found the lack of available communication systems, warning workers of any surrounding hazards, to be the second most common violation in the construction industry resulting in accidents.

As each construction project takes place in a unique location, work can often be managed through a central office. Although this could be on the other side of the country, real-time communication is still possible using wearable technology.

Real-time advice is now available for less experienced workers, letting them perform a job they might not be completely skilled to carry out. This could be done using smart glasses or hardhats such as the DAQRI smart helmet or XOEye Smart Glasses.

Images: DAQRI TM

XOEye Smart Glasses: These glasses include a video camera, passing real-time information to professionals off-site, who can reply to a worker immediately. Providing less skilled workers with constant advice allows them to carry out jobs which they couldn't have finished alone.

Mistakes are less likely as real-time advice from more experienced workers is available, saving vital time and money in project costs.

With the same durability as an ordinary hard hat, the DAQRI Smart Helmet is another wearable allowing workers to communicate with each other in real-time. Information can also be stored in the smart helmet, with details such as safety guidelines and work instructions displayed across the worker's eyes. The job they're working on can be carried out from beginning to end, with instructions included along the way.

Also collecting real-time data, important safety features include a 360° wireless camera built into the helmet and thermal vision. The temperature of an object or surface can be determined through sensors in the helmet. With USB ports built-in, flashlights or gas detectors can be attached to the helmet.

Currently costing $15,000 (April 2017), using a piece of technology such as the DAQRI smart helmet might be seen as a risk and/or a high investment at the time, but these forms of wearable technology can save a lot of money in the long-term.

Long-Term Investment

Tracking any unnecessary work that could be making the job longer is something that could save a lot of money in the long-term. For example, hours of work could be lost if each person takes an extra five minutes walking to the bathroom using a long route, when a faster one is closed off. This would be easy to notice if any wearables including a Global Positioning System (GPS) were available to use or even tested on a single worker.

According to Rackspace Inc. Cloud Computing Company, Texas, wearables in the construction industry that focus on improving speed,can increase the level of productivity by 8.5% over time. Real-time communication means that information can be passed on immediately, whether requesting advice to finish a job correctly before making a mistake, or informing other workers of an accident.

This increase in productivity and an improvement in safety standards are the two most important benefits of introducing wearable technology. Smart helmets, vests and glasses are the most popular styles but some others include smart insoles, boots and even complete exoskeleton suits.

Other Interesting Wearable Technologies

Some of the construction industry's other wearable technologies for 2017 include:

Bionic Exoskeleton Suits: These suits can provide the wearer with more strength to carry heavy objects, protecting them from muscle strain. They can be harder to incorporate into a workplace than smart vests and hardhats that are already worn.

SolePower System: These removable insoles include a self-charging battery pack that is charged up by walking. Containing different sensors for temperature detection, they can also track location and motion. SolePower boots, already containing the SolePower System insoles, are more recently available.

Spot-R: These small sensors are attached to the belts of on-site workers and use a safety incident monitor to indicate any slips, trips and falls. If workers are in a dangerous situation or notice any safety concerns, they can also press a button to inform anyone connected.

Smartwatch: The two-way alarm on this watch allows the wearer to warn someone, or to be warned of a dangerous

situation, by pressing the button attached. Sensors can also monitor and warn workers of health and environmental risks such as a fast heartbeat or toxic gases.

Caterpillar: To prevent accidents involving heavy machinery and workers, Caterpillar Inc., Illinois has created a beacon that fit inside the hard hat of construction workers on-site. Receivers are also set inside the cab of a machine or vehicle, warning drivers with an alarm if any workers are dangerously close.

These wearable technologies can be a huge benefit to certain companies, preventing safety issues that might have always been a problem. Implementing a modern piece of technology into the workplace can help improve safety but it is still important to research any problems that might occur as a result.

Problems and Their Prevention

"While we are all using iPhones, construction is still in the Walkman phase. Many building professionals use hand-drawn plans riddled with errors. A builder of concrete-framed towers from the 1960s would find little has changed on building sites today, except for better safety standards." (Dutch architect Ben van Berkel).

Before wearables are chosen and purchased, it is important to consider any risks involved by asking manufacturers what could go wrong.

These risks could include:

Cyber-Security

The number of wearable devices connected to the company's network now make it easier for cyber thieves to hack into confidential financial or customer information.

Large and small businesses must be aware of the most up-to-date and effective security policies for wearable technology. For example, encryption is critical, every time confidential information is transmitted from wearables to other sources of data. It is important for all workers to understand:

- What information is the most important to secure
- How it could be hacked
- Suitable methods of protection
- How to recognize any problems that might indicate cyber hacking
- How to deal with and who to contact about these problems

Costs

It is still very hard to get construction companies to invest in wearable technology. It could generate long-term financial success, but might cost a lot in the beginning. Most companies are willing to remain using traditional methods of safety prevention until these high costs drop.

In 2016, COLLOQUY surveyed 1060 American workers and 63% still saw wearable technology as too expensive. Connected to other sources, separate smart devices such as smartphones and tablets usually need to be purchased as well.

Privacy

Many workers have rejected the use of wearable technologies due to its potential invasion of privacy. Danny Beaver, co-founder of CEO of HalenHardy, a firm in Pennsylvania inventing safety tools for outdoor industries, states:

Anybody who really gravitates to that type of work has a bit of an independent spirit... unless you present it to them in a way that can really show them their job is going to be easier, I think there may be some pushback on the 'Big Brother is Watching You' thing.

