

## WHITE PAPER

# Enterprise Wearable Technology Case Studies

40 Profiles of Wearable Applications in Automotive, Construction, Corporate Wellness and Insurance, Field Services, Medical and Healthcare, Hospitality, Logistics, Manufacturing, Mining, Oil and Gas, and Retail

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## SECTION 1

### INTRODUCTION

The enterprise applications for wearable technology have only scratched the surface in terms of applicability and use cases. Wearable technologies have touched almost every enterprise vertical market, including automotive, manufacturing, healthcare and medical, logistics, field services, retail, construction, and many more. Although the enterprise wearables market is smaller than the consumer market, the variety, breadth, and scope of how wearable technology can bring speed, efficiency, lower costs, and improved workflows for businesses suggests that a tremendous growth opportunity exists. The companies that are using wearable technology range from large hospitals to small clinics and from top-tier Fortune 500 companies to small- and medium-sized businesses that are trying to experiment with a brand new computing platform in wearables and find their own efficiencies. The wearable devices also range from fitness trackers and smart augmented reality (AR) glasses to voice-controlled headsets and wearable cameras, as well as sensors on the body that track movement or monitor air quality.

Within this white paper, Tractica aims to present a diverse range of case studies for enterprise wearables, segmented by vertical market, that gives a flavor for the level of enterprise wearable activity that is currently taking place and the opportunities that it is creating for the future. Overall, Tractica sees the market for enterprise wearable devices, which includes industrial and healthcare wearables, as growing from \$21 million in 2013 to \$9.2 billion by 2020, representing a compound annual growth rate (CAGR) of 138%.

## SECTION 2

### CASE STUDIES

#### 2.1 AUTOMOTIVE

##### 2.1.1 GENERAL MOTORS

General Motors (GM) has been testing Google Glass at its Orion Assembly and Warren Technical Center in Detroit and has had more than 100 of its employees use the glasses, with around a dozen using the devices on the actual factory floor. The main goal for using Google Glass has been to enhance facility worker productivity and efficiency and has been used in tasks like quality inspection and procedural instruction for employee training and development.

##### 2.1.2 BMW

At its Spartanburg, South Carolina plant, BMW has piloted a Google Glass program that targets the pre-series vehicle inspection procedure. This is part of the Industry 4.0 campaign focused on the application of new technologies to support production and planning. Pre-series cars are production prototypes, which are manufactured in a production setting to test whether the car can be reliably and economically mass-produced in terms of the design. One of the issues facing the quality inspection engineers is difficulty in communicating the issues that have been spotted by the design teams. In 25% of the cases, BMW has noticed the communication between quality inspection engineers and designers to be a major issue, with the existing documentation from notes and photographs being inadequate.

A quality inspection engineer using Google Glass records what is being seen in 2-minute video bursts, which can be referenced at a later stage by the designers. The pilot program was a success, according to BMW, and the company plans exist to extend the system to the final assembly of series vehicles.

##### 2.1.3 VOLKSWAGEN

Volkswagen has piloted the use of Google Glass and Vuzix to replace barcode scanners at its Wolfsburg plant in Germany. Hands-free capabilities enable the warehouse worker to more efficiently locate and deliver the correct parts by simply scanning the quick response (QR) codes on a part and identify whether or not it is the correct part. If the worker does not select the appropriate part, the glasses beep and a warning notification shows up on the glasses. Volkswagen is expected to extend the pilot on a larger scale later in 2015.

#### 2.2 CONSTRUCTION

##### 2.2.1 BRIDGIT

Construction software company Bridgit has integrated Myo and Google Glass to create an innovative mashup wearable solution for the construction industry. Using the gesture recognition capabilities in the Myo armband and integrating them with Google Glass, construction inspectors can perform their tasks in a much more efficient manner. Noise is a big issue at construction sites, making it hard to give voice commands, and, many times, the personnel are wearing gloves, making it difficult to give touch-based gestures. Therefore, a Myo-like gesture armband is a perfect input device that can avoid the need to use voice or touch-based inputs.

Bridgit has a deficiency management mobile platform solution called Closeout, which allows construction managers to spot, flag, manage, and address construction issues. The Closeout solution is already in active commercial deployment. Bridgit has integrated the Myo+Google Glass solution into Closeout, enabling hands-free capability, with inspectors using hand gestures to capture images and flag them for the appropriate personnel. Personnel can also receive alerts on the Glass platform as and when the issue has been resolved, with an image of the resolution. The Myo armband enables completely hands-free control of the Google Glass, including navigating menus and taking pictures.

**Figure 2.1** *Gesture Control for Construction Worker Application*



(Source: Bridgit, Thalmic Labs)

### 2.2.2 LEE COMPANY

Lee Company is a Nashville, Tennessee-based building maintenance business that provides construction sites with experienced mechanics, engineers, electricians, and plumbers. One of its challenges is talent sourcing, as many skilled and trained workers are reaching retirement age, with fewer skilled personnel entering the workforce. This has become a major issue, with aging skilled workers unable to perform key tasks, such as climbing up on a roof where mechanical equipment is stored. Using a smart glasses solution, Lee has created a centralized command center that houses skilled technicians who guide younger workers at the site through a first-person view video feed through their smart glasses. XOEye Technologies provides the smart safety glasses that are equipped with a camera.

Lee has seen a massive benefit in using wearable technology with a faster resolution of issues and a much more optimized system of reporting back to clients once the job is finished, removing paperwork and delays. Lee has plans to equip 300 of its 800 staff with smart glasses.

### 2.2.3 ROGERS-O'BRIEN CONSTRUCTION

Todd Wynne is a Google Glass Explorer and an Operation Technology Specialist for Rogers-O'Brien Construction based in Texas. Wynne's job is to look into innovative technologies that can be applied to the field of construction. As a Google Glass Explorer, Wynne has been testing the use of Glass for various tasks within construction and his goal is to solve inefficiencies in the construction and building industry.

Wynne has used the technology to perform quality control, in-wall inspections, and impromptu meetings with first-person video feeds that help resolve issues faster and more efficiently. In one specific instance, Wynne was able to shorten a process that normally took 2 weeks to only a matter of minutes. While doing an inspection with a project engineer at one of his sites, they came across an issue on the roof that needed fixing. Rather than issuing a standard request for information (RFI) to the architect, Wynne used his Glass to set up a live videoconference to show what he was seeing and point out the exact issue. In a matter of minutes, they had a confirming RFI, which saved crucial time and costs.

