



Wearables: Are They Fit for the Workplace?

Thanks to the increasing miniaturization of components, a decline in sensor and chip prices, longer battery life, improvements in communication and lower connectivity costs, wearables are on the brink of mainstream adoption.

Executive Summary

It is predicted that by 2017, 30% of smart wearables will be inconspicuous to the eye.¹

Wearable devices are not new, and include far more than just smart glasses or smart watches. In fact, they date back to the 1960s, when Bell helicopter experimented with head-mounted displays coupled with an infrared camera - providing military helicopter pilots with the ability to land at night in rough terrain.²

In the 1990s, Boeing took a major step - using heads-up displays to ensure that pilots did not have to look down to see critical dashboard information mid-flight. Boeing later used wearables to provide instructions to wire-assembly engineers, eliminating the need for paper manuals.

Today, wearables have officially arrived. Fitness-monitoring devices such as Jawbone and Fitbit, for example, have quickly become huge hits in the consumer wearables market - accelerating the adoption of these systems.

As components become smaller and cheaper and communications and connectivity continue to improve, wearables are poised to penetrate the workplace.

Breaking Through the Workplace: Easier Said than Done

Most workplaces, including many industrial environments, are well suited for wearables - primarily because they have been shown to enhance employee productivity and satisfaction. According to Human Cloud at Work (HCAW), "Experts from Goldsmiths, University of London, have found that wearable tech in the workplace increases productivity by as much as 8.5%. Further, findings show that wearing wearable technologies increases employee satisfaction by 3.5%."³

The adoption of wearables in the workplace is expected to be fuelled by two factors: First, workers in the field or standing at a machine are arguably more in need of real-time data than a person exercising in a gym or working in a traditional office setting. Secondly, wearables workplace applications provide a far superior ROI than those designed for the consumer market. This is evidenced by a successful pilot conducted by DHL Netherlands. Vuzix Smart Glasses and augmented reality software improved efficiency by 25% during the picking process, reduced errors and enabled hands-free operations.⁴

Real-time data and insight fed to an operator precisely when they need it can significantly improve productivity and efficiency. Wearables that are best suited for industrial applications, including Google Glass, Vuzix and Epson augmented reality (AR) smart glasses, enable engineers and technicians to access information from mobile devices and the cloud, and

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perform hands-free operations in the field. When these products' AR capabilities are combined with MTConnect and other industrial data-exchange protocols, machine monitoring and management information can be available at a glance, in realtime.⁵

Yet in spite of their advantages, wearables face some very basic challenges. In this white paper, we will examine the valid concerns of many companies, and cite business cases where wearables fit into the industrial workplace. We will also provide a blueprint for introducing wearables into work environments.

Distracted Employees, Usability and Privacy

How safe is it for employees to walk around with something in their line of sight, especially in hazardous environments such as an oil rig? A University of Central Florida study revealed that wearing a hands-free headset can result in the same mental delays as using a phone.⁶

There is also the matter of usability. For example, devices such as augmented reality glasses and smart watches require users to interact with them via capacitive touch and speech commands. This is acceptable if the working conditions do not require technicians to wear protective gloves and the environment is relatively quiet. However, if field engineers perform their jobs in a hazardous, inherently noisy workspace such as an oil rig or factory, voice controls would not be effective.

Finally, there is the question of privacy. Organizations are reluctant when it comes to allowing employees to move around their work environment wearing augmented reality glasses and recording everything they see without necessary security controls in place. And employees

certainly don't want their managers watching their every move throughout the work day.

So do the advantages of wearables in the workplace outweigh these issues? Are these concerns merely due to misconceptions? Are issues like making the wrong choice, choosing the wrong design, or using wearables for the wrong purpose preventing their widespread adoption in work environments?

