

Leveraging wearables and the Internet of Things to disrupt, transform, and unlock value

Predictions on the future of wearables and IoT in the enterprise

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Synopsis

Across industries, wearable technologies are transforming enterprise performance and enabling innovative business models. As part of the Cognitive Internet of Things (IoT) ecosystem, and augmented by other Industry 4.0 technologies, these body-worn technologies provide up to four core applications to businesses: real-time monitoring, remote collaboration, personalized perspective, and enhanced ability.

Wearables transform enterprises by increasing efficiency, safety, quality, and collaboration; improving productivity; and reducing costs. As the technology and its adoption evolve, head-mounted displays, body-worn sensors, and exoskeletons will improve employee safety and productivity; and retinal devices and adjustable clothing will enhance employee and user experience.

Combined with the power of IoT, wearables will disrupt traditional business models, help drive the data economy, and offer new value and insights to enterprises. Changes in differentiated services and revenue models will include shifting from B2B to B2B2C and as-a-service, while offering dynamic demand distribution opportunities. As wearables integrate into control centers in IoT enterprises, they will guide new, efficient business processes, and revenue generating and cost saving monetization opportunities.

Wearable technology is already on the agenda of business leaders for its transformational potential—and it's imperative that your business invests in wearables to stay competitive in the market. As you begin your wearables journey, IBM's cross-industry experts can partner with you to develop and maximize your IoT strategies and operations with wearables.

Summary of Predictions

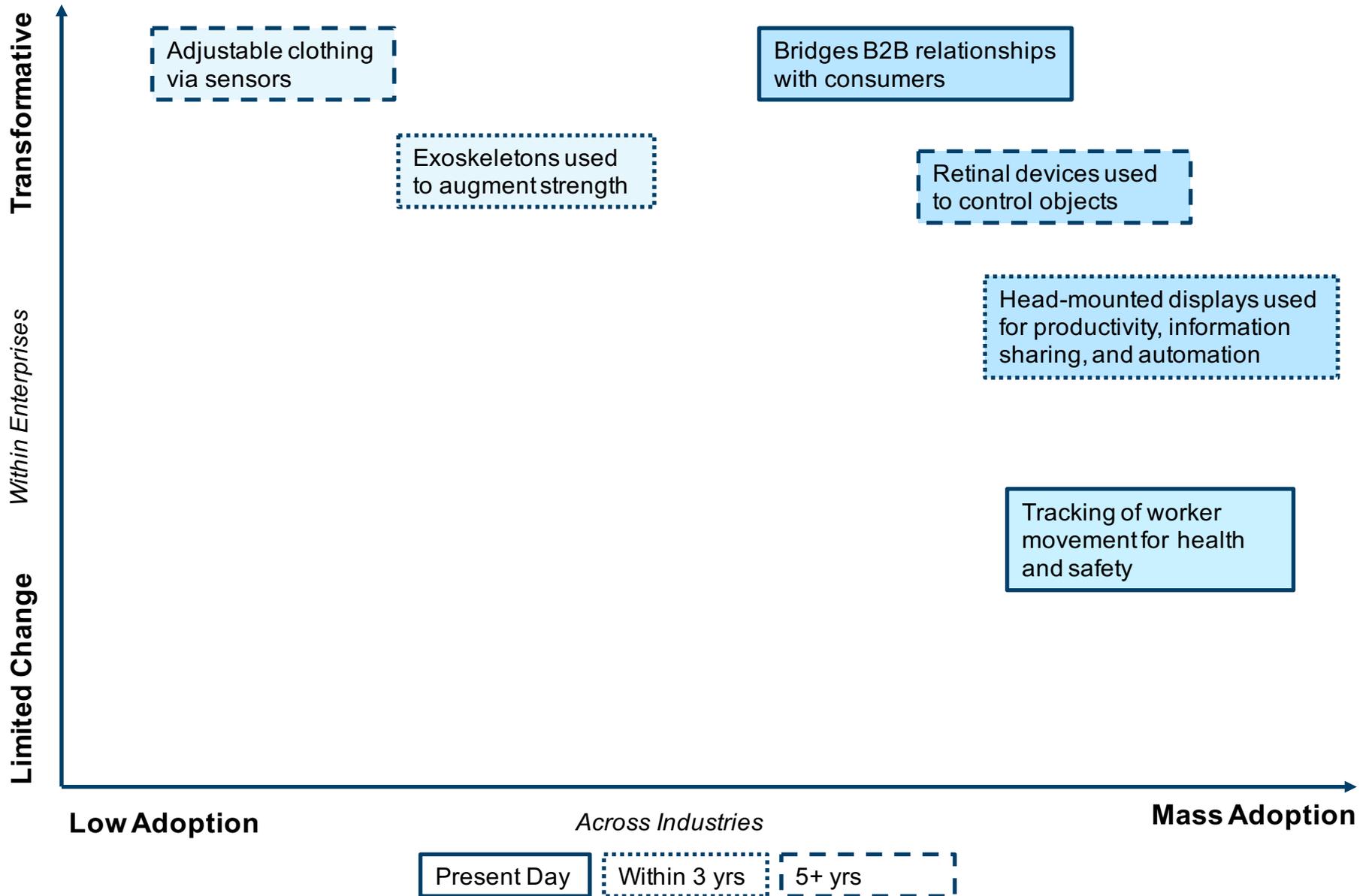




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How wearables disrupt industries

As part of the dynamic Internet of Things ecosystem, leaders are adopting wearable technologies—devices worn on or in the body in support of enterprise activities—to transform operations and performance.



The market for global enterprise wearables will increase to **63.9 million unit shipments in 2020**, up from 6.9 million in 2015.¹

Performance Enhancement

Wearables across industries improve enterprise and customer experience.

76% of enterprise adopters report improvements in business performance since deploying wearables.²

Revenue Generation

Wearables enable innovative and differentiated services and revenue models.

