Hype Cycle for Frontline Worker Technologies, 2021

There has been an increased focus in the last 18 months on supporting frontline workers to ensure they're safe and productive. I&O leaders responsible for supporting frontline workers should evaluate the technologies in this Hype Cycle to optimize frontline environments and processes.

Additional Perspectives

- Summary Translation: Hype Cycle for Frontline Worker Technologies, 2021
(21 July 2021)

Analysis

What You Need to Know

This document was republished on 8 July 2021. The document you are viewing is the corrected version. For more information, see the Corrections *page on gartner.com.*

The pandemic has required organizations to support frontline workers in new ways as they perform new tasks, often alone. For example, frontline workers who are not fully qualified are occasionally needed to assist experts in performing remote diagnosis and inspections due to travel restrictions. Even when travel is reintroduced as an option, financial drivers may necessitate a remote alternative.

To optimize efficiency, organizations must keep investing in mobile technology, including wearable technologies, for frontline workers. These technologies transform the workflows in which these workers participate. Typically, this involves:

- Leveraging various digital tools and data management techniques to improve and integrate their interactions with colleagues, company, and physical and virtual surroundings

- Improving decision accuracy, productivity and first-time resolution

- Proliferating knowledge

- Increasing quality and safety

Gartner predicts that up to 70% of new mobile and endpoint investments over the next five years will be for frontline workers.

For more information about how peer infrastructure and operations (I&O) leaders view the technologies aligned with this Hype Cycle, see 2021-2023 Emerging Technology Roadmap for Large Enterprises.

The Hype Cycle

Frontline workers make up the biggest portion of the workforce, estimated at 2.8 billion workers on a global basis, and can be further segmented into service and task workers:

- **Service workers** primarily spend their time performing client-facing activities. They typically represent the "face" of an organization to customers. Some examples are a delivery person or a retail salesperson.

- **Task workers** primarily spend their time performing operational activities. They typically represent the "heart" of an organization. Some examples are a warehouse worker or someone who works on a manufacturing line.

The pandemic has encouraged a reevaluation of certain frontline tasks and responsibilities. For example, frontline workers have been required to work longer hours; organizations have had to adapt to social distancing requirements; and often a single frontline worker is dispatched on a given task. As another example, new processes for delivery drivers do not require them to collect signatures for deliveries, but instead to photo-document delivery or, in some industries, shift to curbside delivery.
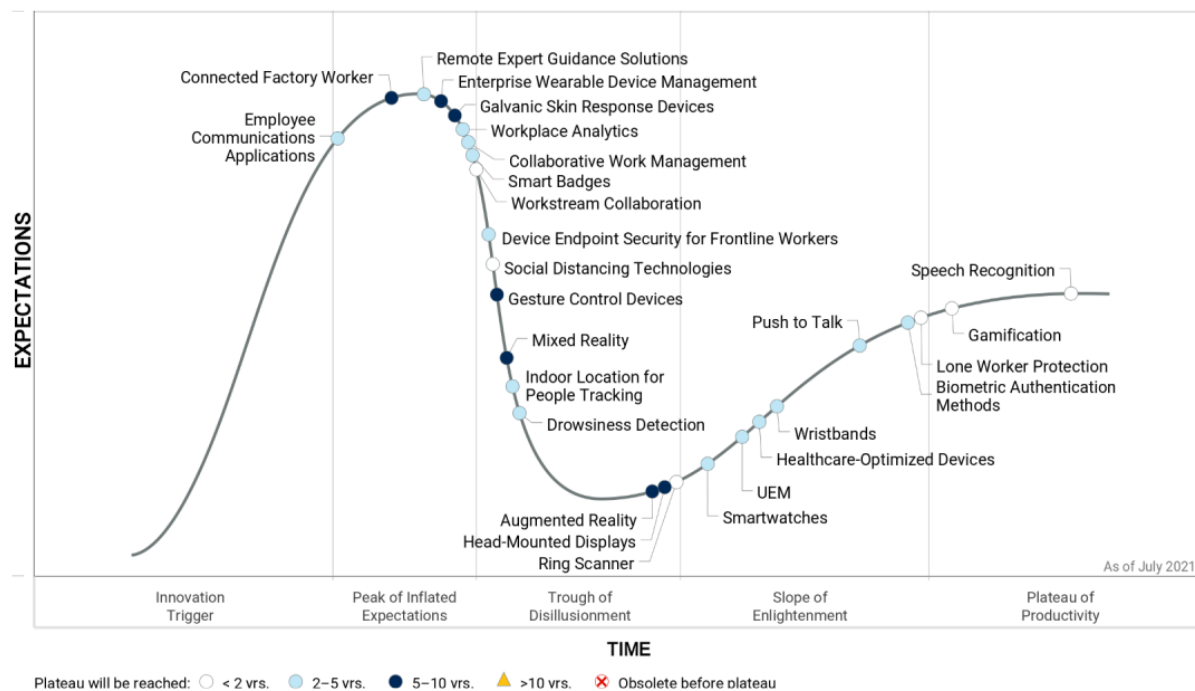
There is a strong affinity between collecting large amounts of Internet of Things (IoT) sensor data, analyzing it, and providing information, typically through dashboards, for the frontline workers to act upon. Increasingly, sensor data analysis is based on machine learning (ML); feeding back this information filtered and sorted, with actions prioritized, is further driving mobile devices into the hands of frontline workers.

Vendors are focusing on frontline workers as a growth segment, integrating frontline-friendly features into products designed with desk-based users in mind. These features include improved support for shared (shift-based) devices, and more straightforward mechanisms for identity and access management and team communication. All frontline workers share a core set of basic communication and collaboration needs, but they also participate in well-defined workflows specific to their role, industry, department, task and responsibility. These workflows demand extensive configurability of the line of business apps, services and hardware they use.

The Hype Cycle contains technologies designed primarily for task workers, but it also includes some technologies designed for service workers, such as employee communication applications, biometric authentication methods and unified endpoint management.

Figure 1: Hype Cycle for Frontline Worker Technologies, 2021

Hype Cycle for Frontline Worker Technologies, 2021

Remote Expert Guidance Solutions
Connected Factory Worker
Enterprise Wearable Device Management
Galvanic Skin Response Devices
Employee
Communications
Applications
Workplace Analytics
Collaborative Work Management
Smart Badges
Workstream Collaboration
Device Endpoint Security for Frontline Workers
Social Distancing Technologies
Speech Recognition
Gesture Control Devices
Push to Talk
Gamification
Mixed Reality
Lone Worker Protection
Biometric Authentication
Methods
Indoor Location for
People Tracking
Drowsiness Detection
Wristbands
Healthcare-Optimized Devices
UEM
Augmented Reality
Head-Mounted Displays
Smartwatches
Ring Scanner

As of July 2021

EXPECTATIONS

Innovation
Trigger
Peak of Inflated
Expectations
Trough of
Disillusionment
Slope of
Enlightenment
Plateau of
Productivity

TIME

Plateau will be reached: ○ < 2 yrs. ● 2–5 yrs. ● 5–10 yrs. ▲ >10 yrs. ✖ Obsolete before plateau

Gartner.

Source: Gartner

Downloadable graphic: Hype Cycle for Frontline Worker Technologies, 2021

The Priority Matrix

As more and more frontline workers are working alone as an effect of the COVID-19 pandemic, there has been an increased focus on technologies to ensure their health and safety.

Lone worker protection, social distancing technologies and contact-tracing capabilities are likely to be requirements when many organizations are planning for the "new normal."

Interest is growing in technologies that enable "no touch" experiences to reduce spreading infectious disease for frontline workers. Examples of these include data entry (speech), wireless access control (such as badges and tags), hands-free UX and biometrics changing from fingerprint readers to facial recognition. However, these technologies may not all deliver tangible business benefits using traditional measurements.

Workstream collaboration, workplace analytics and indoor location for people tracking are increasingly critical technologies for frontline workers. Task workers can see immediate benefits from employee augmentation through the use of wearables such as smartwatches, head-mounted displays and augmented reality. In two to five years, remote expert guidance solutions will allow some service workers to achieve a wider range of capabilities, and to move from traditional classroom-based training to more on-the-job training, accessed on an as-needed basis.

Few technologies have a transformational benefit rating for frontline workers. Speech recognition, together with the connected factory worker, has improved performance and workflows for frontline workers. Employee communication applications enable two-way communications and information dissemination, and deliver an optimized user experience across most industries.

Table 1: Priority Matrix for Frontline Worker Technologies, 2021

(Enlarged table in Appendix)

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational	Speech Recognition	Employee Communications Applications	Connected Factory Worker	
High	Lone Worker Protection Social Distancing Technologies Workstream Collaboration	Biometric Authentication Methods Collaborative Work Management Drowsiness Detection Healthcare-Optimized Devices Indoor Location for People Tracking Remote Expert Guidance Solutions Smart Badges UEM Workplace Analytics	Augmented Reality Head-Mounted Displays Mixed Reality	
Moderate	Gamification Ring Scanner	Device Endpoint Security for Frontline Workers Push to Talk Smartwatches Wristbands	Galvanic Skin Response Devices Gesture Control Devices	
Low			Enterprise Wearable Device Management	

Source: Gartner (July 2021)

Off the Hype Cycle

- Cloud Office: This technology is more directed toward desk-based workers, and so is not that relevant in a frontline worker Hype Cycle.

- Foldables: There aren't really any good use cases for the use of foldables by frontline workers.

- Mobile Identity: There isn't really a separate mobile identity concept any longer.

- Smart Workspace: This technology is more directed toward desk-based workers, and so is not that relevant in a frontline worker Hype Cycle.

At the Peak

Employee Communications Applications

Analysis By: Mike Gotta

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Employee communications applications (ECAs) enable organizations to plan, create, manage, execute and analyze internal communications. The employee value of ECA is based on delivery of relevant content, bottom-up feedback to leadership, and unified access to key applications.

Why This Is Important

Effective communications is strategic in a digital workplace, especially for making frontline workers feel informed and included. ECA enables leadership and those in communicator roles to flexibly interact with workers via multichannel, multidevice experiences and personalized audience segmentation. ECA solutions can positively affect employee experience by creating a sense of belonging, keeping staff aware of safety topics, providing organizational information, and reinforcing business goals.

Business Impact

- ECA solutions help organizations reach the entire workforce, especially staff with limited technology options, so they understand what's going on and what's being asked from them.

- ECA tools provide communicators (those in formal roles responsible for certain types of messaging) the means to plan, manage and analyze communication efforts.

- Workforce value of ECA is based on staff receiving content, providing feedback, and gaining streamlined access to key applications (payroll, benefits and shifts).

Drivers

- ECA tools are part of a broader collection of employee-facing solutions designed to influence and improve both employee experience and organizational culture.

- Leadership teams have largely recognized the value of more effective technology and information sharing with frontline workers who have generally been technologically disadvantaged. While ECA tools are often used across the workforce, they can focus on certain workforce segments. Objectives include better engagement, retention and operational effectiveness.

- Dissatisfaction with email and legacy intranets is encouraging leadership to explore modern ECA tools designed for multichannel and multidevice experiences (including digital signage) with the ability for personalized experiences based on workforce segmentation.

- Campaign-style features enable sequences of messages to be coordinated and delivered to employees following a "journey" concept to "tell a story" related to strategic goals. The concept of communication journeys shifts the focal point of communications from broadcast and delivery to understanding and behavior change to work in new ways and identify with the enterprise mission.

- ECA solutions are primarily used for organizational communications. However, ECA usage is slowly shifting to include operational communications with more emphasis on collaboration and work management (creating synergies with workstream collaboration tools).

- Advanced ECA analytics creates workforce insights that appeal to new stakeholders outside those deciding on ECA strategies, such as those involved in voice or employee and people analytics.

- Vendors in the ECA and emergency or mass notification service (EMNS) are slowly maturing to handle certain types of crisis and urgent communication use cases but differences remain entrenched as to EMNS unique value.

Obstacles

- Business and cultural value from ECA is not commonly known outside those in communicator roles (often in HR and Corporate Comms.), making cost vs. value debates common.

- Deep analytics creates suspicion over tracking or misuse of data, which causes staff (especially frontline workers) to not download the mobile app to personal devices.

- Strategists involved in ECA tool selection can have imperfect market awareness of vendors or insight to features needed to construct effective evaluation criteria.

- ECA vendors come from many different adjacent markets, which makes decision-making complex to find a single solution. Some vendors offer a general intranet option with specific ECA capabilities. Other vendors support broad mobile ECA scenarios with focused intranet features. Some vendors handle ECA needs from other domains such as workforce management, well-being, cloud office or collaboration-related solutions.

User Recommendations

- Establish use cases; identify audience segments, channels, media and content types, campaign objectives, integration needs, application access and analytics by working with stakeholders focused on hybrid work, frontline workers and urgent/crisis communications.

- Assess technical requirements of ECA vendors and select them by including more subjective qualities, such as usability and employee experience. Sustain business value by leveraging employee feedback on ECA usage.

- Ensure operational readiness by taking advantage of ECA vendor consulting options including strategy, proof-of-concept (POC), training and establishing internal support. Execute pilots to assess impact and expand use. Address governance by defining content and administration frameworks to ensure consistency and quality.