## 2.3 CORPORATE WELLNESS AND INSURANCE

### 2.3.1 BRITISH PETROLEUM

British Petroleum (BP) is one of the largest employers in the world using wearables for corporate wellness. BP offers a free or discounted Fitbit device as a part of its BP Million Step Challenge that is included in its Employee Wellness program. One needs to be enrolled in the BP medical plan to be eligible for a Fitbit device. Employees can track their fitness using the Fitbit app or the StayWell portal where one can view progress toward the 1 million steps. According to 2014 estimates, BP had more than 25,000 people enrolled in the Million Step Challenge, with more than 14,000 people already having surpassed 1 million steps. BP also incentivizes its employees that are on the Million Step Challenge by offering lower insurance premiums. After reaching a million steps, employees are given 500 wellness points. By gaining 500 points from the million step challenge, employees meet half their quota of the 1,000 points required for lower premiums. BP has seen the wearable-driven corporate wellness program become a huge success, enabling a healthier and more productive workforce, and reducing its own insurance costs.

Other companies that are using fitness trackers as a part of their corporate wellness programs include Autodesk, eBay, Red Bull, and Qualcomm. Most of these companies, like BP, fund their own insurance programs or are self-insured companies.

### 2.3.2 CIGNA

Cigna is one of the largest health insurance companies in the United States. In 2013, Cigna launched a pilot program where BodyMedia armbands were given to thousands of employees at one of its corporate customers. Early results showed that a number of employees that were on the verge of contracting diabetes had improved their risk profiles. Cigna has since extended its program to other corporate customers and also offers wearables as a part of its Cigna HealthSpring plan that serves elderly people.

### 2.3.3 OSCAR INSURANCE

Oscar Insurance, backed by large venture capital funds like Founders Fund, General Catalyst Partners, and Khosla Ventures, is offering a branded Misfit step counter device to its customers. This is not a trial, but a live commercial offering during which Oscar will give customers opt-in incentives like Amazon gift cards when they reach a targeted number of daily or weekly steps. The Misfit device communicates with Oscar's app to track progress and rewards.

Rather than offering to reduce insurance premiums, Oscar has chosen to focus on a rewards-based approach. This model is known to be working for corporate wellness customers, but has not been tried in the individual private insurance space. Oscar promises not to use the data in its own review process, penalize customers for bad health data, or make the program mandatory. In other words, Oscar is asking wearable users for their trust.

Other insurance providers that provide fitness trackers to corporations and individuals include United Health, Humana, and Highmark Inc.

## 2.4 FIELD SERVICES

### 2.4.1 ABSEILON USA

Abseilon is a work at height and rope access solutions company that specializes in setting up rope systems for areas that are usually inaccessible, and provides services including surveying, inspection, maintenance, and construction. Abseilon has partnered with Vidcie, which provides a wearable camera that can stream live video sessions from the rope technicians, enabling remote monitoring and viewing capabilities. The wearable camera provides a hands-free capability to a rope technician who can focus on the job, receiving instructions from ground control based on what he is seeing. Abseilon has been actively using the Vidcie wearable camera, including on a job at NASA's Kennedy Space Center.

### 2.4.2 SULLIVAN SOLAR POWER

Sullivan Solar Power is a service company based in San Diego, California that specializes in installing solar panels at offices and homes in the San Diego Gas & Electric service territory. Sullivan has equipped its field technicians with Google Glass so that they can record and stream their work as it is being carried out on site. Glass is also used by technicians to connect into the backend system at Sullivan to access specifications and plans of a building or the job that they are doing. Earlier, each solar panel technician had to carry ring binders with specs and laptops to a roof to access the backend database.

### 2.4.3 LAS VEGAS AIR CONDITIONING

Las Vegas Air Conditioning is one of the few companies to send out its field service technicians with Google Glass so that its customers can see a live feed of the repair or installation that is being done. According to the company, this will put to rest any concerns that customers have about the authenticity of the repair job as they can see it live on their iPad or laptop.

**Figure 2.2** *Live Video Feed Enabled by Field Service Technicians*



*(Source: Las Vegas Air Conditioning)*

#### 2.4.4 CITIPOWER AND POWERCOR AUSTRALIA

CitiPower and Powercor Australia is one of Australia's major power companies that has been using body sensors from dorsaVi to improve the ergonomics of its field service staff that work on elevated platforms installing or fixing power lines. As a part of a project, dorsaVi's ViSafe sensors were attached to the arms and lower backs of field workers and measurements were taken while workers lifted a cross-arm (part of a power line pole) from the truck onto an elevated platform and then from the platform onto the pole. The sensors picked up hazardous movement, which could cause injury when the worker was removing an old cross-arm and installing a new one. As a result of the project, dorsaVi was able to suggest a better ergonomic design for the elevated work platform, including a shelf that could support a new cross-arm, lowering the chances of serious injury.

#### 2.4.5 MITSUBISHI ELECTRIC

Mitsubishi Electric has used AR glasses technology to layer instructions via arrows and highlighted areas over air conditioning units in the field technician's field of view. Metaio provided the software solution and the glasses hardware was from Vuzix. The solution solves the problem of air conditioning field technicians having to carry around manuals of hundreds of models of air conditioners, instead having all that information available digitally through smart AR glasses.

#### 2.4.6 NORTHWEST REPOSSESSION COMPANY

The Northwest Repossession Company, based in Missoula, Montana, is in the business of repossessing vehicles for banks when customers have failed to make payments. The activity is fraught with danger and risk to the field agents that conduct these repossessions, as the owners of the vehicles are often angry and some even resort to brandishing weapons. There are also legal repercussions, as the owners of vehicles can sue the company for emotional distress or "breach of peace." The company has been using a Viewu body-worn camera, which records audio and video on the scene, while the repossession is taking place. The video evidence has helped protect the company against lawsuits, which has saved time and money, while also leading to better behavior from the car owners, as they are aware they are being recorded on camera.

### 2.5 MEDICAL AND HEALTHCARE

#### 2.5.1 BETH ISRAEL DEACONESS MEDICAL CENTER

Beth Israel Deaconess medical center in Boston has tested the use of Google Glass with its emergency room doctors in a small pilot involving four units. Doctors using Glass have been able to access the emergency department dashboard, which can be in the field of view of the doctor while speaking with and examining the patient. This has been very useful, especially for receiving real-time updates and notifications. Overall, the hospital saw that Glass improved the workflow of the doctors and did not impede it. Patients that were part of the pilot were intrigued by Glass and did not show aversion to it.