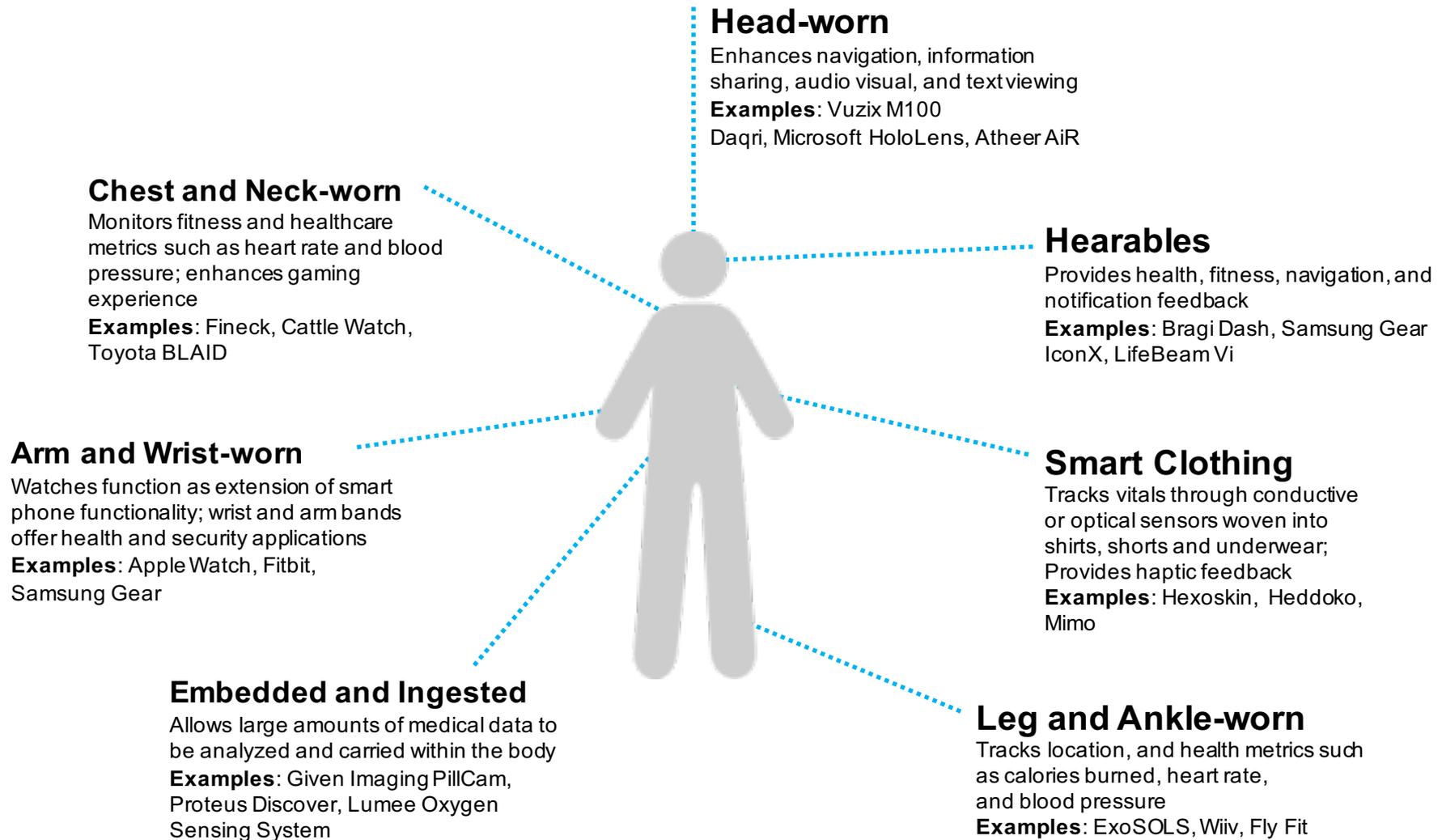
51% of technology and business leaders identify wearables as a priority for their organization.³

Cost Reduction

Wearables reduce costs through operational improvements.

Smart glasses will save \$1 billion per year through field service deployments.⁴

Enterprise wearables fall into seven broad categories.



Wearables that utilize cognitive learn from real-time, contextual data, and augment other technologies.

Cognitive Internet of Things (IoT) is...

Instrumented and Interconnected

Marrying structured data with unstructured data (e.g. social media, text, email, voice)

Intelligent

Applying adaptable machine learning techniques to interconnected physical device data patterns and trends

In Real-time

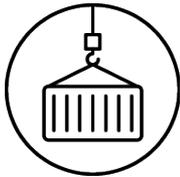
Responding dynamically to chronic, multi-dimensional and/or time sensitive problems

In Context Data

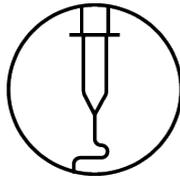
Creating a personal and consumable experience by understanding the human element in the context of both structured and unstructured data

Wearables are part of the Cognitive IoT ecosystem

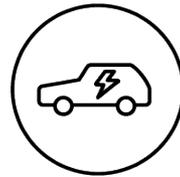
Wearables utilizing cognitive connect to other devices to expedite processes and interactions. Other devices augment the wearable experience.



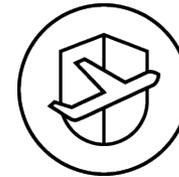
Adaptive Robotics



3D Printing



Autonomous Vehicles



Drones

Workforce, market, technology, and product factors are business drivers for the growing enterprise wearable market.



Workforce

Wearables enable training and safety measures for workers requiring greater supervision.

Workforce safety is a concern, with more than 2.3m work-related deaths per year.⁵



Technology

Wearables are an economically and technologically viable option.

Cognitive technology is increasingly used for data analytics and automation, with 80 of the top 100 largest software enterprises integrating cognitive.⁷



Industry/Market

Companies are required to adopt wearables to compete in the marketplace.

Search for new revenue streams is a priority, with 65% of CEOs preferring IT projects that make money rather than save money.⁶



Products

Wearables are more rapidly designed for user needs and customized experiences.

Continually changing consumer preferences and desire for personalization are part of living in the "age of the customer."⁸

Wearables impact enterprises by increasing efficiency, safety, quality, and collaboration; improving productivity; and reducing costs.