- Connect efforts with ECA technology by making use of adjoining strategy areas such as digital workplace, intranet packaged solutions and emergency mass notification services.

Sample Vendors

Akumina; Beekeeper; Dynamic Signal; Facebook; Four Winds Interactive (FWI); Microsoft; SocialChorus, Staffbase

Gartner Recommended Reading

Market Guide for Employee Communications Applications

Toolkit: Employee Communications Applications Vendor and Product Data

Eight Steps for Modernizing Employee Communications in the Digital Workplace

Market Guide for Intranet Packaged Solutions

Connected Factory Worker

Analysis By: Simon Jacobson

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Connected factory workers leverage various digital tools and data management techniques to improve and integrate their interactions with both physical and virtual surroundings, while improving decision accuracy, proliferating knowledge and lessening variability.

Why This Is Important

Manufacturers are under pressure to integrate their factory workforces with their virtual and physical surroundings. They must change cultures from a "break-fix" mentality to being data-driven without sacrificing intuition, efficiency and engagement. It's as much a technology construct that changes how factory workers access information and knowledge to work differently, as it's a change management exercise in workforce development, behavioral shifts and integrated continuous improvement.

Business Impact

The pandemic forced organizations to pivot investments to enhance the operator experience:

- Technologies focus on executing standard work, connecting IT and OT domains, and improving collaboration in and across sites.

- Initial successes are rooted in operational excellence and flexibility.

- Greater returns appear when initiatives are part of a formal workforce development strategy that spans knowledge management, talent management and organizational design, and include learning and development.

Drivers

- Workforce gaps are widening. Digitization in factories is intensifying, while operational know-how fades. New workers are tech-savvy but lack access to best practices and know-how. Tenured workers might have the knowledge, but not the digital nous needed.

- The nature of work in factories is being (re)designed, digitized and improved, impacting worker productivity and communication.

- Intensified digitization, fluctuating labor availability and costs, and social distancing requirements are opportunities to integrate workers with both physical and virtual environments.

- Embedding new technologies into daily work impacts output. It emphasizes the importance of having the right information available to match the task or decision at the moment of need, regardless of interface.

Obstacles

- Overlooking "what's in it for me?": This prevents building a pull-based system for persona-based talent capabilities with continuous learning at its core. Involving workers in the solution design and implementation process helps adoption.

- Defensive buying: Hype means provider vision outweighs capabilities. If technology acquisition isn't done in a planned, coordinated fashion, process change and security will become costly.

- Establishing trust in artificial intelligence (AI): Providers are aggressively pushing AI to the front line. However, incomplete and/or incorrect data, models or applications will impact recommendations, pay or career advancement, and lessen trust.

- Underinvesting in governance: Providing workers with tools to either build their own experiences or redefine standard work eliminates time and effort. Yet, shadow IT and anarchy arise without dedicated operational excellence/continuous improvement teams to manage common requirements and risks.

User Recommendations

- Strike a balance between digital enablement and cultivating future competencies by framing your initiative as part of a broader manufacturing workforce development program.

- Meet the need for diversity of skills, roles and jobs by developing a broad array of connected factory worker use cases anchored by standard work. This lays the foundation for automating non-value-added tasks and enabling data and tools to improve decision making.

- Make your focus the creation of a "data-driven" culture in manufacturing operations by diligently avoiding a scenario where employee creativity and ingenuity is stifled.

- Prepare to balance governance and flexibility during implementation by having clarity on where enterprise standards must give way to local ways of working.

Sample Vendors

Augmentir; Microsoft; Parsable; Poka; PTC; REVER; SwipeGuide; TeamViewer; Tulip; Zaptic

Gartner Recommended Reading

Innovation Insight for the Connected Factory Worker

The 2020 Top Strategic Technology Trends for Manufacturing Operations

Supply Chain Executive Report: Developing the Supply Chain Professional of 2025

Optimizing Production Post-COVID-19 Swings the Pendulum From Managing Things to People

Remote Expert Guidance Solutions

Analysis By: Chris Silva

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Remote expert guidance (REG) solutions provide two-way communication between a centrally located expert and workers in the field through mobile and wearable devices. Using a device camera, centralized personnel receive a live view of the field employee's environment and task being performed, allowing the expert to provide verbal guidance and visual cues that overlay the remote worker's view. Tools can capture sessions for training, post-task audit and performance analysis.

Why This Is Important

As more workers are forced to work remotely or independently or both due to pandemic restrictions, the use of REG solutions has grown in relevance. Once the domain of specialized workers requiring detailed guidance, REG tools have now been pulled into more pedestrian activities such as end-user IT support, inspections and audits, and directional guidance for lone workers.

Business Impact

REG solutions offer critical support for field workers conducting specialized, delicate or dangerous remote work. As fewer experts can participate in field activities due to social distancing and occupancy restrictions, the impact of REG solutions has grown. The benefit rating has changed from "moderate" to "high" as these solutions help quickly resolve issues well beyond providing on-demand advice to field workers. In field use cases, REG solutions help avoid errors and offer remote completion of critical tasks once done by dedicated staff.

Drivers

■   Use cases where hard-to-find experts can support less-experienced field workers with highly specialized and complex tasks.

■   Demand for immersive, remote learning for specialized curricula, such as one university hosting virtual anatomy and dissection labs for medical students learning remotely.

■   Increase in the percentage of organizations relying on wearable devices to guide remote business processes, such as inspections due to occupancy and social distancing regulations.

Obstacles

- General remote control and support tools can offer some of the features of an REG solution, such as basic screen markup to assist support activities with less complexity and potentially less cost.

- Gartner considers the market for general remote support tools separately from REG, which is still viewed by many buyers as a product with a finite set of use cases. This has hindered the adoption of REG for commodity support and remote collaboration use cases.

- Many organizations tie the use of REG tools to the need for wearable devices, despite the majority of REG tools being consumed on standard smartphone and tablet hardware.

User Recommendations

- Focus on REG solutions for use cases that cannot be met adequately by existing remote control and support solutions.

- Adopt REG technology where capture and reuse of live session recordings and associated metadata is needed for training and development.

- Seek REG functionality to support specific device hardware (such as HMDs) not supported by less specialized, remote support tools.

Sample Vendors

Delta Cygni Labs; Fujitsu; Librestream; OverIT; PTC

Gartner Recommended Reading

Emerging Technologies: Top Use Cases for Enterprise Augmented Reality

Enterprise Wearable Device Management

Analysis By: Chris Silva

Benefit Rating: Low

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Enterprise wearable device management is the set of management functions to centrally monitor, update and configure wearable devices, such as head-mounted displays (HMDs), VR headsets, smartwatches and other body-worn sensors. These tools are commonly used by end-user computing (EUC) teams, and exist as a subset of management capabilities in unified endpoint management (UEM) tools.

Why This Is Important

Wearable devices have gained a permanent place in the role of many field, logistics, medical and other vertical-industry-specific and highly specialized applications. The push to remote and hybrid work in 2020 opened new use cases for wearable devices, though IT leaders' demand for wearable-specific management remains modest, in line with the adoption of wearable devices as workers' primary device.

Business Impact

The benefits of wearable-specific management capabilities mirror those of other endpoints that UEM tools manage; the ability to deliver consistent configuration and support, at scale. These devices can be configured manually with significant overhead needed to do so. The analytics and telemetry data that can be gathered from devices when managed in a capable, cross-platform tool can support better investment and planning decisions on hardware and identifying use cases.

Drivers

- Supporting remote learning for highly specialized curricula; in one example, HMDs were shipped to medical students learning remotely to maintain continuity of learning when physical presence in the school's anatomy and dissection lab is not possible.

- The need to measure and track physical vital signs as part of COVID-19 protocols for return to work and in hybrid workplaces is driving demand for wearables.

- Support for managing wearable devices using the Android operating system has been common in UEM tooling for some time. The support has traditionally been limited to devices with a business-only or primarily business or industrial use cases. Gartner has witnessed vendors adding support for primarily consumer-focused devices like the Oculus family of devices from Facebook, in recognition of the broad availability of, and interest in, these devices in enterprise contexts.

Obstacles

- Forty percent of IT leaders highlighted to Gartner that cost savings is a No. 1 or No. 2 priority coming out of 2020. Gartner has observed wearable pilots and programs being curtailed or limited, respectively. Gartner believes that this drop in overall interest will be time-limited and does not represent a shift in the importance of wearables in the long-term end-user computing strategies of organizations.

- Many of the devices being eyed for these purposes, such as fitness bands and smartwatches, may not benefit from, or be directly addressable by, enterprise wearables management.

User Recommendations

To minimize unnecessary investment, IT leaders must:

- Source wearable device management from existing endpoint management vendors, and avoid proprietary tools when possible; the fortunes of dedicated enterprise wearable device manufacturers have been subjected to great volatility during the past two years.

- Implement the viability of managing and supporting wearables as a key element of decisions concerning sourcing wearable hardware.

Sample Vendors

42Gears; Augmate; BlackBerry; Microsoft; Samsung; VMware; Vuzix

Gartner Recommended Reading

Forecast Analysis: Wearable Electronic Devices, Worldwide

Market Definition and Methodology: Wearable Electronic Devices

Emerging Technologies: Head-Mounted Displays for Augmented, Mixed and Virtual Reality

Peer Connect Perspectives: Implementing Wearables Within an Organization

Galvanic Skin Response Devices

Analysis By: Anshul Gupta, Roberta Cozza

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A galvanic skin response (GSR) device is used to measure electrical conductivity of the skin to help understand a user's physiological and psychological condition. The electrophysiological signal is generated by the sweat glands. Sweat may cause measurable variations in conductivity and resistance, though vascular dilatation and constriction may also contribute.

Why This Is Important

GSR sensors are closely linked to determine human emotions, though they measure only the level of intensity, not state (happy or sad). But it is more important to enhance human-machine interface (HMI) in the workplace.

GSR is being applied across various use cases, which include emotion detection (fear, happiness, threat), clinical research and treatment (depression, post-traumatic stress disorders), and usability and marketing research (product and media content assessment).

Business Impact

GSR devices could be used to measure human reactions to marketing ads in real time. GSR devices used along with other biometric-technology-based devices such as EEG, eye tracking and heart rate measurement help to get an improved understanding of human reactions, types of emotions and engagement levels. GSR devices could also be used within healthcare to treat patients suffering from trauma, depression, phobia or mental health problems.

Drivers

Some drivers for adoption of GSR are:

- GSR devices can be easily set up compared to other biometric-technology-based devices like electroencephalography (EEG), electrocardiogram (ECG), electromyographic (EMG) or heart rate variability (HVR). GSR sensors can be integrated into small wearables with wireless sensors, enabling them to be used in a natural, nonsitting position, raising its usability and use cases.

- GSR devices' inexpensive sensors and ease for visual inspection also make them preferable over other competing technologies.

- Physiological readings from GSR devices in addition to other biometric devices are being used to recognize the digital signature of COVID-19. A deep-neural-network-based solution is being used to interpret data to detect COVID-19 and is being deployed across nursing homes and assisted living to keep work and medical facilities safe.

- The application of GSR in helping frontline healthcare workers and creating safer workplace environments in post-COVID-19 phases will be crucial.

Obstacles

Some obstacles for GSR adoption are:

- The slow response times of GSR devices greatly influence design and implementation to facilitate longer stimulus exposure time and interstimulus intervals.

- GSR devices can only measure the intensity of emotions, not the type of emotions. Thus the use cases of GSR devices in isolation are limited, and the devices' potential is better realized when used in combination with other biometric technologies.

- The use of wearable technology in the workplace is not new. However, the increasing sophistication of these technologies and their rapid evolution put them at risk of being seen as creepy. Employees may see such GSR technologies as an invasion of their privacy; employers will need to be very cautious in their approach to use GSR devices for legitimate business interests.

User Recommendations

- Use GSR and other biometric-sensor-based devices to detect and monitor COVID-19 in real time to keep workplaces safe.

- Measure emotions, such as happiness, sadness and stress, to monitor and treat patients suffering from trauma or depression using GSR-enabled devices.

- Observe and analyze stress, fatigue levels and performance among public safety employees, such as law enforcement officers, emergency workers and firefighters, through GSR-enabled wearables.

Gartner Recommended Reading

Competitive Landscape: Emotion AI Technologies, Worldwide

Workplace Analytics

Analysis By: Dan Wilson, Stuart Downes

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Aggregated insights derived from technology performance data and organizational context are used to improve technology performance and adoption as well as influence employee experience, collaboration and productivity. Data is commonly collected through agents, sensors, graphs or APIs.

Why This Is Important

While many organizations are making significant investments in digital workplace and digital transformation initiatives, most are not collecting data on or are unable to effectively measure the impact of their efforts. Without data and analytics, digital workplace leaders are unable to justify additional investments required to scale new technology. This is especially important given the financial pressure that organizations are under and increased demands to improve employee experience.

Business Impact

Workplace analytics (WPA) provide digital workplace leaders visibility into the impact on digital and organizational change management, including:

- Transparency into technology performance and usage.

- Application of organizational context data.

- Derived insights, which help uncover ways to drive adoption and enhance experience, identify productivity inhibitors, and help improve technology and business alignment.