#### 2.5.2 INDIANA UNIVERSITY HEALTH METHODIST HOSPITAL

In 2014, Indiana University Health Methodist Hospital was the first hospital of its kind to use smart AR glasses in surgery. Dr. Paul Szotek and his team used Google Glass to remove a tumor and reconstruct an abdominal wall. During the procedure, they used the voice command facility on the device to import the patient's magnetic resonance imaging (MRI) scans and X-rays into their field of view, hands-free, while performing surgery.

Dr. Szotek has also subsequently used Google Glass to live stream a hernia repair and abdominal wall construction surgery to a live audience of 600 physicians at the American Hernia Society's physician conference in Las Vegas. Other uses that Dr. Szotek and his team plan to explore include providing first responders with Glass for remote assistance and using virtual tracers in surgery to help surgeons distinguish tumors from healthy tissue.

### 2.5.3 MEDEX AMBULANCE SERVICE

The Medex Ambulance Service in Skokie, Illinois, which provides ambulance services to the Chicago area, has piloted the use of Google Glass for use by paramedics in the field. It used two pairs of Google Glass connected to the Internet to transmit a live video and audio feed from an ambulance to the doctors and surgeons at the trauma center. Pristine, the medical AR glasses software specialist partnered with Medex to enable the trial.

### 2.5.4 UC IRVINE MEDICAL CENTER

UC Irvine has used Google Glass to remotely monitor resident procedures, as they perform procedures in the hospital. Dr. Les Garson, an anesthesiologist, saw a first-person view live video stream and was able to communicate with the residents as they performed procedures. The smart AR glasses trial proved successful and was thought to be much more effective and safer for patients than using pagers, as residents communicate with physicians. The plan is to expand the trial and include other features like having safety checklists being added onto the Glass and field of view, so that residents can perform procedures better.

### 2.5.5 STANFORD UNIVERSITY MEDICAL CENTER

Stanford University Medical Center is using a special type of wearable glasses based on the Vuzix glasses platform developed by Evena Medical. Medical staff can use the Evena Eyes-On Glass system to give them an outline of a patient's veins, which helps them guide a needle much more easily, rather than second guessing its location. This is done by using multi-spectral light to take images under the skin. Medical staff has been able to dramatically improve the success of inserting a needle on the first attempt, keeping patients satisfied and improving the workflow of the hospital.

### 2.5.6 DIGNITY HEALTH

Dignity Health, a San Francisco-based healthcare provider network, is using Augmedix-powered Google Glass to help doctors save time taking notes while they are examining patients. Augmedix is focused on medical applications that use smart AR glasses. Augmedix uses Google Glass as its preferred platform, with a specific focus on physician note-taking. The challenge that Augmedix is trying to resolve is reducing the issues related to note-taking when patients see a doctor. One of the primary complaints in modern medicine is the amount of paperwork and documentation that needs to be completed when a doctor sees a patient, which can be a distraction to doctors and unpleasant for patients. Augmedix-powered Google Glass devices enable doctors at Dignity Health to concentrate on talking to their patients, while the Glass records both audio and video, and processes the medical information at the backend, which is then made available to the doctor. Voice-based requests can also be made to bring up a patient's data like blood pressure readings or X-ray reports, which are then delivered to the heads-up display. Augmedix has also provided doctors with information, such as a patient's or a family member's birthday, which then makes the interaction with the patient much more personal.



**Figure 2.3 Physician's Use of Google Glass Replacing Paperwork Distractions**



(Source: Augmedix, Dignity Health)

On the whole, Dignity physicians can now document patient visits in 15 minutes, compared to the 2 hours they previously spent after every shift typing data into a computer. The feedback from both patients and physicians has been extremely positive and Augmedix is planning to roll out the platform across clinics and hospitals in the United States.

### 2.5.7 DESERT VALLEY MEDICAL CENTER

Desert Valley is one of the first hospitals in the United States to deploy the wireless Leaf Patient Monitoring system across its 135-bed hospital to prevent hospital-acquired pressure ulcers. The main way to prevent these ulcers is by periodically turning the patients, especially those unable to turn on their own. The lack of periodic turning leads to these pressure ulcers, which cost the healthcare system \$11 billion a year in the United States; preventing them saves a lot of money and improves patients' lives, as it is an excruciatingly painful condition. The Leaf pressure sensor is placed on the patient's chest. The Leaf technology automates the patient turning protocols and prioritizes the patient turning needs for a batch of patients. The pressure sensor monitors patient position and provides alerts when assisted turns become necessary, also providing confirmation on a turn being performed. Since Desert Valley deployed the Leaf system, it has seen patient turning compliance increase from 64% to 98%.

## 2.6 HOSPITALITY

### 2.6.1 STARWOOD HOTELS

Starwood Hotels, which owns the Sheraton, Westin, Aloft, Element, and W brands of hotels around the world, has developed a smartphone app that enables a customer to unlock their rooms using their mobile phone, bypassing the reception desk. Users access their hotel room by simply swiping the phone across the room door, enabling keyless entry. The app has also been extended to the Apple Watch, which allows users to use their wrists to unlock their room doors. Starwood has replaced the locks at 30,000 of its rooms across 150 hotels that are part of its Aloft, Element, and W brands, with plans to extend this to other brands in the near future. Swedish manufacturer Assa Abloy provided the door locks.

The Westin Hotels and Resorts properties, also owned by Starwood, have gone further by piloting the use of wearable wristbands at eight hotels. The wristband is a sleep-sensing device from Lark Technologies that tracks the guest's sleep and provides virtual coaching through the companion smartphone app. The wristband can also act as a vibrating alarm

clock that wakes the user gently, rather than the loud sounds that one hears with traditional hotel alarms. The pilot was aimed at improving the guest's wellbeing using new technologies and, in general, the pilot is known to have been successful.

### 2.6.2 PALLADIUM HOTEL GROUP

Palladium Hotel Group is a chain of Spanish hotels, which has been using wearable smart bracelets at two of its properties on the island of Ibiza, off the Spanish coast. This includes the Ushuaïa Ibiza Beach Hotel and Hard Rock Hotel Ibiza. The bracelets act as a room access key, as payment for meals and shopping using an assigned personal identification number (PIN) code, and as a conduit for promotional offers on drinks and nightclubs. The smart bracelet is known as Smart VIB and can interact with multiple touchscreens dotted throughout the hotel to receive these offers and promotions. The bracelet also offers the chance to personalize every guest's visit. Several different packages can be loaded onto the bracelet like a Zen and Wellness package, a Ballad package for romantic couples, or a Clubber package for party hoppers. Smart VIB Kids is a special bracelet for kids that limits their internet access to Facebook and Twitter, with parental supervision. These bracelets are priced separately at €29 (\$32) for the Smart VIB and €19 (21) for the Smart VIB Kids.