For wearables to function well in workplaces, they must be viewed as non-intrusive, performance-boosting accessories that simplify, rather than complicate, workers' tasks so they can focus on their primary jobs. They should repurpose or enhance a device/technology that workers are used to - such as safety glasses, gloves, etc., - rather than force them to accommodate new, unfamiliar or awkward equipment.

Wearables Done Right

Enterprise-level wearables must be simpler to use and more practical than typical consumer products - with the functionality workers need, and without distracting them from their main job.

Workers already wear safety glasses on the floor or in the office. These devices can be enhanced with high-tech features that support:

- Assistance with executing tasks through a checklist of activities.
- Audio and video collaboration with subject-matter experts.
- Automation of simple, discrete tasks such as barcode-scanning in a warehouse.
- Workflow automation, such as identifying defective parts, feeding updated inventory into the ERP system, etc.

Similarly, a non-intrusive smart watch can provide factory workers with real-time updates of manufacturing activity and notifications across noisy shop floors. Haptic (touch) feedback from a smart watch, for example, helps ensure that a machine operator does not miss an announcement - even in a loud environment.

The list of practical applications for wearables is seemingly endless, and need not be limited to glasses and watches. Take the "smart glove" for instance, which changes color to alert engineers when they are in a toxic zone.

Quick Take

Wearables in the Workplace

Below are examples of how we have helped companies study and embrace wearables to improve the productivity and efficiency of their day-to-day operations.

Enhancing Asset Transfer Management for Forklift Operators

The Challenge

- Forklift operators have manual / printed instructions for transferring assets from one part of the warehouse to another to make space and perform other related tasks.
- Asset-transfer operations involve forklift operators scanning the barcode on the assets to be moved, taking them to the required destination shelf, and again scanning the assets and shelf locations designated with a barcode.
- This process was inefficient - necessitating manual data capture and requiring forklift operators to frequently get off and on the forklift for barcode scanning.

The Solution

- Forklift operators equipped with wearable devices powered by Google Glass can view asset transfer instructions on the wearable's heads-up display.
- Operators can scan barcodes on assets and shelves without having to leave the forklift, resulting in more efficient operations and less effort.
- They can update the asset-transfer information using the wearable app; the information is made available in real time to the warehouse operations manager.

Improving Insurance Claims Adjustment

The Challenge

- When a home or commercial property insurance customer files a claim, the claims adjuster visits the claim site to collect infor-



mation and take pictures, armed with many gadgets to complete the task.

- The information collected, including pictures, is tagged with appropriate metadata, and then uploaded into the enterprise system. This is done from the main office.
- If a specialist is required, another trip to the claim site, with experts from the company included, must be made.

The Solution

- We undertook a current state assessment exercise to understand “a day in the life of a claims adjuster” to identify appropriate use cases for wearables. We then designed and developed an app on Glass to help improve operations for claims adjusters in the field.
- With this wearables solution, claims adjusters can manage their claims list for the day, and use Glass while surveying a property and capturing images and notes.
- In addition, the adjuster can initiate live streaming with a remote specialist for collaborative assessment of damages, and sync survey data to the backend enterprise system in real time.

Expected Benefits

- Reduce the time and effort involved in gathering data for claims adjusters.
- Provide easy access to remote experts.

Elevating Insurance Risk Inspection and Safety Management

The Challenge

- Safety management specialists (SMSs) must carry paper notepads and multiple devices like cameras, mobile phones, laptops, mobile hotspots, voice recording devices and GPS systems to conduct risk inspections at customer sites.

- To record their observations, they either take notes on their notepad (which are later converted to text through manual typing), or use a voice-recording device in the field - applying speech-recognition software at a later time.
- Photos taken by digital cameras during the risk assessment are later transferred to laptops/desktops, where they are named and filed by the SMS.
- Occasionally, assistance is provided to the SMS through joint visits and "ride-alongs" with a more knowledgeable peer, or via voice calls.
- Combined, these factors caused long turnaround times for risk assessments, since SMSs must rely on their memory and handwritten notes while preparing reports.
- With a risk-assessment application installed on Google Glass, SMSs will only need to carry their notepad, Google Glass and a mobile phone while onsite.
- With both hands free, they can carry out the visit, even in difficult situations.
- While the visit and information is "fresh," data on overall / LoB risks can easily be captured using voice dictation - resulting in a risk assessment with more detail, less effort, and finished in time to complete the report.
- Photos and videos can be taken and filed easily using voice commands.