- The ability to feed data into or include nudge engines to reinforce best practices.

Drivers

- Overall employee experience is now heavily influenced by the technology experience as the majority of interactions with peers, vendors and customers are exclusively through technology. IT leaders are looking for data to baseline and measure the progress of improving the stability, availability and performance of the devices and systems they deliver, especially as changes are made.

- Digital transformation requires visibility into what technology employees depend on, and how well they can use technology to improve work and improve productivity.

- The increased threat of cyberattacks requires IT and security teams to understand what devices and technology are being used and from where they are being used so appropriate measures can be implemented to reduce risk. This includes use of unmanaged devices (BYOD or BYOPC) or public conferencing technology to conduct internal or confidential classified business.

- Remote work has limited a leader's ability to see and adjust collaborative behaviors and patterns, as they could in the office. The patterns themselves have also changed to be less timebound, requiring leaders to adjust accordingly.

- Organizations are also looking for data to inform the return to the office as a collaboration hub by prioritizing those that are struggling with remote work and for insights into potential employee engagement and wellness issues.

- WIth all of this data and advanced analytics, organizations can also look to identify and promote best practices.

Obstacles

- The inability of IT, HR and business leaders to agree on requirements and use cases.

- The tendency to use dashboards before defining the questions leaders seek to answer.

- Union workers or legal/regulatory limitations on data collection due to privacy concerns within some organizations.

- The threat that leaders with trust issues may misuse data for employee surveillance.

- The failure of change-averse teams to adopt processes focused on delivering change based on analytics-derived insights that, instead, continue to use historic precedence.

- The cost of several tools or capabilities to aggregate data and insights from other digital workplace technology management tools.

- Paying too much attention to experience scores and benchmarking inside analytics tools, which can misclassify efforts due to algorithms lacking context or sophistication.

- A delta between what organizations want from WPA and what can actually be done with the data collected.

User Recommendations

Hype has passed the Peak of Inflated Expectations as more organizations are using WPA, but some are struggling with the need to use multiple tools or aggregate several data sources to maximize value. Gartner recommends:

- Consolidate requirements and align collective goals to corporate objectives by collaborating with shared services and line of business peers.

- Ensure policy and legal compliance by partnering with HR and Legal.

- Avoid tool sprawl by reviewing existing capabilities or potential upgrades before buying new.

- Minimize risk by training managers on appropriate use before granting access and ensuring that employees understand the intent and use of WPA.

- Avoid irrelevant comparisons to other companies by using tool-provided experience scores to baseline and measure your own progress.

Sample Vendors

ActivTrak; Avanade; Humanyze; Microsoft; Sapience; Scalable Software; Worklytics

Gartner Recommended Reading

Enhance Digital Workplace Operations With Machine Learning and Automation

Adapt the IT Operating Model to Deliver Indispensable Digital Workplace Services

Top Strategic Technology Trends for 2021: Anywhere Operations

Optimize End-User Services Through Segmentation of Work Settings

Enablement Mindset Is the Missing IT Ingredient to Improve Workforce Digital Dexterity and the Employee Experience

Collaborative Work Management

Analysis By: Nikos Drakos

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Collaborative work management (CWM) tools provide task-driven workspaces that support business users in work planning and execution. They combine task, project, workflow and automation capabilities with conversations, content publishing, reporting, analytics and dashboards.

Why This Is Important

CWM blends work modeling and planning with management oversight and work execution. CWM fills a gap between free-form collaboration and business or custom applications by supporting emergent structure and coordination, such as in organizing a marketing campaign coordination or in planning an event. CWM technology supports work that can be planned top down, as far as it is possible to plan it, while enabling flexible, self-organizing execution and collaboration.

Business Impact

- Improve activity coordination in a flexible and agile manner

- Empower business users with sophisticated but easy-to-use tools for planning, execution, coordination, optimization and, increasingly, automation of day-to-day work

- Transparency for oversight, as well as the ability to define and fix guardrails that represent constraints on outcomes, timelines, budgets or resources

- Real-time visibility into execution with status roll-ups, dashboards and notifications depending on role or interest

Drivers

- Remote and hybrid work: Rise in interest in CWM, consistent with the recent increase in remote and hybrid work. In-person meetings and conversational channels that lack focus and context and are not enough to provide clarity and alignment — for example by modeling objectives and key results in a flexible and dynamic way. CWM tools are a natural complement to workstream collaboration and/or meeting solutions.

- Supply-side investments: There is notable investment activity and early signs of market consolidation on the supply side. In 2020 we had the Asana IPO as well as the acquisitions of Workfront and Wrike by Adobe and Citrix, respectively. But there is also no shortage of new vendors entering the market (we are aware of at least 80 vendors in the CWM market).

- Interest from vendors in adjacent markets: Vendors are entering this market from multiple adjacent markets (including project management, workstream collaboration, cloud office suites, employee communications, and business applications) contributing to the diversity and heterogeneity of the available products. They are recognizing an opportunity to position their products as solutions that appeal to a much broader user base.

- Demand generation tactics: Vendors are trying to attract business buyers with prebuilt work templates and/or generate demand directly by targeting end users with free/freemium products. One consequence of this use-case-specific vendor push is that many organizations end up purchasing more than one product, each narrowly deployed in a narrow business domain.

- Rising customer demand for a variety of work use cases: Buyers are recognizing the relevance of CWM to work scenarios that are collaborative by nature.But, they also require activity coordination in a context that may not justify purchasing or building specific solutions for everyday or ad hoc projects, case management, service management, product management, work scheduling, etc.

Obstacles

- Vendor and product risk: Most of the vendors in this market are small, in a market that is changing rapidly and where large platform vendors have yet to play their hand. This means buyers face a higher vendor and product risk than in more mature markets.

- No enterprise role for steering large scale deployments successfully: CWM solutions are introduced into many organizations by end users or via small departmental deployments. Most organizations using CWM solutions are introduced tactically without a coherent plan of what it would mean to operate them at scale.

- Lack of experience on governance at scale: When business users are effectively building applications for modeling work, it has implications for roles and responsibilities, quality control, release management and support.

- Culture attitudes and skills readiness: Not everyone will be comfortable or willing to work transparently or welcome more autonomy. Also, some may not have the digital skills to use the technology effectively.

User Recommendations

- Identify business context: Establish specific work management use cases and identify participants, activities and context by working together with relevant business stakeholders to ensure business alignment.

- Address governance issues: Address inevitable governance questions by determining access rights to work management capabilities to ensure consistency, quality and reuse.

- Start small and iterate: Test product and vendor readiness by starting with small, targeted deployments, making sure that use-case-specific issues and vendor readiness are addressed. Focus early deployments on situations where working transparently and collaboratively is already the norm to minimize the challenges from culture and behavior attitudes. As usage grows, rationalize technology choices, including interoperability with existing technology. Establish roles, support structures and governance principles to ensure consistency, quality, and best practice diffusion.

Sample Vendors

Adobe; Asana; Atlassian; Citrix; monday.com; Smartsheet

Gartner Recommended Reading

Market Guide for Collaborative Work Management

Toolkit: Collaborative Work Management Vendor and Product Data

Quick Answer: Which Technologies Can Support an Objectives and Key Results Program?

Market Guide for Marketing Work Management Platforms

Smart Badges

Analysis By: Tracy Tsai

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Smart badges are miniaturized integrated circuit cards in a device form factor that have built-in sensors and the ability to transmit data wirelessly. Sensor examples are infrared sensors, accelerometers, microphones and scanners. Unlike access management smart cards or smart IDs, smart badges are devices that provide advanced features, such as location-based contextual services and analytics, to improve workplace communication, operational efficiency, and employee well-being and performance.

Why This Is Important

Smart badges are increasingly important, especially for frontline workers' safety and health during the pandemic. Examples include contactless operation for workplace access and employees' location tracking for social distancing. Enterprises are seeking innovative technologies in the digital workplace to improve frontline workers' engagement and performance. Smart badges, other than employees' identities, can serve multiple functions to support enterprises' goals.

Business Impact

Smart badges bring high benefits for IT leaders to improve the digital workplace, such as:

- Increase workers' operation efficiency for hands-free identification verification and access authentication — for example, POS or equipment operations.

- Monitor workers' social distance during COVID-19 for employees' safety.

- Augment business with real-time context about the workers and surrounding environment, such as location-based data.

- Improve workers' experiences in the workplace and productivity.

Drivers

Smart badges worn by employees in the workplace have become an important information point about employees and their surrounding environment. Below are the major drivers to move smart badges from the Peak of Inflated Expectations to the Trough of Disillusionment:

- Enterprises' demand to improve the digital workplace for better user experience, such as quick and hands-free identification verification, access authentication, product codes scanning, information checking and task status reporting. Examples include contactless operation for retail POS systems to identify workers who are in close proximity or security authentication for single sign-on within organizations for access control.

- Emergency management by tracking and alerting the nearest available staff on where to go when urgent help is needed.

- Keeping employees' safe, such as. keeping social distances, providing contactless operation to reduce employees' infection during COVID-19, monitoring the fall sensors to detect workers' operational safety, avoiding a collision in forklifts or providing panic buttons.

- Event management to support attendees with personalized experiences and services, such as event schedule and notification. With E Ink's technologies, smart badges for event visitors can be repeatedly used with customizable context on the smart badge's display.

- Maturity of the technology solutions, such as electronic ink, RFID, NFC and sensors, enable smart badges to provide benefits, including customizable context, easy-to-see large displays, mobile payment, or added safety and security functions.

Obstacles

Despite all the benefits and drivers of smart badges in digital workplaces, it will still take two to five years for smart badges to reach the Plateau of Productivity. Here are the major obstacles:

- Employees' privacy is a concern. The smart badges constantly collect information about frontline workers' status, raising the concerns about the intrusion of privacy, potentially reducing workers' morale or and creating resistance toward smart badges.

- Complexity of integrating multiple technologies is a challenge for IT leaders based on different use cases and requirements. There is no "one size fits all" solution in the market.

- Fragmented technology solutions, such as wireless connectivity, sensors, electronic ink, audio, display, form factors and software applications, vary in maturity level.

- Strong justification for investment is needed due to the time and resources required to identify the business cases and conduct a proof of concept (POC) for each application.

User Recommendations

- Work with line of business (LOB) leaders to identify which of their issues and objectives can be assisted by apps for smart badges.

- Clearly explain how employee privacy is protected when implementing smart badges. Enterprises need to let frontline workers understand in advance what's being tracked and analyzed.

- Partner with technology providers to jointly develop the POC that supports not only the applications, but also helps technology providers build their understanding of the business domain.

Sample Vendors

Boni Global; E Ink; Group Dynamics; HID Global; Humanyze; Microchip Technology; PwC; rf IDEAS; SoloProtect; Zebra

Gartner Recommended Reading

Manage Social Distancing and Contact Tracing With Location-Aware Technologies and Devices

Workstream Collaboration

Analysis By: Mike Gotta

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Workstream collaboration (WSC) tools create a persistent chat-based workspace divided into channels. Tools integrate direct and group messaging, along with meeting capabilities, file sharing, alerts, activity streams, tasks, bots, search and other plug-ins. They also come with APIs for customized applications.

Why This Is Important

WSC tools improve aspects of teamwork, especially intrateam messaging. They combine support for channel-based chat, information sharing, task coordination and meetings in order to act as team activity hubs. They help coordinate work, regardless of where team members are located — a key feature for hybrid working. Although still not popular among frontline workers, WSC tools will increasingly impact operational work and external collaboration.

Business Impact

WSC tools help team communication, information sharing, task coordination and management of the overall work process by acting as new work hubs. They also act as governance points for security and compliance, helping to safeguard organizational communications and content.

Business use cases include project management, service and support, sales, marketing and operational scenarios.

WSC tools also help maintain continuity as hybrid teams split their time between remote and on-premises working.

Drivers

- The shift to hybrid working models makes WSC tools essential to satisfy communication, information-sharing and task coordination needs, and creates synergies with collaborative work management tools. It also supports work governance, security and compliance, sometimes via third-party add-ons.

- COVID-19 has prompted a significant increase in the number of remote workers, who need a common work hub to support individual and team productivity in lieu of in-office interactions.

- Online meetings with audio and video support are a fundamental requirement for organizations, and this has resulted in tremendous reliance on WSC tools for everyday productivity.

- Many WSC tools natively support, or are easily integrated with, content services to provide workgroup management of files, which also aids remote working.

- Additional integration capabilities of WSC tools enable plug-ins for other needs, such as tasks, meetings and intranet services. They also enable developers to create more custom extensions.

Obstacles

- Although Microsoft and Google offer native WSC tools, not all business scenarios can be accommodated by everyday productivity suites. This can prompt organizations to adopt multiple WSC tools, which increases costs and complicates IT management.

- WSC vendors are not collaborating on message interoperability. Use of multiple tools to ensure workers can communicate creates "chat silos" and can lead to "tool sprawl." Although third-party vendors use public APIs to exchange messages between tools, risks arise if these vendors lack contractual relationships with WSC tool vendors.

- Frontline workers have not adopted WSC tools to the same extent as office workers. WSC tool vendors need to better address the distinct needs of frontline workers and adjust their offerings.