Improve Operations, Efficiency & Convenience

- ▶ Reduce the need for multiple devices through hands-free operations
- ▶ Re-engineer existing business processes, improving productivity
- ▶ Increase efficiency, and reduce operational errors and costs



Increase Safety

- ▶ Monitor and coach on the wellness and safety of the user
- ▶ Prevent and detect hazards, and notify employees and supervisors



Increase Quality

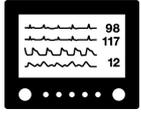
- ▶ Provide rich data points for operational and customer understanding
- ▶ Measure final product size and shape, and verify specifications
- ▶ Predict defects to optimize machines
- ▶ Create new personalized customer service interactions



Improve Collaboration & Training

- ▶ Provide remote training and real-time feedback
- ▶ Enable faster decision-making and responsiveness

Wearables provide up to four core applications: real-time monitoring, remote collaboration, personalized perspective, and enhanced ability.



Real-time Monitoring

Remotely monitor machinery

Monitor vitals and safety, and identify hazards

Facilitate real-time predictive analytics



Remote Collaboration

Diagnose problems and guide repair

Send safety alerts and prompts

Off-site access to experts



Personalized Perspective

Real-time view of factory floor

Hands-free access to information

Live view overlaid with relevant data



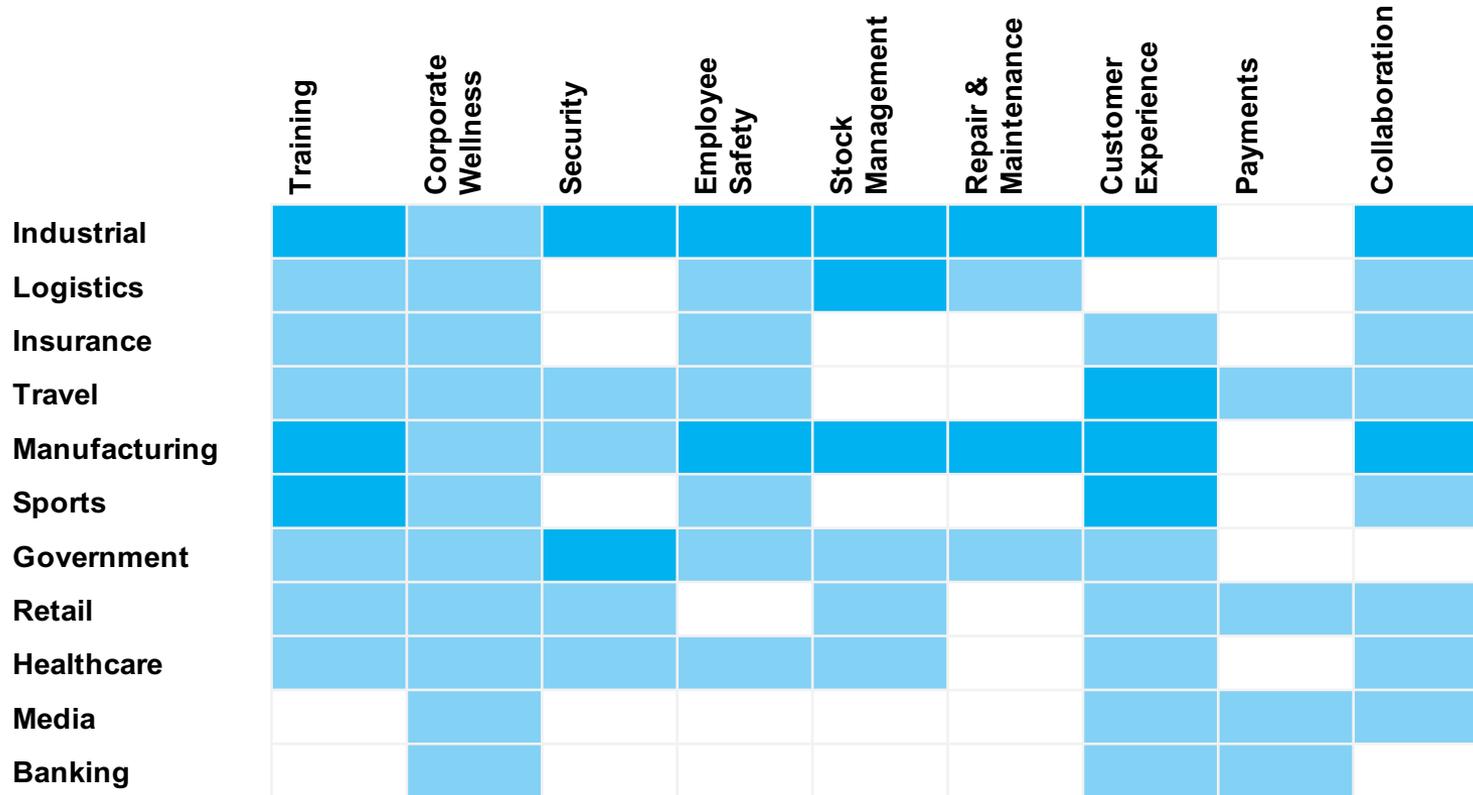
Enhanced ability

Operate and move heavy objects

Speed-up rehabilitation

Integrate sensors with attire for data

Enterprise wearables are found today across industries, with industrial and manufacturing primed for mass adoption.



Source: MD&I analysis of over two dozen IT industry analyst and media reports

Initial enterprise wearable pilots are delivering value in customer experience, employee training, and operational efficiency.

Customer Experience



Their Magic Band wrist-worn device unlocked doors, fast-tracked lines, and ordered food. Magic Kingdom accommodated **3,000 additional daily guests** and **reduced the park entry time by 25%** during the holiday season.⁹

Employee Training

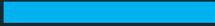


This HVAC, electrical, and plumbing contractor used smart glasses to audibly and visually connect employees with senior technicians for hands-free technical support. The device improved the technician experience and customer satisfaction. The 500-technician deployment delivered a **\$20.11 return for every \$1** Lee invested in the technology.¹⁰

Operational Efficiency



Their “vision picking” pilot used the AR capabilities of smart glasses to view product location, replacing handheld scanners and paper. 20,000 items fulfilling 9,000 orders were picked, **increasing efficiency by 25%**.¹¹



New enterprise models with wearables

Prediction: Wearables will bridge the gap between B2B and consumers, transforming many industries.