The Solution

- To address the above challenges, we developed an application built on Google Glass.
- **Expected Benefits**
- Improved quality and more detailed risk-assessment reports.
- Better turnaround time for risk assessment.

These examples show how wearables can help improve productivity, safety and responsiveness in the workplace. At the same time, most enterprises have yet to realize the possibilities and capabilities of wearable technologies, including their invaluable ability to automate business processes and monitor a wide range of workplace scenarios. There is also the huge benefit of increased workforce productivity that wearables make possible. For example:

- Wearable adoption by DHL helped improve the courier's operational efficiency in the order-picking process by 25%.
- British grocery chain Tesco equipped its workers with armbands to automatically track transported goods along nearly 90 aisles of shelves.⁷ The armbands eliminate the need for workers to mark clipboards or provide managers with an estimated completion time,

since they can check for correct order fulfillment, among other things. This helped reduce the effort required to run a 40,000-square-foot store by 18%.⁸

There are business cases where wearables can be applied to improve operational efficiencies, save billions of dollars within specific industries and for certain types of workers and, above all, make the workplace safer and more secure.

The value of wearable technologies in the workplace is greatest when they are introduced in business processes to:

- **Improve worker safety:** An engineer working with high-tension utility cables can access information on a heads-up display, rather than on a mobile device that must be pulled out of his kit - permitting safe, hands-free operations.

- **Enhance operational efficiency:** A forklift operator can access routing information to navigate through a warehouse without having to scan the barcodes on pallets and other packages.
- **Enable access to information in hazardous environments:** For example, working on a windmill, where carrying a device can otherwise be difficult and dangerous.

Common enterprise and industrial applications that are ripe for wearables include:

- Processes that require workers to use both hands.
- High-precision processes.
- Physically and/or psychologically tiring jobs.
- Hazardous material detection.
- Real-time data collection of equipment performance and transmission.
- Identity recognition.
- Digital user manuals.
- Tracking solutions.
- Customer service (travel information is readily available to help airline employees provide personalized service, for example).
- Remote control of autonomous equipment (a worker is notified of equipment abnormalities via his smart watch, and can analyze, as well as shut down, the operation remotely).

When applied correctly, wearables can:

- **Boost employee efficiency** by providing real-time data access and freeing workers' hands to hold tools or equipment.
- **Enable a powerful new level of collaboration;** for example, by connecting field workers with more experienced colleagues who can then visualize exactly what the field worker is seeing.
- **Facilitate decision making** by compressing the time between intention and action to literally seconds.

Key Considerations

Before moving forward, enterprises need to recognize the trade-offs that come with wearables and develop strategies to address them. The primary goal of wearables is to allow users to take real-time actions by providing them with relevant, contextual information precisely at the point of decision making. As discussed earlier, wearables shine in situations where more traditional technologies, such as smartphones and laptop computers, cannot be used or are not a good fit.

Design

When evaluating wearables, there are several key design elements companies must consider:

- **Augmented single-display design with a translucent LCD** that sits in front of the wearer's left eye. Devices such as Google Glass and Vuzix M100 are, in our view, best suited for glanceable views and real-time collaboration.
- **Immersive displays**, such as Daqri helmets and Epson Moverio, provide true augmented reality, and are ideal for effecting business-process improvements.
- **Virtual reality devices** like Oculus Rift are a good fit for worker-training programs and simulated activities.
- **Augmented and virtual reality displays** are a new breed of devices; Microsoft HoloLens is one of the first - offering the best of both capabilities.
- **Wrist-worn smart watches** can provide safety alerts and non-intrusive notifications via haptic feedback.
- **Other on-body devices** such as gloves, clothing, jewelry, shoes, etc., or even those tattooed to the skin, must also be considered.