Let all workers know how wearables can prevent accidents and make their own job easier. For example, explain how a high body temperature could be detected using their new smart vest. This would probably prevent an accident like heat stroke, but if they did pass out other workers would be able to find them immediately.

Impracticality

Impracticality has been a problem with wearable devices. Some might not run for a long time after charging, or have to stay plugged-in altogether. Safety vests, glasses and hardhats are common wearables, already necessary to use on construction sites. Most wearables are now being created using a normal style, but some frontloaded devices such as smart hats and glasses can feel a lot heavier at the front. It is important that all workers know how these devices should be worn before they start to use them on-site.

Aging Workforce

A large proportion of workers in the construction industry are 'baby boomers', who were born between 1946 and 1964. It is important to present any new device as an advantage to workers of all ages, rather than specifically aimed at older workers. Otherwise, they could see this as a way of exposing their dependence on others.

Using Data Constructively

Employers are sometimes not, but should always be aware of the data they want to discover and which wearable technologies can make this a lot easier. For example, the approximate amount and the type of physical work performed, before body temperature and/or heart rate rise to an unsafe level.

This confirms that any chosen wearables for this job must have the function of measuring body temperature and heart rate. These requirements should all be settled before any smart hats or vests are even considered.

What to Consider Before Wearable Technology is Chosen

When it comes to investing in and implementing a wearables program, it is first important to identify the main goals of this program. Important goals could include:

- Collecting worker data on a regular activity such as, the time spent bending over at the waist to pick up objects; or the amount of force used to grip an object, comparing this with the safe limit which has been decided upon.

- Collecting data to make positive changes in organizational behavior, maybe making a job faster to carry out. This could be a simple change like keeping a doorway open so workers can travel using a quicker route.

- Changing individual behavior can be the most difficult goal to incorporate into the workplace by using wearable technology. If an individual is used to performing their job in a certain way, they might not appreciate being told that they're not strong enough to carry the weight they usually do. It is important to let them know how it has helped others, maybe reducing the risk of musculoskeletal disorder over time.

Looking at the different forms of available wearable technology, it is important to find out:

- Does it meet all these needs? E.g. monitoring constant temperature and heartbeat level.

- Will it be difficult to implement into constantly changing construction sites?

- Will it be reliable for your business? E.g. the strength of a common hardhat

- Does it affect any PPE that is already used? E.g. wearing smart glasses under a hardhat.

When a form of technology has been chosen to meet all the relevant requirements, it can still be difficult to implement it into the regular work routine.

Implementing Wearable Technology into the Workplace

Wearable technology should still be tested out on a small group of workers, who are already interested in trying out this product for the first time. It is important to tell them the positive outcomes you are looking for, using comfortable technology and asking for continuous feedback on their experience.

Laura Kassovic, founder of Mbientla, provider of safety wristbands for construction workers states:

You can't expect construction workers to change routine in order to adopt technology.

The possible safety and/or productive benefits should be explained to everyone who will be wearing it, letting them

know how it can be incorporated into their daily job without disrupting their usual work pattern.

North Star BlueScope Steel is a company that has implemented wearable technology into the workplace with successful results.

Case Study: North Star BlueScope Steel Incorporates Watson Wearable Devices for Worker Safety

Based in Delta, Ohio; NorthStar BlueScope Steel is a global steel producer for building and construction industries. In 2016, they introduced IBM Employee Wellness and Safety System, a research project collecting and analyzing data from sensors attached to Watson Internet of Things (IOT) wearables. These sensors were attached to wristbands and helmets, monitoring heart rate, body temperature and level of activity. They were connected with other sensors, detecting environmental factors such as toxic gases, high temperatures, humidity and loud noise.

Workers could then be provided with instructions if a sensor detected any warnings, such as an increase in body temperature. They might be told to take a 10-minute break, allowing their temperature to return to normal and preventing a serious reaction such as heat stroke.

Malcom Edge, I.T. Director at NorthStar stated:

“We have observed an increased awareness of heat stress and exertion in our trial users... showcasing how data can flow from the user to the IBM Watson IoT Platform and back to a supervisor for intervention. This solution, once fully developed, will provide a solid foundation for increasing worker safety by providing real time monitoring of the environment around the worker.”

The introduction of wearable technology is becoming more popular in similar companies, usually beginning with a trial period.

Conclusion

By 2018, 250 million smart wearables are predicted to be in use globally, with shipments rising to 501 million in 2021. The cost of introducing a piece of technology such as the DAQRI smart helmet could seem like a high investment at the time but, according to Matt Kammerait, VP of Innovation for DAQRI:

Having a smart helmet like DAQRI is a good return on investment when it catches something. In the industries that DAQRI sells to, like oil and gas, the cost of error is really high.

Although workers should be aware of the safety and productivity benefits involved, it is most important to understand what could go wrong if an unfamiliar form of wearable technology is introduced.

These problems are less likely to occur if companies include proper training on how to correctly use wearable technology in their worker orientations. Companies should also decide on their main goals and any real-time data or form of communication that needs to be available. Some of these goals might only be achieved in the long-term, but something as simple as keeping a door open so workers can use a shorter route could save hours over the length of time spent on-site.