The Opportunity

As wearables enable B2B2C solutions, businesses will:

- transform customer experience to be more on-demand and personalized
- create new products and services
- enable customized health offerings for employees
- distribute wearables for employee and customer authentication

Wearable providers will be able to work directly with businesses to offer their customers and employees customized solutions.

Services on the market today will make that change possible.

Salesforce Wear offers tools and applications for B2B and B2B2C solutions. The Salesforce CRM—in partnership with top wearable brands and developers—is used to transmit and track data and information, such as reference material for field workers. Salesforce can also be used to track and implement consumer offerings such as authentication and customized services.

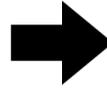
The \$2 billion corporate wellness industry is a prime example of how wearables enable B2B2C opportunities. Wellness providers partner with wearable devices, employers, and insurance companies to collect data and offer more customized benefits and risk profiles.

In the context of a business model, wearables enable innovative and differentiated services and revenue models.



B2B

Wearable manufacturers sell devices to businesses



B2B2C

Wearable manufacturers sell devices to businesses, which resell or use them for customer experiences



As-a-Service

Wearable manufacturers partner with business and data providers and/or buyers to offer devices for services in exchange for data

Bionym is a wearable B2B and B2B2C provider that sells the Nymi authentication band. It's authenticated through the user's heart pattern. A business can sell the band to a user, who can then activate VIP benefits, including customized experiences and incentives.

Fitlinxx is a B2B2C company that provides wearable devices to track health and fitness vitals in partnership with hospitals, insurance companies, and corporate wellness programs. Users receive incentives for participation such as lower health insurance rates.

Wearables will disrupt traditional distributor business models and require companies to provide personalization.

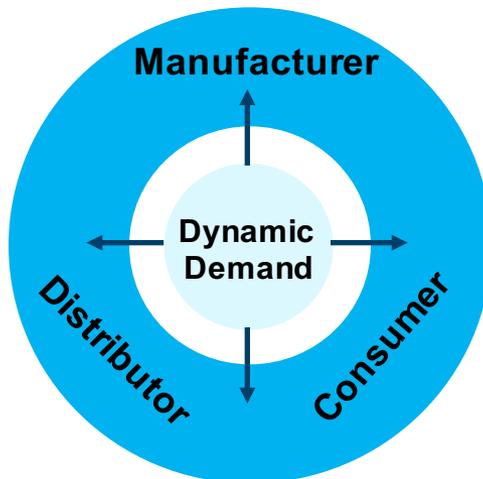
All parties access and analyze data independently.

Without Wearables



With Wearables

- Athletic shirt with sensors monitors performance, tracks vitals, learns, and coaches wearer.
- Shirt business partners with a sports drink manufacturer to sell drinks tailored to the wearer's performance.



- Drink is automatically ordered from a third-party distributor.
- Manufacturer uses the data to improve their products.
- Distributor gets access to data to optimize products and inventory.

- After a strenuous workout, sensor and historical data is analyzed.
- Shirt app coaches wearer on which sports drink will best replenish electrolytes and improve performance and recovery.

As data producers, wearable devices access, control, and/or collect diverse data sets that IoT enterprises can monetize.



Location

Wearable tracks location of injured worker.



Environment

Device data is combined with environmental data to understand patterns.



Attribute

Device monitors user activity to identify health patterns.



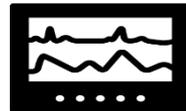
Orientation

Device understands if worker is in a distressed position.



Machine

Wearable used to look inside machines for repairs.



Living

Device monitors and interacts with vitals data for remote healthcare.



Event

Wearable notifies worker in case of emergency.



Motion

Wearable coaches workers on less stressful motions.

Wearables enable a number of revenue generating and cost saving monetization opportunities.



Revenue Generating

- ▶ Derive valuable insights
- ▶ Market to segments
- ▶ Sell data assets to buyers
- ▶ Provide new data discovery interfaces

13.7% of companies use IoT to productize and sell data.¹²

A retailer can use attire sensor data to sell products to segments, and sell data to partners. A retail employee can use a head-mounted display to personalize the customer experience and upsell products.



Cost Saving

- ▶ Optimize staff time and productivity
- ▶ Reduce and prevent operational errors
- ▶ Predict and prevent safety issues
- ▶ Reduce insurance premiums

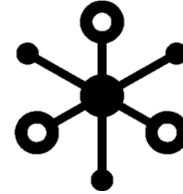
Locke Supply saved training costs by reducing training time from 3 days to 3 hours using a hearable device for warehouse pickers.¹³

Cloud consultancy Appirio cut their Anthem insurance bill by 5% by citing data gathered from employee fitness trackers and their wellness program.¹⁴

In the operating model, command centers will transition to control centers as cognitive and wearables use grows.



Command Center



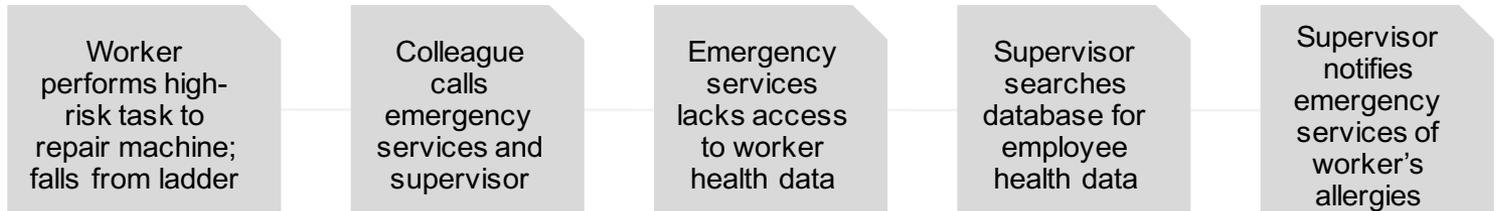
Control Center

Manual	Cognitive
Collects enterprise and other data, with human oversight to take action	Processes and acts dynamically on enterprise and other data with minimal human effort
Monitors	Learns
Analyzes	Predicts
Visualizes	Prevents