**Figure 2.4 Smart VIB Bracelet Used for Hospitality Guest Interactions**



(Source: Palladium Hotels)

### 2.6.3 DISNEY RESORTS

Disney's MagicBand is one of the most extensive and innovative wearable-based hospitality solutions launched to date. The MagicBand is a wearable wristband that provides guests to the Disney resort and theme parks with a range of services, including gate entry, fast track priority for rides, hotel room key, and a payment mechanism for meals and shopping, with Disney guests able to enjoy a more personalized and hassle-free experience. The bands come in different vibrant colors and can be customized as well. Guests that book a holiday online are sent bands through the mail, which they can set up and personalize before arriving at the resort. Theme park guests can also book and prioritize rides in advance, all of which is stored on the MagicBand.

One example of how the MagicBand can create a highly personalized experience is at the Orlando Walt Disney World Resort's Be Our Guest Restaurant. Once a guest with a MagicBand has booked a place at the restaurant, they can be greeted by name as they

arrive, sit where they wish, and have pre-ordered food delivered to their table. The MagicBand is also a radio device that transmits a radio signal at a range of 40 feet, which alerts the restaurant manager and the kitchen about a particular guest arriving and where they are seated. There are additional sensors installed in the ceiling of the restaurant that can triangulate one's location.

**Figure 2.5** *Disney's MagicBand Experience*



(Source: The Walt Disney Co.)

In a sense, the MagicBand is a way for Disney to capture deep behavioral insights about customers as they move about their properties, adapting and customizing services as the data suggests. The full potential of MagicBand has not yet been realized, but over the coming years, Disney hopes to use much more sophisticated big data analysis techniques and localization technologies to capture user data and provide more personalized services to guests based on the MagicBand and also improve and optimize its internal procedures. The MagicBand is also a great case study for how enterprises should think about customer-oriented services and how they should work in the real world, making the internet and sensors much more experiential.

## 2.7 LOGISTICS

### 2.7.1 DHL

DHL has used AR glasses to speed up and optimize its picking processes for warehouse operations. In partnership with Ricoh and wearable software provider Ubimax, using Vuzix's M100 and Google Glass, DHL piloted a "vision picking" application using the AR capabilities of smart glasses. During a period of 3 weeks, 10 warehouse staff in Bergen Op Zoom in the Netherlands were provided with a pair of smart AR glasses. The picking staff was able to view the location of the product, including aisle, location, and quantity, on their heads-up display. During the pilot, 20,000 items were picked, fulfilling 9,000 orders, resulting in an efficiency gain of 25% overall. The smart glasses replaced handheld scanners and paper lists, making the order picking process much more efficient. DHL and Ricoh are now evaluating the solution for a wider rollout, as well as looking at more efficiencies that smart AR glasses can offer within a warehouse setting.

**Figure 2.6** Vuzix M100 Smart Glasses for Warehouse Applications



(Source: Vuzix)

### 2.7.2 UPS

UPS, in partnership with Motorola Solutions, has introduced a new wearable scanning system to replace the point-and-shoot handheld terminals. The solution consists of a hands-free imager that is worn on a finger and a small terminal worn on the employee's wrist or hip. The ring imager automatically scans using label-sensing technology, replacing the point-and-shoot method. The tracking information is then sent to the terminal on the hip or wrist via Bluetooth, and then over to the UPS network via Wi-Fi. The deployment, which began in 2012, had more than 38,000 ring imager devices in use over 1,300 facilities across UPS by the end of 2013. Overall, the system allows for more efficient loading of packages onto trucks, as well as tracking of packages in the system, with over 30 million tracking requests viewed daily on UPS.com.

FedEx is also using a similar ring-based scanning system for scanning packages, as they are loaded onto trucks. However, unlike UPS, which has adopted ring scanners in a large way, FedEx still has a large proportion of hand or wrist scanners, as FedEx mostly ships smaller packages, which do not necessarily call for hands-free capability.

### 2.7.3 LOCKE SUPPLY

Locke Supply is a household hardware distributor based out of Oklahoma City that deals with plumbing, electric, heating, and cooling products. It has 160 brand stores across the United States, which it supplies products via its central distribution center in Oklahoma City. Locke Supply has been facing picking issues with volumes increasing over the years, as warehouse staff are given a specific set of products they need to pick and put into a box that then gets shipped to a specific store.

Locke Supply has a 300,000-square foot central distribution center that operates on 10,000 to 12,000 order lines per day, which are picked from an inventory of 27,000 stock keeping units (SKUs). The traditional solution was using radio frequency (RF) terminals to access pick lists, instructions, and record picking activity. Using handheld RF terminals was not very convenient while doing order picking. The handheld terminals had a complicated user interface for inputting information confirming picks; also an issue with training new pickers.

**Figure 2.7 Voice-Controlled Wearable Solution for Warehouse Picking**



(Source: BEC, Honeywell Vocollect)

The solution that was ultimately chosen for replacing the handheld scanners was Honeywell's Vocollect voice-based system that integrates with backend data and uses wearable RF hardware with a headset and mic. The system went live in 2013 with training time reduced to 3 hours, compared to 3 days. The system works by giving voice commands to the picker near where the item is located. Once the item has been picked, the picker can simply say "picked item." The picker can also check if the item is the right item by simply calling out the item number to hear the correct information. The solution has been hugely successful for Locke, which has doubled the average pick rate for some items and order accuracy has improved from 95% to 99%.

## 2.8 MANUFACTURING

### 2.8.1 ITAMCO

Itamco is an industrial machine equipment component manufacturer based in Plymouth, Indiana. Itamco provides precision-machined components to original equipment manufacturers (OEMs) worldwide. MTConnect is a manufacturing industry standard that allows process information to be retrieved from numerically-controlled machine tools. By integrating MTConnect with Google Glass, Itamco has created a unique wearable enterprise application that allows machine tools to be monitored through Google Glass. The application allows Glass to recognize the machine tool, which then retrieves appropriate information from the server and passes it onto Glass. MTConnect-compatible equipment can pass on vital information onto the Glass display, including power status, emergency stop, alarm/messages, block, controller mode, line, program, execution, path feed-rate, spindle, axis positions, spindle overrides, feed-rate overrides, machine location, part location, and current part status. If the machine has a camera inside that is recording the process, the video can be streamed onto Google Glass and shared with other users.