Input vs. Output

Different types of wearables must be assessed in the right context. For example, fitness bands or heart rate monitors merely collect raw data, filter it, and send it to a central hub.

- **Efficient energy usage** is a key consideration for connectivity, processing, etc. For output wearables such as smart glasses or watches,

priority must be given to enabling quick and easy access to real-time information – a subset of tasks performed on mobile devices.

- **Screen real estate** is another important factor for output devices. Some tasks are better suited for desktops with large screens; others are more applicable to wearables, whose tiny screens provide instant notifications, contextual information and unmatched portability.

Data and Device Management

When smartphones became mainstream, IT services organizations moved quickly to deal with not just the number of devices and the variety of operating systems available, but also with the vast amount of data they generated and consumed.

With wearables, this challenge is going to grow exponentially – especially when dealing with audio and video data generated by devices like smart glasses.

Also, consider how these new devices will be serviced and managed in the field. Businesses will need to expand wireless networks to ensure Wi-Fi / 3G / 4G connectivity for remote workers.

Business Process Modifications

Another key factor when adopting wearables is how the business should rethink and optimize its business processes with these technologies without being constrained by traditional business conventions.

For example, workers equipped with a wearable device can be visually instructed as to where they need to be in a warehouse to pick up a part. After the part is retrieved, it is automatically subtracted from a centralized inventory database. If the wrong part is picked, workers receive real-time notification of the error.

Security

Major considerations here include:

- **Device security:** Wearable devices must run operating systems and applications securely; this requires support for multiple environments. The issue is further complicated by a lack of secure communications standards and authentication mechanisms:
 - As is common with any emerging technology, wearables do not have a standard enterprise

platform for communication, device management and security.

- Cloud-based platforms for the Internet of Things (IoT) are emerging from industry leaders such as Microsoft and Amazon to manage sensors and other edge devices. However, these systems do not sufficiently address security requirements for wearables that run their own operating systems, such as Android and iOS.

- **Link security:** The transmission of information between wearables and a central hub must be protected and encrypted with transport layer security (TLS).
- **Cloud security:** Storing personal information is another delicate area; consumers want to know that their private data is protected from unwanted intruders.

Privacy

If businesses are going to embrace wearable technologies (and many would argue that it is only a matter of time until they are forced to), they will have to develop clear policies for determining who is allowed to bring the equipment into the workplace and connect to the network.

It's important that employees perceive wearables as a tool that will help them perform more effectively on the job. At the same time, new technology tends to breed concerns about privacy, and wearables are no

exception. For example, Tesco's use of employee armbands to improve operational efficiency led to numerous complaints by workers about the company using the information generated by these devices to monitor their activities, breaks, etc.⁹

These kind of apprehensions must be managed, even though wearables are likely to be more readily accepted in the workplace.

The key to mitigating privacy concerns while implementing wearable solutions is to bring employees onboard early in the process, and instill a sense of trust by being fully transparent.

Before moving forward, enterprises need to recognize the trade-offs that come with wearables, and develop strategies to address them.

Quick Take

An Industry Perspective

The following offers an industry view of top use cases for wearables.

Cross-Vertical

- **Smart field service:** Engineers and technicians can use smart glass and smart watch apps to view job details when in the field; view video tutorials; call or stream live to off-field specialists; scan QR/barcodes for inventory updates; and use augmented reality (AR) for intuitive “get help” guidance.
- **Smart inspection:** Workflow-based inspection checklists ensure that no step is missed when completing an inspection, and that a record is maintained at every stage. Simple apps on smart watches can facilitate easy access in nearly all environments.
- **Smart customer support:** Customer support specialists can view customer profiles, past buy/preference patterns and insights on cross-sell opportunities while serving the customer face-to-face.