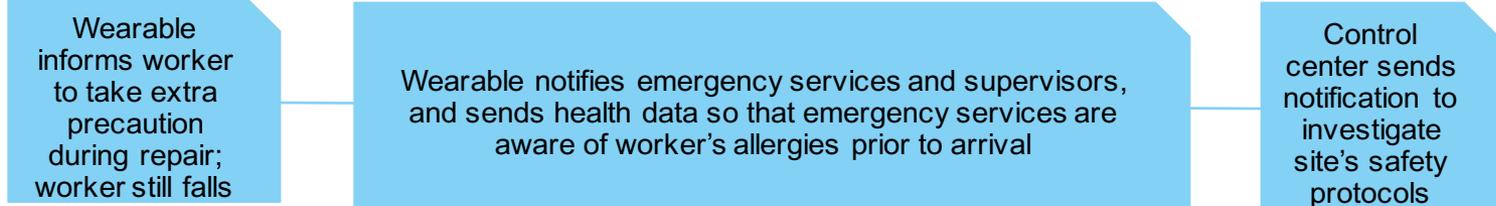
Cognitive and wearable growth

These control centers will drive new and efficient business processes by activating other devices and actions.

Without Wearables: Command center requires manual data input and inquiry.



Utility worker sent to site of previous injuries



With Wearables: Control center enables learning and prediction, and activates processes.

Operationally, wearables can enhance processes, improving productivity, efficiency, and cost-savings.

Process scenario	Select processes with wearables opportunity	
Order/invoicing	<ul style="list-style-type: none"> • e-Commerce/web orders • Returns • Customer specific instructions • Customer pick-ups 	<ul style="list-style-type: none"> • Rebate programs • Rush orders (with add-ons) • Quotations
Shipping and receiving	<ul style="list-style-type: none"> • Warehouse receives delivery via EDI • Proof of delivery • Picking 	<ul style="list-style-type: none"> • Bar coding integration • Dock to stock
Environmental, health, and safety	<ul style="list-style-type: none"> • Safety management • Risk assessment • Employee health monitoring 	<ul style="list-style-type: none"> • Emissions monitoring • Incident management • Corrective/preventative actions
Manufacturing	<ul style="list-style-type: none"> • Goods receipts for production 	
Maintenance and reliability	<ul style="list-style-type: none"> • Maintenance notifications • Maintenance work orders 	<ul style="list-style-type: none"> • Labor confirmations • Emergency work orders
Sourcing	<ul style="list-style-type: none"> • Inspection process • Material returns • Invoice verification 	
Quality management	<ul style="list-style-type: none"> • Field testing/samples (return processing) 	
Warehouse management	<ul style="list-style-type: none"> • Picking from storage • Pick sequencing 	
Inventory management	<ul style="list-style-type: none"> • Obsolete inventory • Inventory monitoring 	

For example, wearables can improve accuracy and productivity in distribution operations.

Pain Points Wearables Address

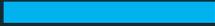
- ✓ Additional hand-held devices not required to identify location and scan items
- ✓ Worker less fatigued from packing, lifting, loading, and unloading
- ✓ Less time required to identify and find inventory location
- ✓ Repetitive processes now automated
- ✓ Variance decreased in training time and skill of workers

Locke Supply used a hearable solution to guide and track picker activity, improving accuracy 95-99%.¹⁵

GM is developing a Roboglove with sensors and actuators to reduce worker picking fatigue.

Head-mounted displays and haptic devices can enable efficient inspection and navigation.





Industry use cases

With technology developments, short term adoption is driven by enhancing experiences and safety, while long term adoption will be driven by brand new services.

	Short Term Multiple sensors and capabilities	Medium Term Non-invasive data collection and application	Long Term Virtually invisible and autonomous new experiences
Industrial	Employee safety; Hazmat detection	Disaster management	Simulate machinery repair
Manufacturing	Field services and training	Remote maintenance	Exoskeletons
Logistics	Warehousing and parts tracking	Measuring parts	Gesture-controlled warehousing
Travel	Check-in; Payments	Customer service and personalization	Facial and personality recognition
Healthcare	Remote patient care; Diet and exercise	Vascular imaging; Clinical trial participation	Remote surgery
Sports	Performance monitoring	Umpiring	Imbedded rehabilitation devices
Government	Law enforcement	Security management	Bio-authentication
Retail	Alerts; Customer service; Payments	Identifying customer preferences	Facial recognition
Insurance	Corporate wellness	Claims management	Underwriting and pricing
Media	Gaming; Advertising	Personal VR/AR devices	Holograms
Banking	Payments	Alerts; Basic services	Bio-authentication

2017

0-1 years

2-6 years

6+ years

Prediction: Most industries will adopt head-mounted displays for business processes, transforming their operations.

The Opportunity

Head-mounted displays will be used across industries for:

- remote collaboration
- access to images, video, and information such as manuals
- object and facial recognition
- holograms and 3D visioning
- internal machine insight and repairs
- simulations and training

These devices will enable greater productivity and collaboration, especially between field/factory workers and headquarters.

39.9m head-mounted display units expected to be sold in 2020, compared to 1.4m units in 2016.¹⁶

Services and developments on the market today will make that change possible.

General Electric's Smart Helmets connect oil and gas field workers with headquarters employees, who guide the workers through tasks with two-way audio and visuals.

Germany's Ubimax is a leading solution provider in Europe that partners with hardware vendors including Epson, Google, Brother, and Vuzix, to deploy head-mounted display solutions across various industry and business value chains.

Purdue University researchers developed an AR tele-monitoring system for surgeons to receive remote guidance on procedures.



In the future...