User Recommendations

- Assume everyday productivity needs can be satisfied by the incumbent productivity suite vendor (Microsoft or Google) when evaluating WSC tools. Remain open to adding WSC tools for process-driven and operational-role-based work when assessing business use cases that are not productivity-centric. Consider frontline workers' needs as being "stretch goals" for many WSC tool vendors.

- Prioritize a strong focus on employee communications, a champion program, analytics, training and promotion of best practices based on successful use of WSC tools by staff, in order to reinforce new ways of working.

- Onboard new team members using WSC solutions and establish the right usage behaviors early.

- Reduce "noise" and fatigue by educating staff about chat etiquette and communicating best practices for using WSC tool features by, for example, showing them how to fine-tune alerts and notifications.

Sample Vendors

Cisco; Coolfire; Google; Mattermost; Microsoft; Rocket.Chat; Salesforce (Slack)

Gartner Recommended Reading

Market Guide for Workstream Collaboration

Forecast Analysis: Workstream Collaboration, Worldwide

Forecast Analysis: Social and Collaboration Software in the Workplace, Worldwide

Device Endpoint Security for Frontline Workers

Analysis By: Patrick Hevesi

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Device endpoint security for frontline workers includes a set of technologies that provide protection for purpose-built devices and their users. Depending on the industry and use case, devices may need to be physically secured to permanent stations, tracked and checked out for use during a shift, or possibly used by multiple users in a particular area.

Why This Is Important

Frontline workers work mainly from fully managed, purpose-built, locked down, ruggedized mobile devices tailored to their job. These devices come at a premium and are hard to update and patch to maintain their security. This has led some organizations and vendors to explore personal devices with protection around the mobile applications. This, however, provides less control than a fully managed device and can open up the organization to loss of productivity, data leakage or other malicious attacks.

Business Impact

In many cases, frontline devices are off-premises and handled by customers, contractors, temporary staff, and employees. Frontline scenarios involve access to sensitive and critical systems, which raises the risk and need for precautions, and a combination of solutions may be necessary to mitigate all possible security risks. Some solutions are built for traditional mobile management scenarios and not frontline workers, and may need custom development work to meet security requirements.

Drivers

- More companies are enabling frontline workers with access to cloud SaaS applications, which exposes organizations and workers to additional cloud security risks.

- Risk of data leakage or other malicious attacks has caused security teams to reevaluate their frontline endpoint security strategy and architectures.

- In line with the BYOD trend, organizations are increasingly allowing use of personal devices driving the need for new solutions around mobile application management (MAM) and mobile threat defense, resulting in deployment of application-level container solutions.

Obstacles

- Covering all fronts in terms of security often requires addition of multiple layers based on the multiple use cases encompassing specialized hardware and additional cloud functionality. This leads to additional costs that organizations may have not accounted for.

- Endpoint security for frontline workers needs to include physical security solutions like camera, check-in/check-out processes, user and device identity management, shift-based devices where data needs to be cleared after each use and geographic/location type protection. These requirements further elevate the cost and difficulty of deploying device endpoint security solutions for frontline workers.

User Recommendations

For managed devices requiring specialized solutions:

- Leverage purpose-built, specialized solutions.

- Fully manage and lock down the devices with EPP, UEM or MAM.

- Ensure that OS security settings, updates and patches are applied.

- Ensure that physical security is in place (e.g., cables for kiosks, geofencing/geolocation for on-the-move devices, check-in/check-out processes for multiuser devices).

For unmanaged devices, where LOB and other collaboration apps are allowed to run:

- Use UEM tools to apply MAM policies to add layers or encryption, MFA and time-based lockout on worker apps.

- Evaluate MTD vendors for device-based risk attestation, with apps managed by MAM.

For custom-built worker apps:

- Ensure that LOB apps are engineered with secure design principles and custom-built multiuser authentication.

- Use app shielding, app wrapping and in-app MTD (or generally, "in-app protection") to protect your IP within binaries and apps in runtime on a device.

For cloud-based apps:

- Use CASBs for threat and data protection.

- Use adaptive access control for frontline users and devices when they consume external SaaS services.

Sample Vendors

CommuniTake Technologies; Imprivata (GroundControl); Lookout; Microsoft; Samsung Electronics; SOTI; Symantec; Veracode; Zebra Technologies; Zimperium

Gartner Recommended Reading

Guide to Endpoint Security Concepts

Market Guide for Mobile Threat Defense

Advance and Improve Your Mobile Security Strategy

Social Distancing Technologies

Analysis By: Leif-Olof Wallin, Nick Jones

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Social distancing technologies help to encourage individuals to maintain a safe distance from each other. Some of these technologies and solutions also provide contact tracing capabilities if an individual is discovered to be infected. Contact tracing can be implemented in many ways, including via an app on a smartphone, as a feature of a location tracking system, via a dedicated wearable device or using observational tools such as Wi-Fi or video analytics.

Why This Is Important

Social distancing technologies provide a tactical solution to help organizations and individuals deal with the COVID-19 pandemic and implement a duty of care for employees. They can help organizations whose business requires workers to be present in spaces such as offices and factories when home working is impractical. Social distancing can help reduce the likelihood of infections spreading in the workplace, and the technologies provide contact tracing to manage risks if infections do occur.

Business Impact

Social distancing is one part of a multidimensional strategy that includes behavioral guidelines, new working practices, COVID-19 testing, attestation, workplace sterilization and controlling visitor numbers. It is valuable when the organization cannot operate without on-premises staff or where there are regulations or a legal duty of care to minimize the risks employees face. Most systems are based on modifications of existing technologies, so we expect maturity within two years.

Drivers

- Some organizations, such as factories, warehouses, construction sites and process plants, cannot operate without on-site employees.

- Minimizing infection risk is good business practice, beneficial for employee relationships and, in some cases, a legal requirement.

- The organization wants to provide tangible evidence to employees (and sometimes visitors) that the organization is concerned for their welfare.

- Without technological support, effective contact tracing is very difficult to implement.

- Some systems can support other valuable anti-COVID-19 goals, such as encouraging regular hand washing.

- Social distancing systems that track an individual's location can provide data for workplace and process restructuring to further reduce risk.

Obstacles

- Most technologies have significant flaws related to distance measurement and will generate false positives and negatives.

- Some users will feel social distancing is an invasion of privacy because it involves location and behavior tracking.

- The cost can be significant, in some cases, hundreds of dollars per employee accompanied by monthly service charges. Many solutions are seen as "throwaway" and will be discarded when COVID-19 is under control. So organizations may be reluctant to invest.

- Social distancing cannot prevent infection, only reduce the risk of infection.

- In general, social-distancing tools are more effective for use by employees than visitors.

- Smartphone-based systems have significant technical limitations unless used in conjunction with other technologies such as beacons.

User Recommendations

Organizations that need to manage risk as staff return to work after the pandemic should consider social distancing technologies because:

- Despite their limitations, any form of risk reduction is better than none.

- Industrial, construction and blue-collar workers who may not carry smartphones in their normal work environment may benefit from dedicated proximity-warning devices or equipment such as smart hard hats that have been modified to track proximity.

- Staff in office-based environments may benefit from app-based solutions.

- Most organizations will use social distancing technologies in conjunction with processes such as reducing the number of employees in offices and establishing behavior and visual guidelines.

- Some app-based solutions may be superseded or augmented by national social distancing app initiatives or apps from megavendors such as Google and Apple.

Sample Vendors

AiRISTA Flow; Cloudleaf; Estimote; Kontakt.io; Radiant RFID; Zebra Technologies

Gartner Recommended Reading

Manage Social Distancing and Contact Tracing With Location-Aware Technologies and Devices

Market Guide for Social Distancing Technology

Gesture Control Devices

Analysis By: Roberta Cozza

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Gesture control devices are either wearables or devices held in proximity to the user that can capture body movements, hand, arm, head, face gestures and microgestures. Gestures with specific semantic content can be interpreted by devices and software applications to enhance the human-machine interface (HMI) and understand behaviors from gesture analytics.

Why This Is Important

Interactions involving gesture control are not new, but new trends make this technology more important to enhance HMI in the workplace. Increasingly, diversity of smart devices and things means that many will not have the traditional design suitable for touchscreens and keyboards. Limitations like physical size, battery life and capabilities demand new types of interactions. Additionally, trends like smart spaces mean that HMIs will be increasingly multimodal and contextual.

Business Impact

Vendors of applications in productivity software, gaming, AR/VR simulations, smart spaces, automotive and robotics can leverage gesture control devices to enhance the UX and differentiate. When delivering dedicated gesture control devices, key considerations are wearability, accuracy, ergonomics and connectivity. Predefined gesture sets must be intuitive and as simple as possible to reduce learning curve and respond to real deployment usability challenges.

Drivers

- Better integration with AI technologies. The bigger trend toward smart spaces and improvement in computer vision and ML technology has enabled the extrapolation of better analytics around gestures using existing and new sensors. This reignited interest in gesture analytics.

- The UI paradigm is evolving. With this, gesture control becomes a capability integrated into computing devices, smartphones and smart cameras, and in wearables like smartwatches, smartglasses/HMDs, smart display and things, as well as being enabled by dedicated additional gesture devices. Short-range radar technology, for example, is embedded in some smart mobile devices via Google's Motion Sense chip. Embedded short- and medium-range radar systems and ultrasound sensors can help in several scenarios like assisted living, and industrial environments where traditional touch input methods or touchscreens are challenging.

- COVID-19 effects. The effects of COVID-19 are pushing for more touchless interactions around interactive kiosks, public touchscreen/surfaces, elevators, vending machines, office and factory premises, and sign-in displays in medical settings. This will accelerate gesture recognition as an embedded capability in a number of user and workers settings. Gesture control devices have taken different and, recently, more diverse form factors like electromyography (EMG) armbands, straps, rings and gloves.

- VR and AR simulations. Gesture control devices remain a key companion HMI in VR and AR simulations to enhance users' immersive experience. For example, gesture control devices have been used in VR simulation environments for rehabilitation and surgery in healthcare, or remote training/assistance. Companies like Xsens produce gesture-sensing devices for professional athlete analysis to drone control.

Obstacles

- The market for gesture recognition and control devices remains niche today and mainly driven by customized solutions and interest from specific verticals such as education, medical, entertainment and manufacturing.

- Gesture recognition is delivered through alternative methods from the dedicated gesture control devices, for example, via video embedding computer vision for key analytics. Use of 3D depth cameras is also adding to the accuracy of gesture control solutions.

- Gesture control devices can require learning and memorization of predefined gestures and microgestures (i.e involving one finger, hand/arm movements) despite the intent to create intuitive and natural gesture interactions.

- Alternative technologies like voice and conversational UIs are being adopted by users. Some of these can more easily replace triggering actions/commands via gestures, which users might not like; also, most gesture control solutions assume the user has a free hand.

User Recommendations

- Assess the addition of gesture control in its various forms to augment the HMI of your employees for a natural, intuitive use model.

- Assess whether the pain point for a worker or customer is better addressed by a customized gesture control device or if alternatives via other embedded technologies in existing devices would deliver more usability value.

- Invest or partner to include intelligence and analytics linked to your gesture control devices and solutions. Go beyond just gesture "control" to recognition, inference, prediction and understanding to create more customer value.

Sample Vendors

Tap; Xsens

Gartner Recommended Reading

Plan Your Hardware Product Roadmap Around Top 5 UX Trends and Technologies

Deploy No-Touch User Experiences for the "Untact" Era

Inclusive Design for Disability Will Lead to Augmented Human Innovation Breakthroughs

Mixed Reality

Analysis By: Tuong Nguyen, Marty Resnick

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Adolescent

Definition:

Mixed reality (MR) is the merging of real and virtual worlds, where physical and graphical objects appear to interact and integrate naturally. MR, in concept, is a single technology. However, MR includes an underlying group of technologies encompassing the spectrum of immersive displays and interactive systems that spans from the digitization of real environments to augmented reality (AR) and virtual reality (VR).

Why This Is Important

Similar to AR, MR enhances the user's surroundings with real-time, relevant, interesting and/or actionable information, but adds a layer of sophistication through advanced, contextual understanding of the scene and situation. This makes the digital filter (MR) more dynamic, relevant and immersive, creating a more seamless experience/interface between the digital and physical world.

Business Impact

Today, MR capabilities focus on optimizing "hands-busy" work environments such as maintenance and repair. Over time, MR will expand to include experiences that can visually enhance everyday objects. New business models will emerge that change how customers buy products using MR or how they conduct operations by visually connecting the user's view of the real world with their data-driven virtual world counterparts. For example, rapid prototyping and testing of products and marketing.

Drivers

- We have moved the MR profile forward on the Hype Cycle by one position to balance out the forward momentum of this technology with the long maturity horizon expected.

- Developments and maturity of AR Cloud technologies and functionalities will foster the development of MR. These innovations will come from startups in diverse areas such as mapping, tracking, modeling, indexing and integration.