### 2.8.2 INDUCTIVE AUTOMATION

Inductive Automation is a web-based industrial automation software supplier. The company specializes in supervisory control and data acquisition (SCADA)-based control automation software, which is the protocol used to control machines in an industrial manufacturing environment. Inductive Automation has developed a solution for industrial alarms that can be pushed onto smart AR glasses like Google Glass. The initial prototype alarms are basic,

such as letting the user know about high temperatures in a tank. However, by integrating with the SCADA platform, the user can receive context about the alarm and recommendations on addressing and resolving the alarm. On a factory shop floor, alarms are commonplace occurrences, with a shop floor manager able to handle as many as 300 alarms on a daily basis. If the software could prioritize the alarms and find the root cause of the alarm, then that would be extremely valuable in a manufacturing setting.

### 2.8.3 BOEING

Boeing, in partnership with APX Labs, is using Google Glass to reduce paper-based instructions for assembling wire harnesses at its Commercial Planes wire harness facility. Traditionally, this task was done using a paper-based manual and diagram that workers needed to reference, while trying to assemble a complicated wiring harness. The earlier method is prone to errors, with the worker's hands caught between the harness, the manual, and the diagrams. Boeing plans to extend the pilot to other parts of its manufacturing operations, especially those that use paper-based instructions. Boeing is also exploring the use of Google Glass in space at the International Space Station for increased payload utilization and crew efficiency.

## 2.9 MINING

### 2.9.1 RIO TINTO

Rio Tinto is a global mining and metals company. Rio Tinto has piloted the use of wearables to improve worker safety in mines, especially workers that work with heavy machinery in hazardous conditions. Rio Tinto has used a solution from a company called Fatigue Science. Fatigue Science is a Blaine, Washington-based company that specializes in building solutions for fatigue-related risk management and human performance optimization. The solution consists of a wrist-worn wearable device called Readiband and an analytics tool called Fatigue Avoidance Scheduling Tool (FAST). Rio Tinto have used the Readiband and FAST solution to implement new guidelines around the length of worker shifts, especially those that operate heavy equipment. The outcome of the solution allowed Rio Tinto to change the guidelines that no worker can operate equipment after being awake for 14 hours, which resulted in increased productivity and eliminate fatigue-related accidents.

### 2.9.2 MOTION METRICS

Motion Metrics develops advanced monitoring solutions to improve safety, efficiency and productivity in the mining sector. Motion Metrics has partnered with wearable solutions provider Vandrico to create a Google Glass application for the MetricsManager platform. The MetricsManager platform is a centralized equipment management system from Motion Metrics that provides access to real-time information on equipment like shovels, loaders and belts. The information can be accessed over the web or mobile using the existing IT infrastructure in the mine. The MetricsManager platform is installed in over 50 mining sites across the world. With the Glass app, site managers can have real-time instant access to site equipment data including status reports, view feeds of shovel cameras and swing statistics and monitor conveyor belt payload output. This is a first of its kind application that uses wearables to provide hands-free convenient access to operational analytics on a mining site.

**2.10 OIL AND GAS****2.10.1 SCHLUMBERGER**

Schlumberger is a leading services company providing technology, project management, and information solutions for the oil and gas sector. Schlumberger has partnered with technology specialist Wearable Intelligence to create a special version of Google Glass that can be used on an oil and gas site. As part of a pilot, Schlumberger used 30 units in the field to provide real-time information to workers. The information included live gauge readings, inspection and safety checklists, inventory checks, and step-by-step procedure videos. Voice commands were the main command inputs used in this solution. The access to real-time information is valuable, especially in a hazardous setting like an oilfield. In addition, having a wearable device like smart AR glasses provides hands-free capabilities that allow the worker to continue working on important tasks.

**2.10.2 BAKER HUGHES**

Baker Hughes is an oil and gas drilling services contractor based in Austin, Texas. Baker Hughes is developing a new smart helmet technology that includes a head-up display and has sensors tracking the user's vital statistics, including heart rate, oxygen levels, and blood sugar levels, for safety purposes. The helmet can also display information around key technical questions. Interestingly, the helmet is known to work by reading brain signals, which is extremely unique for wearables today. While not many details have been revealed by Baker Hughes, the helmet should be applicable to industries beyond oil and gas.

**2.10.3 MARATHON PETROLEUM CORPORATION**

Marathon Petroleum Corporation is the fourth largest oil refinery company in the United States supplying fuel for the transportation sector. The company has deployed its Life Safety Solution wearable device that can detect multiple types of hazardous gases and has a panic button. It also carries a global positioning system (GPS) locator and motion sensor for identifying the location of each employee. The solution has been implemented across the Robinson, Illinois refinery after conducting a successful pilot in 2010. The solution was developed in partnership with Accenture and AeroScout.

**2.11 RETAIL****2.11.1 TESCO**

The U.K. retailer Tesco has been testing the use of Google Glass in its labs and showcased a trial app for Glass, which allows customers to shop for items in the comfort of their own home by simply scanning the barcode. After scanning the code, the item information comes up, with additional nutritional value also available in the customer's field of view.

**2.11.2 THE CONTAINER STORE**

The Container Store is a Texas-based retailer for container and storage systems. Until recently, it used walkie-talkies for internal employee communication on the shop floor, but now has decided to test a new wearable technology system to replace them. Theatro's wearable computer is a credit card-sized device that can be clipped onto a worker's clothing or worn with a strap. The purpose of the device is to enable hands-free communication over a Wi-Fi network. The backend system of Theatro is in the cloud, which means the packets travel into the cloud, are processed, and are then sent back to the location from where the packets are broadcast to the network. There is also an offline mode, which means that the communication would still work when the internet is down and cloud access is unavailable.