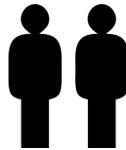
automotive manufacturers will use wearables for cost-effective prototyping and enhanced user feedback.



Prototyping

Virtual reality (VR) used to design prototypes with users for immediate feedback and reduction in time and costs.

John Deere reduced design time by 18 months and design costs by \$100,000 by using virtual reality simulations.¹⁷



User Feedback

Wearables worn by users will provide emotional sensing feedback while test-driving cars.

The Zenta biometric bracelet tracks and analyzes the wearer's emotions overtime, in addition to heart rate, skin temperature, and respiration.



Cost Effective Design

Cognitive trade-off analytics will be used during VR simulations to determine the most resource-effective designs.



In the future...

aerospace companies will use wearables to monitor machinery and enable virtual simulation and remote support for repairs.



Machine Monitoring

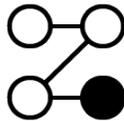
Employee with wearable measures the change in surface temperature, power, vibration, or sound to detect early signs of machine failure.



Repairs

AR used to pull up repair documents for on-the-spot fixes to machines.

The Schlumberger oil and gas company tested Google Glass to replace paper and tablet checklists for field workers.



Simulation

Wearable used to view inside machinery to simulate repairs prior to fixing.

Agricultural manufacturer AGCO Corp is experimenting with hologram-like images to help guide workers through a welding process with three-dimensional images.



Remote Support

Employee uses head-mounted display to video conference with remote expert to advise on repairs.

Prediction: Many industries will track worker movement for health and safety, transforming their operations.

The Opportunity

Wearables can track a range of vitals to:

- coach workers on safety measures
- track workers in distress
- alert supervisors and emergency services
- understand health factors
- monitor actions and activity that put the employee at risk

These use cases are applicable across almost all industries. Businesses will centralize this data into a control infrastructure to properly track and prevent health and safety issues.

10% of wearable patents are for health monitoring.¹⁸

Safety wearables on the market today will make that change possible.

The SmartCap Technologies hat alerts managers when workers operating equipment lose focus. The worker's drowsiness level is measured via sensors in the cap.

AlertGPS integrates location tracking with safety monitoring, combined with a "mobile personal emergency response system (mPERS)" alert system. When a worker falls or is in distress, the system alerts appropriate parties of the worker's issue and location.

Fujitsu's Ubiquitousware package of head-mounted displays, wristbands, and badges can locate workers, track their safety status, and transmit actionable data.



In the future...

oil & gas companies will monitor the location and safety of their workers and provide more immediate emergency assistance.



Safety

Employee uses a wearable device to monitor heart rate and safety factors.

IBM's Employee Wellness and Safety Solution tracks vitals and safety, and alerts workers and management when on-site safety requirements aren't being followed.



Coaching

Wearable virtual personal assistant used to coach employees on safety and health best practices, and alert of potential hazards.

Proxii is an armband that warns utility workers when they are at risk of high voltage, and notify supervisors if there is a warning, shock, or fall detected.



Location

Wearable used to alert supervisors and locate all employees with their health status in case of accident.



Health Data

Wearable stores and can pull up medical and emergency information on employee in case of accident.

Prediction: Exoskeletons will be used to augment strength in a select number of industries, in a transformative way.

The Opportunity

Exoskeletons will be used by enterprises for their employees and for healthcare patients to:

- increase stamina and reduce fatigue
- prevent injury
- make tools and heavy loads lighter
- support physical rehabilitation in cases of limited mobility
- provide bullet-proof protection

Exoskeletons are already being used in the military, construction, warehousing, shipbuilding, and in hospitals.

Exoskeletons in the industrial market are projected to grow 229% per year, reaching \$1.12b in 2021.¹⁹

Use cases and developments in the market show this change is possible.

Researchers at Duke University got eight paralyzed patients to feel sensation in their legs with the use of a VR headset controlling a robotic exoskeleton on their legs.

General Atomic's TALOS program for the military is building a lower-body exoskeleton suit to take armor weight off the spine. The suit can cool in temperature and covers over half the body with bullet-proof material.

The Daewoo Ship Building exoskeleton weighs 62 pounds on the body and can lift 62 pounds. It's projected to be able to eventually lift 220 pounds.



In the future...

logistics workers will use wearables to augment their strength and make their workflow more efficient.



Heavy Lifting

Exoskeleton used to prevent injury and augment strength and productivity for intense jobs.

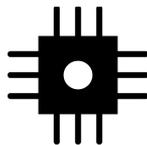
Lockheed Martin claims that its exoskeleton makes shipyard workers 20 times more productive.²⁰



Robotics

Adaptive exoskeleton robot will help workers reduce fatigue and prevent injury from repetition.

Factory floor use of exoskeletons is estimated to save firms up to \$4.1b in lost productivity.²¹



Data fusion

Exoskeleton will be instrumented to sense and fuse data to enhance decision-making and coaching.



Rehabilitation

Injured employee uses exoskeleton to speed up rehabilitation after injury.

Prediction: Retinal devices used to control objects will be transformative across many industries, replacing hand-held devices.

The Opportunity

Wearable devices embedded in retinas are the next generation of head-mounted display use cases to:

- identify, select, and control objects
- adjust and improve eyesight
- take pictures
- authenticate users

Retinal devices will gain in popularity for being more discrete than head-mounted displays.

Patents and prototypes show this change is possible.

Fujitsu has developed several retinal devices for gaze tracking, and iris authentication. One device is a retina scanning laser that uses a micro-projector on glasses to use the retina as a screen. People with impaired vision are able to see more clearly with this device.

A Samsung patented device projects images onto the user's eye and takes and sends photos to their phone via a built-in camera and antenna.²²

University of Washington in Seattle researchers developed prototypes to harvest Bluetooth signals in embedded devices to transmit wi-fi signals. This paves the way for smart contact lenses to connect with other devices.



In the future...

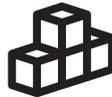
the automotive industry will use retinal devices to increase productivity and enhance customer experience.



Hands-Free

Gesturing used to signal a retinal device to direct machinery in hands-free manner.