- Tech giants will also play a significant role in the development of MR. For example, Microsoft continues to empower the ecosystem with advancements introduced by HoloLens 2 as well as enterprise partnerships through its Mixed Reality Partner Program. At Ignite 2021, the company introduced Microsoft Mesh — providing a foundational element for the industry to create collaborative and spatially aligned content in the physical world. For example, Microsoft is working with OceanX on a "holographic laboratory" where scientists can (either in person or virtually from labs and offices around the world) see 3D holograms of the areas of the vehicles they are exploring.

- Finally, technology improvements and advancements such as object occlusion, edge processing and high-bandwidth, low-latency networks provide the steppingstones to more sophisticated experiences. The combination of these developments continues to move mixed reality along the Hype Cycle at a steady pace.

Obstacles

- **Content** — Digitization efforts have seeded the market with some content, but will need to be increased by orders of magnitude to make MR useful for the mass market.

- **Control** — MR adds a layer of control complexity over AR because it moves beyond a simple digital overlay. It includes active interaction with, and of the digital aspects of, a physical scene. For example, "touching" and "feeling" a digital object, or hearing a digital object coming from a distance or overhead. This also implies and requires systems that are sufficiently sophisticated to understand the environment, context and the processes of a scene/situation.

- **Convenience** — This includes access to experiences and form factors that make these experiences seamless and valuable. For example, handheld devices deliver a poor user experience for extended MR usage.

User Recommendations

Apply MR technology to enable new types of experiences and interactions; more personal and contextually relevant for the user to:

- Assess the tactical value of MR. While it may be the culmination of AR and VR technologies, MR will demonstrate more value in scenarios that will benefit from digital objects being aware or interacting with the physical environment. For example, fitting new surgical equipment into dimensional constraints of an operating room.

- Evaluate ROI potential by focusing on a small number of pilots benchmarked against traditional, non MR experiences as well as AR and VR experiences.

- Build in-house expertise for MR experiences by hiring developers with immersive skills (such as gaming engine, 3D modelling and UI design).

Sample Vendors

Google; Magic Leap; Microsoft; Nreal; ThirdEye Gen

Gartner Recommended Reading

Emerging Technologies: AR Cloud Will Create a Multilayered Crowdsourced Canvas of the World

Emerging Technologies: Top Use Cases for Enterprise Augmented Reality

Emerging Technology Analysis: Augmented and Mixed Reality Opportunity for 3D Design Software and Vertical ISVs

Cool Vendors in Augmenting Human Experiences

Emerging Technologies: Head-Mounted Displays for Augmented, Mixed and Virtual Reality

Indoor Location for People Tracking

Analysis By: Tim Zimmerman, Annette Zimmermann

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Indoor location for people tracking is an umbrella of technologies dedicated to 2D and 3D tracking the location of human beings in an indoor context. The precision of these technologies can vary from a few meters to a few tens of centimeters.

Why This Is Important

Tracking people is important in a wide range of industrial, healthcare and personal security situations. It poses different technical challenges depending on the position of the human body or the proximity of the tracking tag to the body. In addition, the energy used for communication may be absorbed or blocked, leading the application to "lose track" of a person if the right technology is not selected.

Business Impact

A Gartner Indoor Location Services customer survey reported that over 70% of enterprises looking to track assets also wanted to track people as part of a cohesive solution. From a safety standpoint, not being able to track people in dangerous situations or environments results in not only avoidable injuries but also loss of life. In the U.S., some states are adopting personnel emergency notification or location requirements such as in hospitality and healthcare.

Drivers

- Safety and compliance for industrial environments including factories or plants where fumes, chemicals or temperatures create a safety risk, and construction sites for employee safety and anti-collision purposes (with equipment such as forklift trucks).

- Safety in healthcare pertaining to infants or the elderly, or hospitality workers who may not be aware when they are in a dangerous situation.

- Process optimization when employees are performing identified tasks such as tracking patients in hospital care workflows either in real time or geofenced for safety concerns. This can also apply to time and motion standards in manufacturing or other industries.

Obstacles

- The biggest issue in people tracking continues to be privacy. People don't want to be tracked.

- Organizations must choose the right technology for the desired outcome. Some technologies cannot guarantee the location of the person being tracked 100% of the time.

- Cost, which may manifest itself as the cost of the tag or the cost of the infrastructure necessary to capture the information.

User Recommendations

Organizations looking to implement indoor location services should:

- Define the use case to ensure that the frequency of data collection and accuracy of the location meet the documented requirements. Vertical market solutions such as healthcare or construction may have industry-specific requirements or certifications.

- Implement a center of excellence that reviews the limitations of differing radio frequencies, the form factor of tags, wristbands or lanyards that are needed to achieve the desired location, and battery life (if applicable).

- Deploy the correct technology because vendors may deploy a solution that is applicable for assets but not for people tracking.

- Construct an ROI for any people tracking location investment since the cost of tags varies widely.

Sample Vendors

AiRISTA Flow; GuardRFID; Midmark; Pozyx; Quuppa; Zebra Technologies

Gartner Recommended Reading

Magic Quadrant for Indoor Location Services, Global

Critical Capabilities for Indoor Location Services, Global

Market Guide for Indoor Location Application Platforms

Competitive Landscape: Indoor Mapping

Drowsiness Detection

Analysis By: Leif-Olof Wallin

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

Drowsiness detection devices use different technologies to determine whether a person is starting to experience fatigue and risk falling asleep while operating a vehicle or heavy and potentially dangerous equipment, or while performing vital tasks that require full concentration. The most common technologies assess heart rate, head position, eye movement, steering pattern, brain activity, skin conductance and muscle activity.

Why This Is Important

Drowsiness detection can prevent incidents including loss of life and the technology capabilities have matured significantly, resulting in fewer false positives. Machine learning is increasingly being used to help calibrate solutions.

Business Impact

This technology is highly relevant for organizations in the transportation and logistics vertical industries. It has the potential to be mandated by regulatory authorities.

Drivers

- Some vehicles now have drowsiness detection fitted as standard in passenger vehicles from major manufacturers such as Ford (Driver Alert), Mercedes-Benz (Attention Assist), Nissan (Driver Attention Alert) and Volvo (Driver Alert Control).

- There is strong interest from organizations where employees are operating trains, buses, airplanes and heavy equipment to ensure that accidents are prevented from happening.

Obstacles

- False positives generated by devices have been an issue historically but are getting better.

- Some of the technologies used can be perceived as a bit intrusive, like clipping something onto a body.

- There is still no recognized standard, and the accuracy varies a great deal among the potential technologies.

User Recommendations

- Organizations that have employees (or partners) operating vehicles or dangerous and heavy equipment on a large scale, (e.g., buses, trains, taxis, airplanes, trucks) should investigate this technology as a means to reduce accidents, including fatal ones, among their employees, as well as customers or third parties.

- Pilot these solutions extensively prior to adoption, because there's a learning curve for some of these devices to be able to adequately assess a driver's level of alertness.

- These technologies can also be used to optimize shift patterns.

Sample Vendors

BMW; Ford Motor Company; Fujitsu; Mercedes-Benz; Robert Bosch; Volvo

Gartner Recommended Reading

Augmented Reality

Analysis By: Tuong Nguyen, Auria Asadsangabi

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

Augmented reality (AR) is the real-time use of information in the form of text, graphics, audio and other virtual enhancements integrated with real-world objects and presented using a mobile, head-mounted display (HMD) or projected graphics overlays. It is this "real world" element that differentiates AR from virtual reality. AR aims to enhance users' interaction with the environment, rather than separating them from it.

Why This Is Important

AR is the next era of experience or interface (via the form of a digital filter) that enhances the user's surroundings with real-time, relevant, interesting, actionable information. This has an impact on both enterprises and consumers. As such, AR is broadly applicable across many markets, including entertainment, industrial design, digital commerce, marketing, mining, engineering, construction, energy and utilities, logistics, manufacturing, healthcare, and education.

Business Impact

- Current technology is best suited for purpose-built, specialized solutions. As such, position and adoption speed will vary by vertical and industry.

- Current horizontal tasks seeing the most traction are procedural tasks, situational video, visual design and customer engagement.

Drivers

- We have moved the AR profile forward by one position to represent the continued momentum of this Innovation Profile; it will take five to 10 years for the ecosystem, marketplace and technologies dependencies to sufficiently evolve to significantly increase the use of AR.

- Market interest is growing steadily, but current solutions are better described as AR-inspired solutions — experiences that contain elements of AR and offer limited, purpose-built capabilities. AR adoption continues mainly in enterprise applications. Based on Gartner inquiry (22% increase in inquiries in 2020 over 2019, 35% among end users/technology buyers) and industry news, B2B AR continues to gain traction as more enterprises are seeing the value of using AR in their workflow.

- For enterprises, AR can provide value by furnishing checklists for training and maintenance or for remote telestration in see-what-I-see video collaborations. HMD sales reflect the burgeoning pilot deployments using hands-free AR devices. Advancements in HMD hardware (lighter, more durable, safer, etc.) will provide more compelling hands-free use cases for AR as well. For the benefit of consumers, AR offers brands, retailers and marketers the ability to seamlessly combine physical campaigns with their digital assets.

Obstacles

- Content: The amount of digital content and associated AR experiences will need to be increased by orders of magnitude to make AR useful for the mass market. For example, consumer-facing implementations are still struggling to show consumers consistent value beyond narrow use cases like virtual try-on and social/messaging filters. The experiences that do show value are siloed from other experiences and interactions.

- Control: Interacting with both physical and digital elements in 3D space requires a mix of "vocabularies" of different interface modalities (speech, motion, touch, gesture, etc.) that need to be defined and standardized to make AR interactions intuitive.

- Convenience: Ease of access to form factors that make AR experiences seamless and valuable needs improvement. For example, handheld devices deliver a poor user experience for extended AR usage.

User Recommendations

- Decide on the audience for your AR experience. Internal- and external-facing solutions are not currently transposable.

- Restrict initial trials to a specific task or goal. Set benchmarks against unaugmented solutions to understand risks and benefits.

- Set the business goals, requirements and measurements for your AR implementation before choosing a provider.

- Determine a clear intention for your deployment to ensure value. For external-facing implementations, use AR as an extension of your brand and experience. For internal-facing implementations, use AR as a tool that will enhance employee job function. This could include, for example, delivering context-specific information at the point of need for mobile workers, better leveraging experts (using one-to-many video support) in plant and maintenance operations, or enhancing business processes via AR-based training and instruction.

Sample Vendors

8th Wall; Apple; Atheer; Google; Librestream; Microsoft; PTC; Scope AR; TeamViewer Frontline; Wikitude

Gartner Recommended Reading

Emerging Technologies: Kick-Start Adoption With Essential Enterprise Augmented Reality Business Practices

Emerging Technologies: Top Use Cases for Enterprise Augmented Reality

Virtual Reality and Augmented Reality for Remote Workers

Emerging Technology Analysis: Augmented and Mixed Reality Opportunity for 3D Design Software and Vertical ISVs

Emerging Technologies: AR Cloud Will Create a Multilayered Crowdsourced Canvas of the World

Cool Vendors in Augmenting Human Experiences

Emerging Technologies: Head-Mounted Displays for Augmented, Mixed and Virtual Reality

Forecast Analysis: Wearable Electronic Devices, Worldwide

Head-Mounted Displays

Analysis By: Tuong Nguyen

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Adolescent

Definition:

Head-mounted displays (HMDs) are small displays or projection technology integrated into head-worn devices. They are worn or mounted on or near the head so their displays can be seen by the wearer at an ideal viewing distance. Additionally, aspects of the visual content will be contextual information that translates the wearer's state into visual cues.

Why This Is Important

In both AR and VR cases, HMDs are a hands-free display option for individuals and enterprises. In other words, HMDs exist on a spectrum of other computing and display options such as smartphones and tablets; and complement these devices. For AR, benefits are potentially high for frontline workers that benefit from a hands-free display — especially in capital-equipment-intensive industries. For VR, HMDs provide a level of immersion unavailable to traditional display devices.

Business Impact

HMDs can provide a hands-free and immersive way to interact with the physical and digital world.

Large enterprises see value in AR HMDs for cases such as increasing first-time fix, productivity and work order completion, and improved safety. VR HMDs's value is mostly for entertainment, but businesses are seeing more adoption for training, product design and reviews. MR HMD are further down the timeline for use cases such as accurately visualizing architectural fit for structures or machinery.

Drivers

- Mass-market penetration won't be achieved until key elements such as content availability and device usability and accessibility are vastly improved. Facebook's AR HMD plans and Apple's rumored head-worn device currently have limited impact on the pace and trajectory of HMDs, but will likely accelerate adoption as the launch dates draw near and applications are announced.

- We have moved the HMD profile forward by one position to represent the continued momentum due to market factors such as:

- Strong sales — 2020 was a strong year for HMD sales. The global pandemic spurred HMD sales (especially for consumer VR HMDs).

- Increased accessibility and usability — All-in-one VR HMDs continue to provide a significant stepping stone in VR adoption. Moreover, features such as Oculus Link extend content library access. This accessibility will be further increased by adding wireless capability (Air Link).

- Burgeoning ecosystem — The value chain for AR and VR is evolving. The net benefit is improvements that promote enterprise adoption (such as better deployment, management and integration).