**Figure 2.8** *Theatro Voice-Based Wearable for Retail Applications*



(Source: Theatro)

The Container Store worked for more than a year to develop the product and has deployed the device at its Austin store with 35 employees using it. Every morning, a store employee picks up a Theatro device from the charging station and logs in by speaking a command through their earpiece that is attached to the device. The system recognizes the voice and logs the worker into the system. At the same time, everyone else on the network is notified about the new arrival. There are specific voice commands that can be used, such as finding a specific employee, which then results in the system triangulating the location of a user and providing a response. Customized messages can also be sent to each employee and the system can also set up separate groups, such as a general sales group or specialists in home storage solutions. There are many possibilities of how the store can configure the network and the devices. Training for the new system took less than 10 minutes and the store found, on average, it heard 60% fewer messages in a given day, as the system filters the messages, but at the same time, saw a 30% increase in actual messages going through the system.

As the wearable system is completely voice controlled, it is much more flexible and scalable in the long run, as compared to a walkie-talkie system. In addition, the salespeople on the floor are not distracted, as the system is hands-free and allows them to focus on talking and helping customers.

### 2.11.3 WALGREENS

The drugstore chain is using wearables to promote healthy living among its customers by incentivizing them by awarding points. This different kind of enterprise usage of wearables is customer facing and helps promote healthy living, while also promoting its brand and creating stickiness for customers. By downloading the Walgreens mobile app, any customer that has a fitness tracking device like Fitbit, Jawbone, Withings, or MapMyFitness can have their data fed directly into the Walgreens app. Users essentially receive points for the number of times they log fitness data, rather than the amount of weight they lose or steps they walk. The wearable-driven program is targeting awareness and leaves the tracking to the professional fitness apps.



## 2.11.4

## WOOLWORTHS

Woolworths, a supermarket chain in Australia, used lower back sensors from dorsaVi to create an ergonomic design for its milk trolleys. In the older milk trolleys, in order for a worker to offload the milk from the trolley onto the display fridge, there were 30 forward bends required at greater than 20 degrees to lift and fill 5 crates onto the fridge. The new self-supporting milk trolley only requires 4 forward bends. As a result, Woolworths has reduced the risk of injury for its staff and seen a 21% reduction in the time it takes to load the milk fridge.

## SECTION 3

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## SECTION 4

### ACRONYM AND ABBREVIATION LIST

Augmented Reality .....	AR
Compound Annual Growth Rate .....	CAGR
Global Positioning System .....	GPS
Magnetic Resonance Imaging .....	MRI
Original Equipment Manufacturer .....	OEM
Personal Identification Number .....	PIN
Quick Response .....	QR
Radio Frequency .....	RF
Request for Information.....	RFI
Stock Keeping Unit.....	SKU
Supervisory Control and Data Acquisition .....	SCADA

## SECTION 5

### TABLE OF CONTENTS

<b>SECTION 1</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>1</b>
<b>SECTION 2</b> .....	<b>2</b>
<b>Case Studies</b> .....	<b>2</b>
2.1 Automotive .....	2
2.1.1 General Motors.....	2
2.1.2 BMW.....	2
2.1.3 Volkswagen .....	2
2.2 Construction .....	2
2.2.1 Bridgit .....	2
2.2.2 Lee Company .....	3
2.2.3 Rogers-O'Brien Construction .....	3
2.3 Corporate Wellness and Insurance.....	4
2.3.1 British Petroleum .....	4
2.3.2 Cigna .....	4
2.3.3 Oscar Insurance .....	4
2.4 Field Services.....	5
2.4.1 Abseilon USA .....	5
2.4.2 Sullivan Solar Power .....	5
2.4.3 Las Vegas Air Conditioning .....	5
2.4.4 CitiPower and Powercor Australia.....	6
2.4.5 Mitsubishi Electric.....	6
2.4.6 Northwest Repossession Company .....	6
2.5 Medical and Healthcare .....	6
2.5.1 Beth Israel Deaconess Medical Center.....	6
2.5.2 Indiana University Health Methodist Hospital.....	6
2.5.3 Medex Ambulance Service.....	7
2.5.4 UC Irvine Medical Center .....	7
2.5.5 Stanford University Medical Center.....	7
2.5.6 Dignity Health .....	7
2.5.7 Desert Valley Medical Center.....	8
2.6 Hospitality.....	8
2.6.1 Starwood Hotels .....	8
2.6.2 Palladium Hotel Group .....	9
2.6.3 Disney Resorts .....	9
2.7 Logistics .....	10
2.7.1 DHL .....	10
2.7.2 UPS .....	11
2.7.3 Locke Supply.....	11
2.8 Manufacturing.....	12
2.8.1 Itamco.....	12
2.8.2 Inductive Automation.....	12
2.8.3 Boeing .....	13
2.9 Mining.....	13
2.9.1 Rio Tinto .....	13
2.9.2 Motion Metrics .....	13
2.10 Oil and Gas .....	14



2.10.1	Schlumberger .....	14
2.10.2	Baker Hughes .....	14
2.10.3	Marathon Petroleum Corporation.....	14
2.11	Retail .....	14
2.11.1	Tesco .....	14
2.11.2	The Container Store.....	14
2.11.3	Walgreens .....	15
2.11.4	Woolworths .....	16
<b>SECTION 3</b>	.....	<b>17</b>
<b>Company Directory</b>	.....	<b>17</b>
<b>SECTION 4</b>	.....	<b>22</b>
<b>Acronym and Abbreviation List</b>	.....	<b>22</b>
<b>SECTION 5</b>	.....	<b>23</b>
<b>Table of Contents</b>	.....	<b>23</b>
<b>SECTION 6</b>	.....	<b>25</b>
<b>Table of Charts and Figures</b>	.....	<b>25</b>
<b>SECTION 7</b>	.....	<b>26</b>
<b>Scope of Study</b>	.....	<b>26</b>
<b>Sources and Methodology</b>	.....	<b>26</b>
<b>Notes</b>	.....	<b>27</b>
<b>SECTION 8</b>	.....	<b>28</b>
<b>Additional Reading</b>	.....	<b>28</b>
<b>SECTION 9</b>	.....	<b>31</b>
<b>Enterprise Wearable Technology Summit</b>	.....	<b>31</b>

## SECTION 6

### TABLE OF CHARTS AND FIGURES

Chart 7.1	Tractica Research Methodology.....	27
Figure 2.1	Gesture Control for Construction Worker Application .....	3
Figure 2.2	Live Video Feed Enabled by Field Service Technicians .....	5
Figure 2.3	Physician’s Use of Google Glass Replacing Paperwork Distractions.....	8
Figure 2.4	Smart VIB Bracelet Used for Hospitality Guest Interactions .....	9
Figure 2.5	Disney’s MagicBand Experience.....	10
Figure 2.2	Vuzix M100 Smart Glasses for Warehouse Applications.....	11
Figure 2.6	Voice-Controlled Wearable Solution for Warehouse Picking.....	12
Figure 2.7	Theatro Voice-Based Wearable for Retail Applications .....	15

## SECTION 7

### SCOPE OF STUDY

This white paper covers the enterprise wearable technology market, providing real-world case studies of how wearables are used in various industry verticals. The verticals covered include automotive, manufacturing, mining, retail, construction, oil and gas, logistics, field services, hospitality, healthcare, medical, corporate wellness, and insurance. The devices covered include smart AR glasses, voice-controlled headsets or clip-on devices, body sensors, wearable cameras, and fitness trackers.