Google has patented a smart contact lens that can control other objects by using gestures.²³



Inventory

Connected contact lenses used to identify items and stock for picking.



Eye authentication

Customer will scan their iris to unlock their car.

EyeLock and Voxx Electronics partnered to develop a system for the car to start only when the correct driver's iris is detected.



Gaze tracking

Car windows and mirrors will track eye gaze to alert the driver of potential distractions out of sight.

Prediction: Clothing items with sensors will allow more personalization over time, transforming a select number of industries.

The Opportunity

Sensors on clothing items will activate changes, including to:

- adjust the size of the item
- moderate the item's temperature
- shift colors based on mood
- 3D-print better fitting items
- help athletes adjust form to prevent overuse and injury

Wearables providers will work directly with retail companies to understand and design for customer preferences. This is another example of the bridging of B2B and consumers.

Patents and prototypes show this change is possible.

One university patent uses sensors to adjust the straps and size of a shoe.²⁴

Digitsole is a shoe insole that is temperature controlled via a smartphone. The insole temperature can also be auto-adjusted based on user preferences.

Google patented a fragrance-emitting device for clothing items to monitor odor levels, emit fragrance, and connect to social networks.²⁵



In the future...

oil and gas employees will have connected uniforms that adjust to the wearer's needs.



Temperature

Shirt sensors will measure the outside and body temperature, cooling or heating the shirt to the employee's preference.



Invisible Sensors

Uniforms will be fitted with sensors as small as dust, instead of bulky materials or add-ons.

EPIC Semiconductors reports developing nano cloud processors the size of dust that powers itself and connects to the Internet.



Custom Fit

Employees will wear new gear and uniforms that can self-heal through nanosensors in fabric and fibers.

The Advanced Functional Fabrics of America Institute is developing sensing fabrics that can capture energy, monitor vitals, and engage in self-repair.



Flexible interface

Smart glove with flexible interface will be used to interact with machinery data.



Barriers to implementation

Enterprises face a range of complications from security concerns to legal implications when deploying wearables.



Personal Data

Companies risk loss, manipulation, or theft of employee personal data.



Legal

Wearables open up legal questions of liability.



Health Data

Employee sharing of health data is legally protected, and required to be voluntary.



Safety

Wearables pose safety risks from malfunction to electric or chemical exposure.



Security

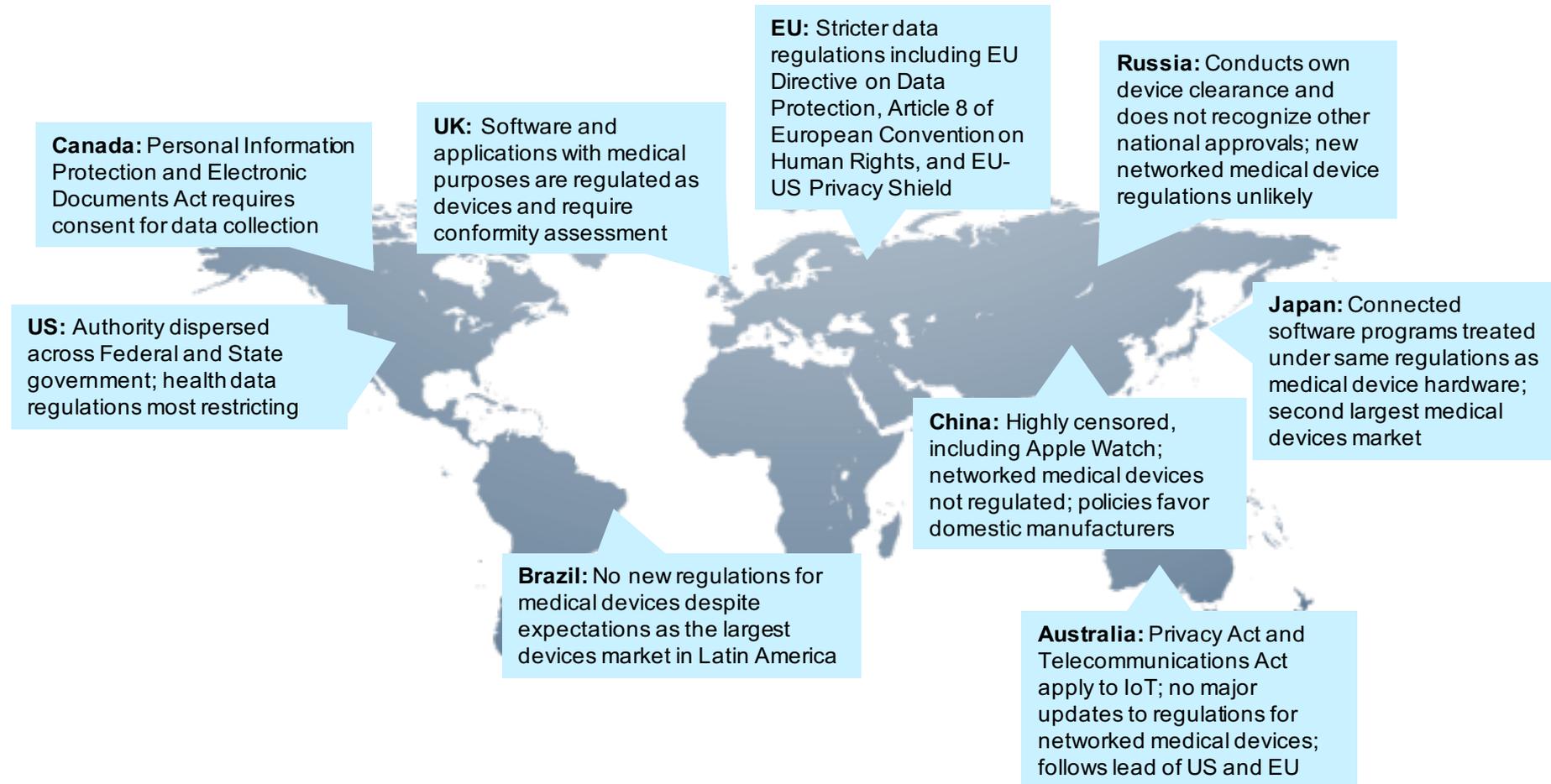
Poor encryption and protections make wearables easy hacking targets.