- Technology improvement — Continued technology improvements across the spectrum of HMD and adjacent technologies display and optics technologies, computer vision-based applications, natural language technologies, rendering and graphics technologies, interfaces and more have made experiences much more immersive.

Obstacles

- Single-purpose and purpose-built devices will have limited adoption potential (for example, within certain tasks within the enterprise)

- Current AR, MR and VR use cases do not reflect the enormous potential of HMDs

- Current technology limitations will introduce barriers such as interoperability, form factor, legal and social limitations (such as safety and fashion), ergonomics and battery life

- Enterprise adoption is limited by lack of enterprise-ready solutions

- Limited collaboration and investment will occur among hardware providers

User Recommendations

- Use HMDs as an extension of your current endpoint devices (laptops, smartphones, tablets, monitors) spectrum.

- Evaluate AR/MR HMDs for situations where the user's hands are occupied with a task or when the user is moving while accessing information — for example, to review work instructions, schematics or customer data.

- Assess the cost of VR experiences against the benefits. The cost of service and customization for VR experiences can come at a high cost, but there are also barriers around user interfaces (how to interact with virtual, 3D objects) and user experience (motion sickness and other adverse, physical reactions due to sensory mismatch).

- Adopt HMDs tactically — current devices are purpose-built hardware with rapid (yearly) product release cycles.

- Evaluate ROI potential by monitoring HMD advancement such as improvements in display (resolution, brightness, response time, field of view), better battery life, comfort and lower cost.

Sample Vendors

Facebook; Google; HTC; Microsoft; RealWear; Vuzix

Gartner Recommended Reading

Emerging Technologies: Head-Mounted Displays for Augmented, Mixed and Virtual Reality

Product Manager Insight: OEMs and ODMs Must Adopt a Platform Strategy for the Augmented Reality Market

Forecast Analysis: Wearable Electronic Devices, Worldwide

Ring Scanner

Analysis By: Leif-Olof Wallin

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

A ring scanner is a class of small Bluetooth scanners that can be worn as a ring on top of one or two fingers. Its placement enables workers to use both hands and scan at the same time. The scanner uses a laser scanner or imager, and is connected through wires — or wirelessly using Bluetooth — to a handheld or mobile computer.

Why This Is Important

Ring scanners enable hands-free operation, unlike traditional scan guns. Recent developments in LED and low-power Bluetooth technology have improved capabilities and battery life significantly, and have opened up new opportunities for the technology.

Business Impact

The technology is highly relevant for organizations with warehousing and logistics operations, such as pick/pack/ship, as well as those with select use cases in travel, transportation and hospitality that involve scanning while carrying items at the same time.

Drivers

- Ring scanners can be used independently and replace conventional scanning, while increasing in multimodal use when combined with technologies like voice or smartglasses.

- New forms of equipment in warehouses like cart-sized automated guided vehicles (AGVs) have the potential to drive up ring scanner adoption.

Obstacles

The biggest challenge with ring scanners is the trade-off decision at acquisition time. Most ring scanners are available in a Bluetooth or a tethered version:

- The tethered version is usually more reliable, up until the cable starts to suffer from wear and tear. It can also leverage power from a bigger power source like a mobile computer clipped to a belt or strapped to an arm.

- The Bluetooth is free from cables and can be perceived as more comfortable, but on the downside, has limited battery power, the need to have additional charging equipment for the ring scanner and issues around lost pairing.

User Recommendation

- Customers changing their warehouse or logistics processes should investigate/pilot ring scanners as tools that can potentially increase productivity and improve ergonomics at the same time.

Sample Vendors

Datalogic; Eurotech; Honeywell; Zebra Technologies

Smartwatches

Analysis By: Annette Zimmermann, Roberta Cozza

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

A smartwatch is a device that resembles a traditional watch and serves as either a companion to the smartphone (for alerts, calls and voice commands) or a stand-alone smart device with Wi-Fi or cellular connectivity. It must be able to transmit an electronic signal, for example, to control an external app or device, or transmit voice or biometric data from built-in sensors.

Why This Is Important

App development has gained a new dimension with smartwatches becoming a new hub of glanceable information and notifications. Moreover, as a subcategory of wrist-worn wearables, these devices received a new impulse during 2020 as they were integrated into location-enabled contact tracing and social distancing solutions. Going forward — and not only because of the pandemic — employee health monitoring and wellness will play an increasingly important role.

Business Impact

Smartwatches have been making an impact on day-to-day activities such as quick glanceable notifications, messaging and payments. Since the COVID-19 outbreak, several health apps have started to leverage their integration with third-party smartwatches like Apple Watch in order to perform symptom monitoring — the Cardiogram app is an example. The other use case in this context is social distancing alerts being extended to smartwatches.

Drivers

We have moved this Hype Cycle entry one step further on the Slope of Enlightenment. While the technology is already quite mature, the main challenge is its low adoption in the enterprise, as it is not considered as a "must-have device." So that is the reason this entry has not yet moved off the Hype Cycle.

The drivers we have identified:

- As many organizations are planning "return to work" scenarios (after shelter-at-home mandates are lifted), employee health monitoring is sparking rising interest. This has security and privacy implications. Enterprise organizations may encourage the use of smartwatch and associated apps to monitor symptoms of COVID-19, however it should be left to the employee to use such technology.

- Another opportunity is fatigue tracking to help with employee safety using the sleep-tracking functions of smartwatches. Here, measuring the "fatigue risk" of someone who is unwell that must operate critical equipment could prove useful.

- There is some interest by retailers to provide smartwatches to in-store staff to enable subtle notifications.

- Healthcare providers are exploring smartwatches for remote health monitoring of patient exercise, sleep and heart rates, especially after being discharged from the hospital. Smartwatch vendors (like Apple) have been partnering with healthcare providers to study certain conditions. Consumers could volunteer to participate in these studies and the results of these studies provide new insights on specific diseases.

- Other use cases emerging in the enterprise for smartwatches are voice-enabled note taking, task management and invoicing. Furthermore, smartwatches can interface with software and apps to provide alerts and reminders about key customers.

- The introduction of embedded cellular connectivity has also enabled more independence from smartphones and better access to glanceable data and microinteractions when hands-free is critical.

Obstacles

The main barriers to adoption are:

- Cost — leading smartwatch models from Apple and Samsung cost $300 or more, which does not justify an occasional use scenario.

- The small screen size makes it restrictive in use and therefore unable to replace the smartphone.

- Some users may already own a personal watch and in case the watch is not a shared corporate device, employees are unlikely to adopt another one.

- Critical considerations are around the use of smartwatches in enterprise and subsequently around employees' privacy concerns and compliance with regulations, as wearables can potentially continue to collect a large amount of personal data (location, biomarkers, fitness/health information).

- Most smartwatch models are designed for the consumer market, hence form factor and durability do not speak to some important environments (for example, industrial environments). There are some ruggedized models in the market but they tend to be more expensive since it is such a small and specialized market at this time.

User Recommendations

- IT leaders should consider offering smartwatches connected to personal mobile emergency monitoring services in order to ensure safety for lone workers (such as real estate agents or taxi drivers). There could be a business case where the smartwatch has a lone worker monitoring function, which also adds significant value to work processes.

- IT leaders should seek opportunities to use a smartwatch instead of a smartphone or IT device to increase employee performance/support compliance, such as haptic alerts for geofencing or using the watch as an ID token for access control.

- Consumers that purchase smartwatches will want the convenience of wearing them for work as well. Therefore, IT leaders should include smartwatches in their corporate policy for the use of personal mobile devices at work.

Sample Vendors

Apple; Google; Huawei; Lenovo; Samsung Electronics

Gartner Recommended Reading

Forecast Analysis: Wearable Electronic Devices, Worldwide

Emerging Technologies and Trends Impact Radar: Devices

UEM

Analysis By: Dan Wilson, Chris Silva

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Unified endpoint management (UEM) tools provide agent-based and agentless management of computers and mobile devices through an employee-centric view of endpoint devices running Windows 10, Google Android and Chrome OS, Apple macOS, iPadOS, and iOS. UEM tools apply data protection, device configuration and usage policies using telemetry from identities, apps, connectivity and devices. They also integrate with identity, security and remote access tools to support zero trust.

Why This Is Important

UEM simplifies endpoint management by consolidating disparate tools and streamlining processes across devices and operating systems. UEM has expanded beyond management to offer deeper integration with identity, security and remote access tooling to support a zero-trust security model that enables the anywhere workforce. Leading UEM tools are also using analytics and machine learning to enable intelligence-driven experience automation (IDEA) to reduce IT overhead and improve employee experience.

Business Impact

By adopting UEM, I&O leaders can streamline operations and improve endpoint management. Specific impacts include:

- Location-agnostic endpoint management and patching, enabling the anywhere workforce.

- Reduced total cost of ownership (TCO) of managing endpoint devices by simplifying device management and support processes.

- Reduced security risk through support for more device types and OSs, better policy management, and integration with identity, security, and remote access tools.

Drivers

- The anywhere workforce demands tools that extend beyond a single platform or require devices to be on a specific network to function.

- IT looks to simplify and streamline endpoint deployment, management and patching to enable provisioning of new devices for remote employees, improve device performance and reliability as well as visibility across the endpoint estate, and reduce security risk.

- Increasing emphasis on employee experience requires greater visibility into performance, reliability and consistency of endpoints is supported by new UEM tool analytics and automation capabilities.

Obstacles

Though they are reducing as tools mature, obstacles to UEM adoption include:

- Legacy organization models where the responsibility for mobile and PC management, remote access, and security is distributed across several IT teams.

- Gaps in IT's skill set around modern endpoint management, or too much focus on maintaining heavily customized and controlled device configurations.

- Costs can be a concern for organizations that do not currently use mobile device or client management tools.

- Organizations with thousands of group policy objects (GPOs) with little awareness of what each does will struggle to rationalize them in order to migrate to configuration service provider (CSP) profiles.

- Highly complex environments with multiple Active Directory forests or domains, network segmentation, and/or autonomous subsidiaries or business units can also struggle with the centralized nature of cloud-native UEM tools.

User Recommendations

Hype has advanced beyond the trough toward the Slope of Enlightenment as UEM tools have matured and adoption has increased. Some organizations still struggle with the human change management that is required to adapt processes and refocus IT staff on simplifying and modernizing endpoint management.

Gartner recommends:

- Capitalize on pandemic-induced momentum and the need to enable the anywhere workforce to replace disparate MDM and CMT tools and consolidate to UEM as well as embrace modern OS management for Windows 10 and macOS.

- Review IT policies and procedures to identify and eliminate unnecessary references to or dependence on MDM, CMT or location-specific technologies. This will help avoid common inertia, limitations and excuses related to something being against policy.

- Upskill or replace IT engineers and support staff to increase the use of UEM, modern management and automation capabilities.

Gartner Recommended Reading

Magic Quadrant for Unified Endpoint Management

Critical Capabilities for Unified Endpoint Management Tools

Security Best Practices for Work-From-Home Scenarios

Embrace Windows 10 Modern Management to Enable a Highly Distributed Digital Workplace

Predicts 2021: Digital Workplace Infrastructure and Operations

Innovation Insight for Unified Endpoint Security

Healthcare-Optimized Devices

Analysis By: Leif-Olof Wallin

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Mature mainstream

Definition:

Healthcare-optimized devices are ruggedized, typically handheld and are manufactured with special materials, such as anti-microbial plastics/coatings, that can be sanitized with aggressive detergents typically used in a healthcare environment. Special care has been given to ensure there are no surface features where germs or viruses can hide and that the device can be operated with gloves on.

Why This Is Important

Handheld devices in healthcare are increasing in adoption quickly as many healthcare organizations are looking to increase productivity and quality of healthcare provided. There has been a long tradition in healthcare to prefer high-end commercial off-the-shelf (COTS) devices that are difficult to sanitize in a professional way without degrading/destroying the exterior.

Business Impact

Although healthcare-optimized devices are more expensive compared to COTS devices, the total cost of ownership (TCO) will be lower as they typically last more than five years, as opposed to three years for a COTS device. They have much longer times between charges than a typical COTS device — typically enough battery capacity to last a full shift — and don't degrade when sanitized frequently, which leads to a higher propensity to sanitize.

Drivers

- Many healthcare organizations have invested in new electronic health record systems. In order to reap the expected benefits around increased compliance, quality and productivity, staff are increasingly equipped with handheld devices capable of presenting information, scanning patient bracelets, medication and medical supply inventory levels.

- Another important feature found with healthcare-optimized devices is that they support "glomo" (glove motion); that is, they can be used with protective gloves on, abecauses the touchscreen is optimized for glove use.

- Healthcare-optimized devices typically include any special security features needed for HIPAA or similar compliance.

Obstacles

- Taking a COTS device and putting it into a protective casing may actually make the situation worse. as you're now introducing surface features and a container where germs and viruses can hide and multiply.

- The use of COTS devices introduces a risk for spreading pathogens as staff may be deterred from following proper sanitation protocol to avoid damaging the mobile device.

User Recommendation

- These devices will be moving from bedside to bedside, together with the staff, and will need to be regularly sanitized to prevent spreading infection. By buying ruggedized healthcare-optimized devices, healthcare organizations ensure they can sanitize the devices as frequently as needed without degrading the functionality, nor look and feel of the device.