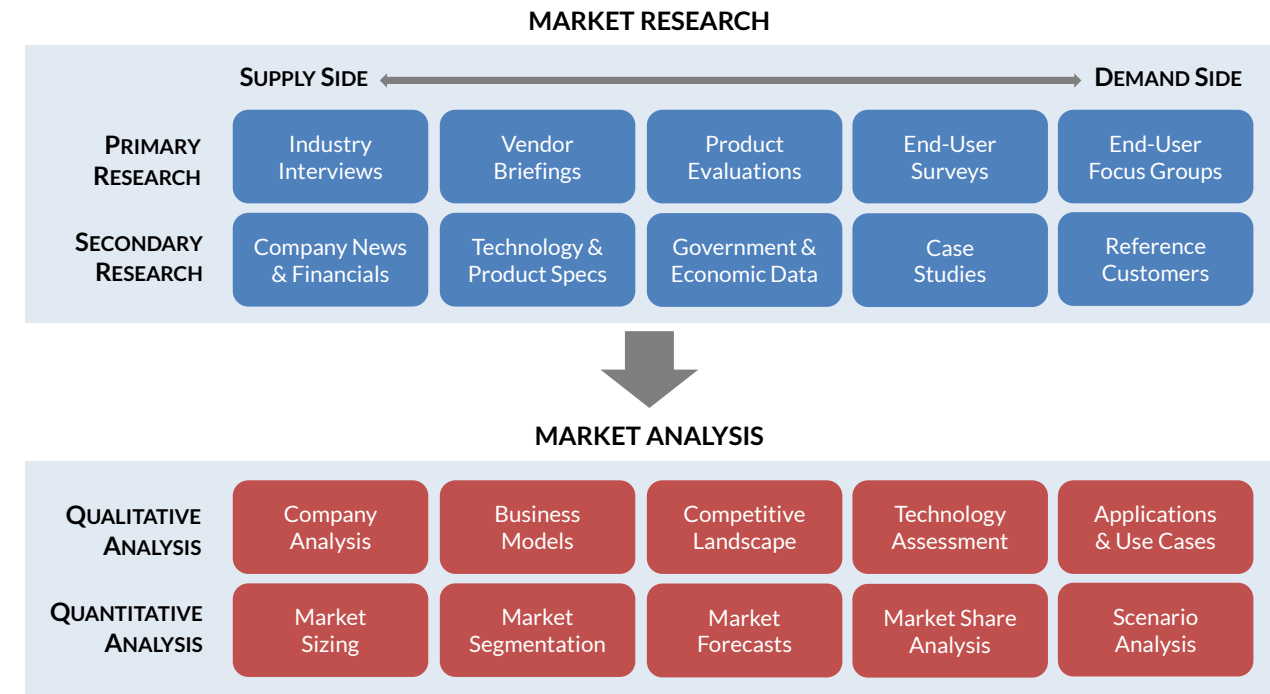
### SOURCES AND METHODOLOGY

Tractica is an independent market research firm that provides industry participants and stakeholders with an objective, unbiased view of market dynamics and business opportunities within its coverage areas. The firm's industry analysts are dedicated to presenting clear and actionable analysis to support business planning initiatives and go-to-market strategies, utilizing rigorous market research methodologies and without regard for technology hype or special interests including Tractica's own client relationships. Within its market analysis, Tractica strives to offer conclusions and recommendations that reflect the most likely path of industry development, even when those views may be contrarian.

The basis of Tractica's analysis is primary research collected from a variety of sources including industry interviews, vendor briefings, product demonstrations, and quantitative and qualitative market research focused on consumer and business end-users. Industry analysts conduct interviews with representative groups of executives, technology practitioners, sales and marketing professionals, industry association personnel, government representatives, investors, consultants, and other industry stakeholders. Analysts are diligent in pursuing interviews with representatives from every part of the value chain in an effort to gain a comprehensive view of current market activity and future plans. Within the firm's surveys and focus groups, respondent samples are carefully selected to ensure that they provide the most accurate possible view of demand dynamics within consumer and business markets, utilizing balanced and representative samples where appropriate and careful screening and qualification criteria in cases where the research topic requires a more targeted group of respondents.

Tractica's primary research is supplemented by the review and analysis of all secondary information available on the topic being studied, including company news and financial information, technology specifications, product attributes, government and economic data, industry reports and databases from third-party sources, case studies, and reference customers. As applicable, all secondary research sources are appropriately cited within the firm's publications.

All of Tractica's research reports and other publications are carefully reviewed and scrutinized by the firm's senior management team in an effort to ensure that research methodology is sound, all information provided is accurate, analyst assumptions are carefully documented, and conclusions are well-supported by facts. Tractica is highly responsive to feedback from industry participants and, in the event errors in the firm's research are identified and verified, such errors are corrected promptly.

**Chart 7.1 Tractica Research Methodology**


*(Source: Tractica)*

## NOTES

CAGR refers to compound annual growth rate, using the formula:

$$\text{CAGR} = (\text{End Year Value} \div \text{Start Year Value})^{(1/\text{steps})} - 1.$$

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2015 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

## SECTION 8

### ADDITIONAL READING

Tractica's Wearable Devices advisory service covers hardware, software, and services in the rapidly-emerging market for connected wearables. Key categories of focus include smart watches, smart glasses, and wearable sensors for consumer, commercial, and industrial markets. The wearables value chain is examined in depth including detailed analysis of supply-side and demand-side factors, from semiconductors and components to the dynamics of end-user demand for specific device categories. Areas of focus within research reports include market development factors by geography and segment, technology issues, the competitive landscape, and detailed market forecasts.