Video and Search

The legal precedents for use of AR and VR in public and private spaces are nascent.

Global regulations are disparate and slow to change; health data and medical devices are the most regulated.²⁶



PCI Security Standards the same worldwide for secure payment processing

Technical barriers may limit mass adoption until there are improvements in usage, design, and cost.



Long-term use

AR devices can now be worn for up to 8 hours, but not VR devices.



Interoperability

Devices must be able to exchange information with existing software platforms.



Battery life

Battery life not long enough to last a full day shift or long video conferences.



Price

Cost per device remains high.



Aesthetics

Design needs to appeal to diverse tastes while withstanding harsh environments.



IBM's role in the enterprise wearables market

IBM can partner with businesses at different stages of their wearables journey.

Stage of business	Interested in wearables	Strategy around wearables	Conducted B2B pilot/initial deployment with wearables	Conducted B2B2C pilot/initial deployment with wearables
Example use cases	<ul style="list-style-type: none"> Exoskeletons Facial recognition Bio-authentication 	<ul style="list-style-type: none"> Disaster management Remote maintenance Personalization 	<ul style="list-style-type: none"> Employee safety Field service Corporate wellness 	<ul style="list-style-type: none"> Performance monitoring Wellness Payments
Initial engagements with IBM GBS	<ul style="list-style-type: none"> Build value proposition Process/workflow assessment for dynamic insight opportunities Business activity monitoring for workstep value proposition Performance management assessment/dynamic scorecard Market assessment of wearable evolution Assessment of current workforce wearable adoption Cybersecurity assessment 	<ul style="list-style-type: none"> Build standard operating procedures Construct pilot: <ul style="list-style-type: none"> Technical integration Simulation of a wearable's impact within a workflow or process Implementation plan Develop performance metric scorecard to measure effectiveness 	<ul style="list-style-type: none"> Deployment plan Maintenance and refresh approach Process re-engineering: <ul style="list-style-type: none"> Establish command /control center Integrate business activity with dynamic operational data Establish closed-loop performance management with monitoring and metrics Benefits realization and governance model Value assessment of data <ul style="list-style-type: none"> Operational technologies Workforce productivity benchmarks Data monetization strategy 	<ul style="list-style-type: none"> Closed-loop supply chain process for consumer data to transform operations Data monetization strategy for revenue generation Flexible supply chain modeling Deployment plan Maintenance and refresh approach Migrating from assemble-to-order to make-to-order Benefits realization and governance model Value assessment of wearable data <ul style="list-style-type: none"> Product specificity Driving customer-centricity in the product
Ecosystem dynamics	<ul style="list-style-type: none"> Multi-modal application across industries (theme parks, hospitals, hotels) 	<ul style="list-style-type: none"> Service-level agreement session Technical integration camp 	<ul style="list-style-type: none"> Control-center teaming IoT ecosystem consortium (wearables and other emerging technologies) 	<ul style="list-style-type: none"> Control-center teaming IoT ecosystem consortium (wearables and other emerging technologies)

IBM's cognitive solutions exemplify how wearables can improve the workplace and consumer experience.



IBM's Employee Wellness and Safety Solution²⁷

North Star BlueScope Steel has partnered with this Watson IoT and wearable solution to prevent injuries.

Wearable devices collect data from multiple sensors about skin temperature, heart rate, and level of activity, and compare it with external weather data. The solution provides personalized safety guidance to employees, and alerts management and emergency services when issues occur.



IBM + Under Armour²⁸

The UA Record fitness app uses cognitive coaching for data and guidance on sleep, fitness, activity, and nutrition. The app will incorporate visual recognition, personalization, and weather-based data and advice.

Under Armour's wearable gear such as shirts, socks, and wristbands transmit data that is incorporated with larger data sets used for analysis and predictions by IBM's Watson.



IBM + Bragi²⁹

This hearables company has a set of headphones—The Dash—that can receive and transmit instructions and situational awareness, and allow for interaction among colleagues.

With IBM, they are investing in cognitive capabilities in six areas: worker safety, guided instructions, smart employee notifications, team communication, workforce analysis and optimization, and biometric ID.

IBM's Global Watson IoT Consulting Solutions Practice develops and deploys IoT-enabled business solutions to impact an enterprise's top and bottom lines.

	Connected Solutions Deliver differentiated services and new revenue streams in response to evolving market conditions	Building & Asset Optimization Maintain and optimize your cost to serve in unforeseen market conditions, events, and challenges	Next Generation Supply Chain Improve insights and efficiency, and optimize working capital through agile operations
Offerings	<ul style="list-style-type: none"> IoT Insights Workshop IoT Data Monetization Cognitive IoT Connected Devices & Vehicles Advanced metering & infrastructure Blockchain for Operations 	<ul style="list-style-type: none"> Facilities & Asset Management (C2O) – Tririga and Maximo implementation Building Optimization (aaS/C2O) Predictive Asset Optimization Predictive Project Health (aaS) Field Asset Inspection, Monitoring, Maintenance (aaS, C2O) 	<ul style="list-style-type: none"> Working Capital Management (C2O) Workflow Optimization (aaS/C2O) – links connected solutions with process automation I4.0/ CPS Factory (C2O) Supply Chain Optimization (aaS/C2O) Cognitive Manufacturing
Example solution	Adopting wearable technologies for data monetization opportunities	Deploying sensors on employees for optimizing building and energy use	Implementing a wearables strategy for inventory picking and warehouse logistics
IBM's differentiation	<ul style="list-style-type: none"> Industry-specific solutions/semantic models in industrial and energy & utilities Consult to Operate including white labeling Pre-built assets for aaS IoT offerings Pay per Device with Watson IoT 	<ul style="list-style-type: none"> Rules-based optimization Industry specific solutions with asset class detail Simple subscription-based agreement for aaS assets 	

aaS – as-a-service; C2O – consult to operate



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