Sample Vendors

Honeywell; Spectralink; Vocera; Zebra Technologies

Wristbands

Analysis By: Roberta Cozza

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Wristbands are electronic devices that have band or bracelet designs, with or without displays. Wristbands have a two-way wireless connectivity and are used for collecting data about the wearer's physical activity biometrics and the ambient environment, and for other purposes, including fitness, safety, access, payments, data sharing, and monitoring personal health and well-being. Examples of wristbands include the Fitbit Charge/Inspire series or Garmin vivosmart.

Why This Is Important

Wristbands respond to the increasing desire of people to improve well-being or monitor health. This trend accelerated with the pandemic. Employers and workers have increased their attention to track health and wellness both at work and remotely from workplaces. At the same time, due to enforcing social distancing measures at the workplace, wristbands have crucially helped with tracking users, enabling alerts enforcing social distancing rules, and driven safer contactless types of interactions.

Business Impact

Wristbands still remain an alternative to smartwatches because they are lower-priced, have less functions and longer battery life. Wristbands serve as simpler devices to monitor activity and for micro interactions. Wristbands provide a way to engage employees and monitor performance and well-being. Employer wellness programs and health insurances are using wristbands to improve worker well-being. Data from wristbands is increasingly used by healthcare organizations to enhance their services.

Drivers

We have moved this profile one step further on the Slope of Enlightenment. While wristband adoption is widespread in consumer markets, this technology is still at the early stages of adoption in enterprises as more impactful use cases emerge and more sensors and intelligence are being built in to deliver more relevant employee analytics. Some of the key drivers are:

- Increased use by healthcare organizations to provide holistic care through a more accurate understanding of a patient's activity levels, identifying certain health conditions earlier, such as heart arrhythmia. Recently, wristbands have also included more sensors, enabling the tracking and study of early signs of COVID-19; tracking of movement and activity performance resulting in shorter rehabilitation time; and help managing chronic health conditions.

- Wristbands enable touchless UI for access, user authentication, payments and touchless access to shared devices/machines. A key use case is wristbands launched to ensure social distancing practices.

- Healthcare providers and insurance companies offer incentives for monitoring fitness and health data sent from wristbands.

- New sensors and AI technology embedded in wristbands are boosting the attractiveness and usefulness of wristbands. Some of the latest improvements based on more accurate and new sensor technology are around vital signs analytics and personalization.

- The evolution of dedicated chipset solutions is improving overall battery life and performance despite more embedded sensors.

- Wristbands have lower ASP compared to alternatives like smartwatches. Another advantage of wristbands is their simpler user interface and interaction modes of wristbands.

- Fitness gyms, health and life insurance agencies use wristbands as a way to extend engagement by gathering data on exercise outside of the facility. Theme parks, resorts and entertainment venues use wristbands for user access, on-site purchases and pedestrian traffic analysis.

Obstacles

- Smartwatch pricing and adoption trends. The wristband market is expected to show just a 4.5% compound annual growth rate (CAGR) through 2024. Providers continue to struggle because of the appeal of smartwatches' broader capabilities. Also, as more value vendors enter the smartwatch market increasing competition and accelerating decline in smartwatch ASPs, even premium vendors like Apple have been offering lower-cost options, discounting older versions of the Apple Watch.

- Evolving smartwatch capabilities like cellular connectivity and ongoing evolution of more sophisticated embedded sensors continue to improve smartwatch appeal as they offer much broader capabilities than wristbands. The addition of cellular connectivity makes the smartwatch also a more flexible and independent wearable from the smartphones.

User Recommendations

- Contemplate using wristbands in the enterprise in place of, or in addition to, corporate badges for access to buildings and information. They can also be used to receive alerts from apps or about incoming calls or texts, to enable micro interactions in hands-free mode, to increase remote-worker safety by detecting falls, tracking location and contacting help in an emergency.

- Explore wristbands as customized solutions to enforce new pandemic-driven social distancing measures in industrial settings and workplace. Also, they can be used in connection with touchless site access and use of shared equipment in the wake of more stringent hygiene measures.

- Address privacy and security concerns as wristbands can track and collect a wide range of sensitive physical and behavioral data like location or health data. Set strategies with HR and legal leaders to drive ethics standards and ongoing compliance with privacy regulations.

Sample Vendors

Fitbit, Garmin, Nymi

Gartner Recommended Reading

Deploy No-Touch User Experiences for the "Untact" Era

Forecast Analysis: Wearable Electronic Devices, Worldwide

Push to Talk

Analysis By: Leif-Olof Wallin

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Definition:

Push to talk (PTT) voice communication as a concept has been around since the first voice-capable radios. After pushing the button, other endpoints on the device's channel/frequency/group can hear what that person says until the button is released. In this context, PTT refers to applications or network-based services (PTT over cellular/Wi-Fi) delivering PTT on modern handsets/smartphones/computers.

Why This Is Important

Frontline worker use cases are leveraging apps on smartphones that use alternate data transport networks (Wi-Fi and cellular) to provide communications including PTT, audio broadcasts and messaging. These devices provide communications and apps for specific business use cases, and will allow organizations to consolidate devices for frontline workers, include remote users and reduce costs.

Business Impact

PTT has its biggest advantage when the use case requires command and control for first responders or urgently reaching out to a group of people simultaneously and ensuring everybody gets the same verbal information. Typical use cases include first responders, security, transportation and building sites. In many use cases, voice communication is being replaced by sending the relevant information to the recipient directly and awaiting a confirmation (e.g., dispatch).

Advanced PTT systems offer the ability to include computer-based telephony for control room and remote users to user conversations, as well as enabling working groups to communicate openly without disrupting those outside of that group. Mission-critical PTT over LTE was introduced in release 13 of the 3GPP standard back in 2016.

Drivers

- Next-generation PTT solutions typically support dynamic generation of talk groups based on location or APIs. This could be short-lived talk groups to meet a specific task like turning around an aircraft at a gate.

- Bots can also be part of a talk group and listen in to perform tasks or execute actions based on the conversation (e.g., request an ambulance during first-aid incident responses).

- For many hands-free use cases, voice remains the most effective way to communicate.

Obstacle

- Traditional PTT is very "chatty" and intrusive, and has a perception of walkie-talkie-style communication that can easily be overheard and users waiting "in turn" to communicate, projecting a last century experience. Next-generation PTT needs to overcome this perception and leverage the concept of very fine-grained, dynamically created and hierarchical talk groups to showcase its value.

User Recommendations

- PTT functionality on a mobile device eliminates the need for a second device in those scenarios where voice is being used to coordinate the activities of a team.

- PTT works best when the groups are relatively small and communication isn't constant.

Sample Vendors

Instant Connect; Motorola Solutions; Orion Labs; Spirent; Zebra Technologies

Biometric Authentication Methods

Analysis By: Ant Allan, Tricia Phillips

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Biometric authentication methods use unique morphological or behavioral traits to corroborate a person's claim to an identity previously established for access to an electronic or digital asset. A biometric authentication method typically uses a one-to-one comparison ("verification") to support an identity claim. Rarely, a method uses a one-to-many search ("identification"): The person simply presents a biometric trait and the system finds one or more candidate matches from a larger population.

Why This Is Important

User authentication is fundamental to identity-first security. It must provide sufficient credence in an identity claim to bring account takeover (ATO) and other digital-identity risks within an organization's risk tolerance. Unlike other types of authentication credential, biometric traits are inherent to a person. Thus they cannot easily be shared or stolen and potentially free the person from having to remember a password or carry a token.

Business Impact

Identity and access management (IAM), fraud and other security leaders across all industry verticals and geographies can benefit from investment in biometric authentication methods, which can:

- Be adopted in a wide range of use cases for employee and customer authentication

- Be used alone or as an element of multifactor authentication (MFA)

- Enable passwordless authentication

- Improve trust and accountability

- Improve user experience (UX)

Drivers

- Ubiquity of device-native biometric methods in smartphones and increasing availability of this in other endpoint devices, including Microsoft's support for face and other modes in Windows Hello for Business in Windows 10. This in turn drives interest in third-party biometric methods that can make use of standard inputs (camera and microphone). These offer organizations greater control over configuration, enrollment, choice of modes, consistency across devices and channels, and improved customer trust.

- Increasing interest in, and successful deployments of, passwordless authentication, as a way to avoid the vulnerabilities, risks and frustration that passwords engender, including: (1) embedding device-native or third-party methods in customer-facing mobile apps, especially in banking; (2) proprietary passwordless **mobile MFA** tools that incorporate device-native or third-party methods within a smartphone app; and (3) **Fast IDentity Online (FIDO) authentication protocols,** especially FIDO2 (although FIDO doesn't demand the use of biometric methods).

- Increasing adoption of **document-centric identity proofing** for customer onboarding and a desire to leverage biometric face recognition data for customer authentication and identity recovery across multiple channels. This also extends to employee authentication, especially for gig workers. This specifically drives interest in third-party methods with centralized architectures.

- Successful use of voice recognition in contact centers as a welcome alternative to knowledge-based verification (KBV), which people often find frustrating and attackers readily defeat (and thus it provides very little confidence in an identity). Voice recognition is also a natural fit for virtual personal assistant (VPA or "smart speaker") use cases.

Obstacles

The following issues may deter adoption, especially regarding third-party methods rather than device-native methods:

- Usability and reliability vary across modes, populations and use cases, limiting the success with any single technology.

- Demographic bias, especially in methods using machine learning, can discriminate against certain groups, impairing security as well as UX.

- As biometric traits cannot be "reset," effective biometric methods must corroborate genuine human presence; thus, presentation attack detection (PAD; i.e., "liveness testing") is essential. However, some PAD techniques can add friction, leading to poorer UX.

- Concerns about replay and injection attacks, which are more scalable than presentation attacks and likely present a greater risk.

- Privacy laws are seen as a barrier, but compliance really only adds some bureaucratic hurdles. Data security controls are seen as a major obstacle but are only prudent anyway.

- Some people might view the use of biometric methods as creepy.

User Recommendations

- Use biometric methods (solely or as an element of MFA) as a way of achieving passwordless authentication.

- Prefer third-party methods over device-native methods for improved trust and accountability (including robust enrollment), multichannel support, and (for face) integration with document-centric identity proofing.

- Choose tools that reflect both the diversity of and personal preferences among the target population.

- Choose tools that demonstrate genuine human presence. Carefully evaluate vendor claims and favor methods tested in conformance with ISO/IEC 30107-3:2017. Be wary of PAD techniques that add friction and potentially erode UX benefits.

- Evaluate how vendors can mitigate replay and injection attacks.

- Reduce privacy concerns by paying full attention to nontechnical regulatory requirements as well as architectural and data security issues. Be open and transparent about how the data is used.

Sample Vendors

Auraya Systems; Aware; Daon; FaceTec; Fujitsu; IDEMIA; iProov; Ipsidy; Nuance; Veridas

Gartner Recommended Reading

Technology Insight for Biometric Authentication

Lone Worker Protection

Analysis By: Leif-Olof Wallin

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Definition:

Lone worker protection (LWP) devices use technologies that determine whether a worker is in distress and notify a service center, which assesses the situation. Basic devices can be activated by the user pressing a button or a cord being ripped. More-complex devices may include fall detection, lack-of-motion detection and sudden vertical movement detection. The location is usually transmitted, and the service center typically establishes voice communication.

Why This Is Important

LWP devices are becoming mainstream in many verticals to increase the safety of workers in community settings, during incident response work or at remote locations. In some verticals/use cases such as fire services, using LWP is mandated. Organizations that genuinely care for the safety of their employees are increasingly equipping them with technology to improve their safety and well-being.

Business Impact

The technology is highly relevant for field service organizations that handle hazardous products/technologies, such as energy or gas, and those with civil servants who may be exposed to personal harm in the normal discharge of duties. This also includes healthcare professionals making house calls in higher-risk locations; manufacturing staff that handle hazardous materials or gases; and lone workers handling cash or theft-prone products like electronics.

Drivers

- Recent advancements in sensor technology and mobile network technology have made it possible to improve the battery life of LWP devices, as well as to reduce their size and weight. This will be further accelerated by the introduction of narrowband Internet of Things (NB-IoT) in networks.

- The COVID-19 pandemic has also increased the number of lone workers as part of the need for social distancing.

Obstacles

- LWP solutions need to work "all of the time" and with "no excuses." Elaborate solutions that require Bluetooth tethering and multiple devices that have to be charged decrease the likelihood of the end-to-end solution working when a distress button is pushed.

User Recommendations

- Keep the design simple and always operable. A single-purpose device that is self-contained will always deliver to a higher SLA than devices that depend on other devices or services being available to work.

- Providing an LWP solution for employees that is regarded as undependable is, from a reputation perspective, worse than not providing an LWP solution at all.

- Leverage future products that are likely to include warnings for proximity to dangerous objects and to monitor for dehydration and stress, as they become available. Some specific functionalities, such as man down and gas spectrometry, are already available in purpose-built smartphones.

Sample Vendors

ecom instruments; MSA; SoloProtect; Sonim Technologies

Entering the Plateau

Gamification

Analysis By: Brian Burke

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Gamification is the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals. It is important to distinguish gamification from video games and loyalty programs as gamification uses techniques from behavioral science to "nudge" people into achieving their goals.