#### **Wearable Device Market Forecasts**

*Smart Watches, Fitness Trackers, Smart Glasses, Smart Clothing, Body Sensors, Wearable Cameras, and Other Wearable Devices for Consumer, Enterprise, Healthcare, Industrial, Public Safety, Sports, and Other Markets*

Published 1Q 2015

<https://www.tractica.com/research/wearable-device-market-forecasts/>

This Tractica report examines global market trends for wearable devices and presents 7-year market sizing and forecasts for device shipments and revenues during the period from 2013 through 2020. The comprehensive market model is segmented by device category including smart watches, fitness trackers, smart glasses, smart clothing, body sensors, wearable cameras, and other wearables such as location trackers, smart jewelry, and gesture control devices. The forecasts for each device type are also segmented by world region, application market, and connectivity technology.

#### **Smart Watches**

*Apple Watch, WatchKit, Android Wear, Tizen, WebOS, and Embedded OS: Global Market Analysis and Forecasts for Smart Watch Devices, Operating Systems, Connectivity Technologies, and Application Markets*

Published 1Q 2015

<https://www.tractica.com/research/smart-watches/>

This Tractica report examines global market trends for smart watches and provides 7-year market sizing and forecasts for smart watch device shipments and revenues during the period from 2013 through 2020. The report examines the technology issues, market opportunities, and barriers for smart watches and the relevant application markets including consumer, enterprise, industrial, healthcare, and sports. A separate analysis is provided around smart watch operating systems and the implications for watch app developers. Key industry players are analyzed in depth, including assessments of their relative strengths and weaknesses. Market forecasts are segmented by world region, application market, and connectivity technology.

**Wearable Devices for Enterprise and Industrial Markets**

*Corporate Wellness, Manufacturing, Warehouse, Field Maintenance, Mobile Workforce Management, First Person Communications, Holographic Modeling, Workplace Authentication, and Other Applications*

Published 2Q 2015

<https://www.tractica.com/research/wearable-devices-for-enterprise-and-industrial-markets/>

This Tractica report provides a comprehensive examination of the market opportunity for enterprise and industrial wearables, analyzing various device categories, their specific roles, and adoption timelines in the workplace. Key device categories include smart watches, smart glasses, fitness trackers, smart clothing, body sensors, wearable cameras, and other wearables. The report also contains market sizing and forecasts from 2013 through 2020, providing shipments and revenues along with segmentation by device category, region, and enterprise and industrial use cases.

**Wearable Cameras**

*Consumer, Sports, Public Safety, Enterprise, Industrial, and Other Applications for Body-Worn and Mounted Cameras: Global Market Analysis and Forecasts*

Published 2Q 2015

<https://www.tractica.com/research/wearable-cameras/>

This Tractica report analyzes the market for wearable cameras, providing insights into the drivers and barriers that impact this new market segment, including an assessment of some of the technology issues surrounding market development. The study provides detailed forecasts and analysis of how wearable cameras are being adopted in sports, public safety, consumer, enterprise, industrial, healthcare, and other applications and how the market will grow between 2013 and 2020. The report also provides strategic recommendations for the value chain with a competitive SWOT analysis of the key players in this market.

**Smart Clothing and Body Sensors**

*Connected Sports and Fitness Apparel, Fashion Apparel, Baby and Pregnancy Monitors, Heart Rate Monitors, Headbands, Posture Monitors, and 3D Trackers*

Published 2Q 2015

<https://www.tractica.com/research/smart-clothing-and-body-sensors/>

This Tractica report examines the market opportunities for smart clothing and body sensors including a detailed analysis of market drivers and challenges, technology issues, and the industry ecosystem. The study provides global shipment and revenue forecasts through 2020, segmented by device category, application market, connectivity technology, and world region. Key smart clothing and body sensor companies are profiled in depth and the report also includes strategic recommendations for current industry participants, as well as those who are looking to enter the market.

**Connected Wearable Patches**

*Clinical and Non-Clinical Patches for Patient Monitoring, Treatment, and Health & Wellness Applications: Global Market Analysis and Forecasts*

Published 2Q 2015

<https://www.tractica.com/research/connected-wearable-patches/>

This Tractica report examines the market trends, drivers and barriers, applications and use cases, technology issues, and key industry players for connected wearable patches within the clinical and non-clinical environments. It presents forecasts for unit shipments, revenues, ASPs, and segments/use cases during the period from 2014 through 2020. The report focuses on three main use cases for connected wearable patches: medical monitoring, detection, and diagnosis; medication management and treatment; and health, wellness, and prevention.

**Smart Augmented Reality Glasses**

*Head-Up Displays, Mixed Reality Holographic Displays, and Smart Helmets for Consumer, Enterprise, Industrial, Sports, Healthcare, and Public Safety Applications: Market Analysis and Forecasts*

Published 2Q 2015

<https://www.tractica.com/research/smart-augmented-reality-glasses/>

This Tractica report covers the various types of smart AR glasses products, from simple HUDs to mixed reality (MR) holographic displays and smart helmets. The different application markets for smart AR glasses that are covered in depth include consumer, enterprise, industrial, public safety, and healthcare. The study includes competitive analysis of the various hardware and software vendors, along with strategic recommendations for players in the value chain. Market forecasts are included for the period from 2013 to 2020, with unit shipment and revenue data segmented by region, application market, and connectivity technology.

**Wearable Payments**

*Contactless NFC, RFID, and QR/Barcode Payment Technologies for Smart Watches, Fitness Trackers, and Payment Wristbands*

Published 3Q 2015

<https://www.tractica.com/research/wearable-payments/>

This Tractica report analyzes the market opportunity for proximity payments or transactions made physically at POS terminals utilizing wearable devices such as smart watches, fitness trackers, and payment wristbands. The report examines the market drivers and barriers, business models, enabling technologies, and key applications for wearable payments. Key industry players are profiled and case studies are provided for notable market trials and deployments. Market forecasts for wearable payment transactions and transaction volume are provided for the period from 2015 through 2020, and are segmented by device type, technology, and world region.

## SECTION 9

## ENTERPRISE WEARABLE TECHNOLOGY SUMMIT



The [Enterprise Wearable Technology Summit](#) is the only event entirely focused on wearable technology for the business enterprise. Bringing together the leading enterprises, the conference examines the applications, assessment, and possibilities of wearable technology and its use in the workplace. Consisting of real-world case studies and best-practice user examples, the event offers a great opportunity for you to hear and learn from the top companies and specialists utilizing this new wave of technology and form relationships that will certainly lead to improvements for you and your business.



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