Banking, Financial Services and Insurance

- **Smart claims adjuster:** Surveying a property or vehicle for damages typically requires climbing ladders and crouching into small spaces. A wearable provides a hands-free, voice-assisted means for claims adjusters to conduct surveys more efficiently.
- **Safety management:** Specialists can perform accurate on-site risk assessments by collaborating with a remote team through live streaming – all while recording their observations using a wearable app.
- **Smart property inspection:** This becomes a guided, error-free job using a checklist-driven app that allows for photo and audio notes to be taken in the field and saved immediately to an enterprise system.

Manufacturing and Logistics; Energy and Utilities

- **Smart service:** (See cross-vertical use cases, above).

- **Digital showroom:** Automotive sales staff equipped with wearables can seize a sales opportunity by streaming live vehicle views to a remote customer who is unable to visit the showroom. Wearable apps combined with augmented reality can allow sales staff to showcase various accessories and other custom options to the customer – even if the accessories are not actually in the showroom.
- **Field engineering:** Engineers who work in and around hazardous environments, such as oil rigs, wind turbines, mine sites and high-tension utility equipment, need real-time information as well as hands-free operation to carry out their tasks. Wearables can deliver these advantages – helping workers complete their jobs faster and with less risk.
- **Secure package delivery and pickup:** Wearables permit delivery staff to deliver packages securely using facial biometrics, perform volumetric analysis of the package during pick-up, and provide dynamic pricing options, for example.

Retail

- **Smart customer support:** (See cross-vertical use-cases above).
- **AR-based equipment:** Installation/repair/maintenance with 3-D content-enabling allows engineer facilities to perform these tasks.
- **Smart warehouse operations:** Forklift operators and other warehouse staff equipped with wearables can efficiently carry out day-to-day activities, such as inventory management, order updates, navigation within the warehouse, etc.

Healthcare

- **Caregivers and other hospital staff:** Using wearables, healthcare professionals can collect patient information on these devices at the right moment, while providing services to patients. Current vitals, past history and related information can also be made available on the wearables.

Moving Forward

Accordingly to a recent survey by Robert Half Technology, 81% of 2400 CIOs surveyed believe

wearables will perform in the workplace; however, their time estimates vary.¹⁰

The key to mitigating privacy concerns while implementing wearable solutions is to bring employees onboard early in the process and instill a sense of trust by being fully transparent.

Regardless of your organization's wearables objective, it will never be fulfilled without a well-crafted plan that includes IT deployment, business process change and,

most importantly, change management. Engaging the workforce is essential.

Key Questions to Ask

- What persistent problems would wearables solve?
- What opportunities could be created?

Likewise, ask employees to share their concerns about these devices and develop plans to address them. To get started, we suggest the following four-step approach:

Rethink

- Reconsider business processes. How will your business's effectiveness improve if workers have the information they need at the moment they need it.

Pilot

- Pilot and evaluate various wearable devices and platforms.

- Partner with wearables manufacturers, as well as software solution and service providers.
- Identify early adopters within the organization.

Redesign

- Choose the right wearable.
- Design wearable apps from the ground up; do not miniaturize the smartphone app.
- Be time-sensitive; design apps that provide contextual and timely information.

Adopt and Engage

- Interact with the workforce.
- Identify and alleviate employee concerns by instilling trust in the process change.
- Focus on employee education and use cases with clear benefits for business and the workforce.

Enterprises that are ready to shed traditional thinking and work through misconceptions, as well as rethink and redesign their business processes to support workers with digital and just-in-time contextual information, can increase worker efficiency and productivity while making the workplace safer and more secure. These businesses will not only establish themselves as modern organizations that attract the best and brightest workers, but will also get a jumpstart on fulfilling the immense potential of wearables.

Footnotes

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