Why This Is Important

Gamification builds motivation into a digital engagement model and can be used to add value to products and to deepen relationships by changing behaviors, developing skills or driving innovation. According to Google Trends, interest in gamification peaked in 2014 and has declined moderately over the years; it continued to decline 7% in the past year. However, Gartner inquiry on gamification has increased 62% over the past year.

Business Impact

Gamification can increase the effectiveness of an organization's digital business strategy. It:

■ Provides a means of packaging motivation and delivering it digitally to add value to products and relationships.

■ Has a digital engagement model that can scale to any number of users with very low incremental costs.

■ Is relevant to human resources, product management, sales, marketing and customer service, whose aim is to meaningfully engage customers, employees or the public.

Drivers

- User engagement is at the heart of today's "always connected" culture. Incorporating game mechanics encourages desirable behaviors, which, with the help of carefully planned scenarios and product strategies, can increase user participation, improve product and brand loyalty, advance learning and understanding of a complex process, accelerate change adoption, and build lasting and valuable relationships with target audiences.

- Broad interest in gamification is coalescing around a much narrower set of use cases. These include online learning and employee training (particularly security awareness), employee performance (mainly in sales and customer service organizations) and engaging employees in innovation.

- This narrower set of use cases is due to repeatable paths to success and move gamification toward the Plateau of Productivity.

- Other use cases for gamification include customer engagement, collaboration, change management and wellness.

- Given the impact of COVID-19, there have been several inquiries on leveraging gamification to engage employees working remotely to ramp up adoption of collaboration and social tools.

Obstacles

- Organizations must recognize that simply including game mechanics is not enough to realize the core benefits of gamification. Making gamified solutions sufficiently rewarding requires careful planning, design and implementation, with ongoing adjustments to keep users engaged.

- Designing gamified solutions is unlike designing any other IT solution, and it requires a different design approach. Few people have gamification design skills, which remains a huge barrier to success in gamified solutions.

- Organizations often benefit from working with digital agencies that employ behavioral scientists and have experience designing solutions focused on digital engagement.

User Recommendations

- Focus gamification design on leveraging behavioral science to engage and motivate people, rather than on slapping badges onto activities.

- Determine the goals and motivations of the target audience you intend to engage, how those goals align with organizational goals and how success will be measured.

- Focus gamification efforts on providing feedback to help people achieve their own goals to engage people on an emotional level, rather than on a transactional level.

Sample Vendors

Betterworks; BI WORLDWIDE; Capita (G2G3); Centrical; Checkmarx; CloudApps; Pluralsight; SAP

Gartner Recommended Reading

Boost Customer Community Participation With a Rewards and Gamification Program

Motivate and Engage Learners With Gamification

Use Gamification to Flatten the Curve of COVID-19 Infections

Gamifying Your Compliance Training: Examples From 3 Companies

Toolkit: Use 'Red Team, Blue Team' Gamification to Make Smarter Decisions

Assessing Online Learning Platforms for Technical Skills Development

Speech Recognition

Analysis By: Anthony Mullen

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

Speech recognition, commonly referred to as automated speech recognition (ASR) or speech to text (STT), digitally translates human speech into text for further processing.

Why This Is Important

Speech recognition democratizes access to systems and services by leveraging a communication modality users are already familiar with — their voice. This makes for a richer, more immediate and intuitive interface to engage with customers and employees. The technology also enables a variety of automation initiatives across the organization with training data. We see speech data being mined to extract latent business processes, intents and entities, question-and-answer pairs, etc.

Business Impact

Speech recognition enables intuitive, self-serve engagement with business processes and services, along with real-time compliance in conversations. With features like transcription, speaker verification, speech-powered chatbots, device control, and meeting support and coaching, speech recognition can be applied across departments and use cases. Additionally, speech metadata provides additional signals of customer behavior and mining of speech transcripts enables further automation.

Drivers

- **Expansion of services to richer voice suites:** With the core technology inching forward, vendors are beginning to expand services like multiparty authentication, talk over analysis, compliance, and privacy and security features, to extract additional metadata from speech (e.g., emotion). The technology impact is also expanding to functions like contact center, media monitoring and meeting room transcription, and verticals such as finance, media, legal and communications.

- **Conversational AI and IVR modernization:** The COVID-19 pandemic has revealed just how brittle the operational models were for customer service organizations relying on IVRs. As a result, in 2H20, there was a marked increase in the volume of end users modernizing IVR and telephony stacks with both direct-to-consumer speech automation and agent assist services.

- **Speech and user environment metadata improving analytics and experiences:** Along with the literal words spoken, there are other signals present in speech data, such as environment noise, syntax, cadence and emotional cues. The idea of multimodal input, to support better speech recognition, is also beginning to emerge in the translation space where visual imagery provides context and disambiguation to improve speech-to-text performance.

- **Privacy and trust:** While speech recognition has not yet received the same attention as computer vision with regard to AI legislation, we expect this to accelerate in the next two years.

- **New AI techniques indicating better speed of processing and ease of customizing models:** Large language models such as transformers (e.g., BERT, GPT-3), when used with transfer learning, are providing an easier path to custom models for organizations. Further, the use of GPUs with these technologies is also shortening transcription time, with NVIDIA-backed Deepgram managing to transcribe 10 hours of audio in just 40 seconds.

Obstacles

- **Difficulty with scaling speech systems:** While adoption and performance have accelerated, the increased rollout of speech recognition services has revealed gaps in capabilities when scaling systems across languages and business domains. However, we expect AI techniques such as transformer models and transfer learning to set new bars for speech recognition over the next two years.

- **Speech vendors' visibility in the buying cycle.** We see insight engines, conversational AI platforms, CX and CPaaS suites, and low-code/no-code platforms, all acting as a broker for speech recognition services. Consequently, speech vendors find it hard to form direct relationships and break out of being a tactical, commoditized choice for enterprises.

- **High-effort process:** Making speech to text work entails more than simply activating an off-the-shelf solution. Enterprise effort is required to attain high-quality experiences and accuracy. Organizations must plan for extended human involvement, to monitor, train and improve performance (especially around modeling proprietary business terms, dialects and noisy/complex environments).

User Recommendations

- Modernize your IVR with speech recognition and conversational AI, if your B2C organization is struggling with high call volumes.

- Use speech recognition and transcription as an accelerator to mine for automation assets (Q&A pairs, intents, entities, topics, processes) if you have a large corpus of recorded speech.

- Use edge-based, speech-to-intent models if you're looking to deploy autonomous ordering systems or interactive public services.

- Empower workers (e.g., field engineers or medical professionals) who have "hands busy, eyes busy," to engage with systems or take notes using speech rather than typing for entry, including email, reports and status updates.

- Use speech recognition to enable support for those with injuries or disabilities, and to simplify engagement with devices and services (e.g., electronics devices, automotive, smart home and IoT).

- Use speech recognition to facilitate compliance processes in regulated industries.

Sample Vendors

Alibaba Group; Amazon; Cedat85; Dasha AI; Deepgram; Google; IBM; Intelligent Voice; Microsoft; Speechmatics

Gartner Recommended Reading

2021 Strategic Roadmap for Enterprise AI: Natural Language Architecture
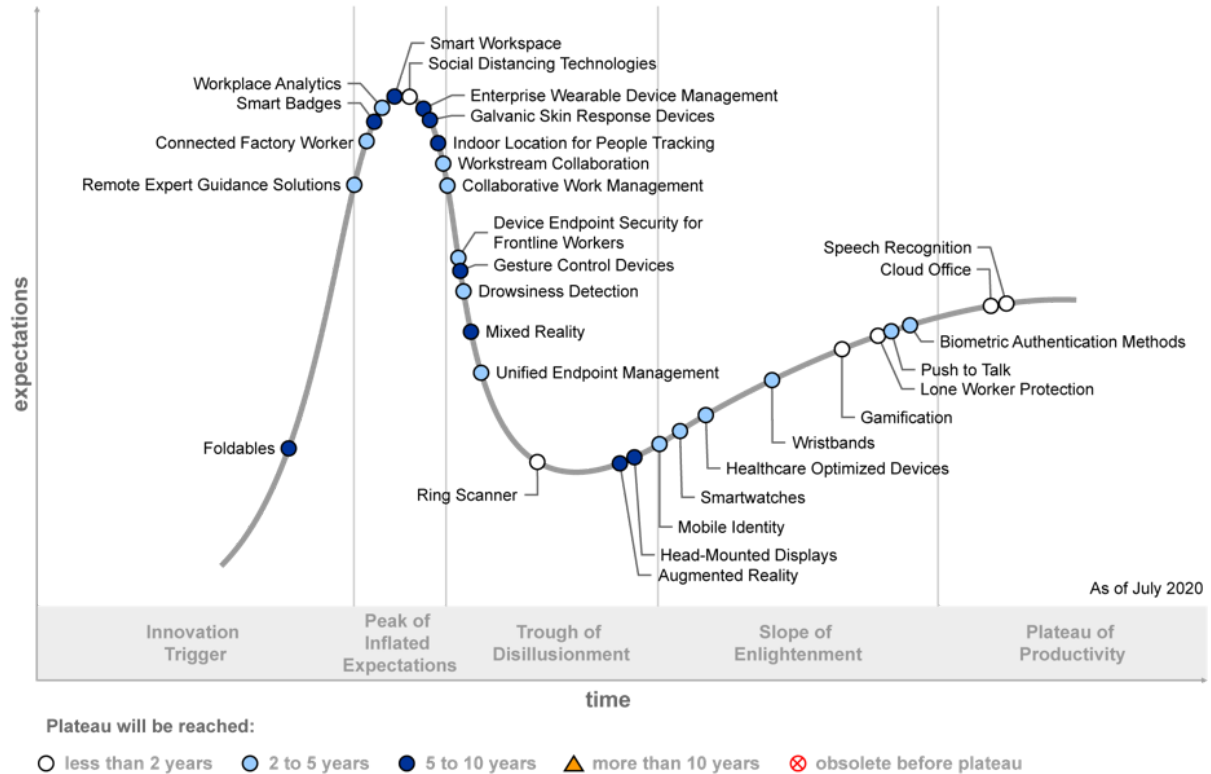
Magic Quadrant for Cloud AI Developer Services

Architecture of Conversational AI Platforms

Cool Vendors in Conversational and Natural Language Technologies

Appendixes

Figure 2. Hype Cycle for Frontline Worker Technologies, 2020

Hype Cycle for Frontline Worker Technologies, 2020

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase ↓	Definition ↓
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (July 2021)

Table 3: Benefit Ratings

Benefit Rating ↓	Definition ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2021)

Table 4: Maturity Levels

(Enlarged table in Appendix)

Maturity Levels	Status	Products/Vendors
Embryonic	In labs	None
Emerging	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
Adolescent	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
Early mainstream	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
Mature mainstream	Robust technology Not much evolution in vendors or technology	Several dominant vendors
Legacy	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
Obsolete	Rarely used	Used/resale market only

Source: Gartner (July 2021)

Document Revision History

Hype Cycle for Frontline Worker Technologies, 2020 - 7 July 2020

Hype Cycle for Frontline Worker Technologies, 2019 - 31 July 2019

Hype Cycle for Frontline Worker Technologies, 2018 - 5 November 2018

Recommended by the Author

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

Create Your Own Hype Cycle With Gartner's Hype Cycle Builder

Transform Frontline Worker Computing With a Product-Oriented Focus

Technology Investments for Frontline Workers Will Drive Real Business Benefits

Solution Path for Expanding a Mobility Strategy Into a Unified Workspaces Strategy

Use Wearable Technology to Enhance Frontline Worker Productivity: Field Service Management

Cool Vendors in Frontline Worker Technologies, 2021

Table 1: Priority Matrix for Frontline Worker Technologies, 2021

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational	Speech Recognition	Employee Communications Applications	Connected Factory Worker	
High	Lone Worker Protection Social Distancing Technologies Workstream Collaboration	Biometric Authentication Methods Collaborative Work Management Drowsiness Detection Healthcare-Optimized Devices Indoor Location for People Tracking Remote Expert Guidance Solutions Smart Badges UEM Workplace Analytics	Augmented Reality Head-Mounted Displays Mixed Reality	
Moderate	Gamification Ring Scanner	Device Endpoint Security for Frontline Workers Push to Talk Smartwatches Wristbands	Galvanic Skin Response Devices Gesture Control Devices	

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Low			Enterprise Wearable Device Management	

Source: Gartner (July 2021)

Table 2: Hype Cycle Phases

Phase ↓	Definition ↓
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Phase ↓	Definition ↓

Source: Gartner (July 2021)

Table 3: Benefit Ratings

Benefit Rating ↓	Definition ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2021)

Table 4: Maturity Levels

Maturity Levels ↓	Status ↓	Products/Vendors ↓
Embryonic	In labs	None
Emerging	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
Adolescent	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
Early mainstream	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
Mature mainstream	Robust technology Not much evolution in vendors or technology	Several dominant vendors
Legacy	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
Obsolete	Rarely used	Used/resale market only

Source: Gartner (July 2021)