MARKET RESEARCH NOTE

How Bluetooth® Technology is Enabling Safe Return Strategies in a COVID-19 Era

Bluetooth® Market Research Notes provide in-depth analysis of trends and forecasts highlighted in the annual Bluetooth Market Update. While it is well known that governments are leveraging Bluetooth® technology to power their Exposure Notification Systems to track, trace and slow the spread of COVID-19 in the population, organizations are also looking to use the technology to enable a safe return to offices, commercial buildings, public spaces and public venues. This supplemental report shares insight into how Bluetooth technology is being leveraged to help protect the safety of the public and workforces across many different environments.

Bluetooth®

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Executive Summary

As the COVID-19 impact continues around the globe, Bluetooth® technology is being leveraged by governments and commercial organizations to help protect the safety of both the general public and workforces across many different environments.

Bluetooth technology is being utilized for regional exposure notification and testing systems, helping companies develop safe return strategies, as well as enabling safe diagnosis and treatment solutions.

With respect to safe return solutions for companies, while a number of new safe-return-to-work devices have emerged in recent months to help enforce social distancing, ABI Research believes that Bluetooth technology can be leveraged more effectively by expanding beyond single use case COVID-19-related solutions and developing more futureproof and holistic RTLS and IoT deployments. These solutions are capable of not only providing value during the pandemic but can also generate additional efficiencies and ROI to help businesses thrive in the post-COVID-19 world.

Introduction

The COVID-19 pandemic has transformed the way we live. Factories, offices, schools, shops, restaurants, and other workspaces and public venues have been forced to close, devastating economies and individual businesses. Governments and organizations around the world are now shifting their attention toward easing lockdown restrictions in a safe manner and enabling people to return to work while reducing the risk of further outbreaks. While the hope is that an effective vaccine can help life return to normal as soon as possible, Bluetooth Real-Time Location System (RTLS), wearable, smart building, and other IoT solution providers across the globe have the ability to provide a number of solutions that can help ease this transition. This includes enabling workplace social-distancing enforcement, contact tracing, hygiene compliance, and contactless access control, while, at the same time, combining these offerings with the wider asset tracking and operational efficiency gains that RTLS solutions can provide. Bluetooth technology is one of several technologies that can help enable this. By 2025 there are anticipated to be nearly 550 thousand Bluetooth RTLS implementations around the globe.

550
THOUSAND
global implementations of Bluetooth® RTLS by 2025

Enabling a Safe Return to Work and Other Environments

Bluetooth® technology is already being leveraged extensively across the globe in attempts to help reduce the spread of coronavirus. Thanks to the ubiquitous presence of Bluetooth technology in smartphones, governments around the world are relying on Bluetooth connectivity to support public exposure notification systems capable of informing users when they have been in close proximity to someone who was later diagnosed with COVID-19. In the UK, for example, the National Health Service (NHS) contact-tracing app has been downloaded nearly 20 million times in the first two months of launch. Similar solutions have been launched in many countries, and, while the focus of this report is on the safe return to work, it is clear that exposure notification systems will also be a part of both a safe return and reopening of numerous environments, including workplaces, schools and universities, retail stores, offices, public venues, and many other locations.

Technologies such as Bluetooth are helping companies build COVID-19 safe-return strategies, enabling employers and building and venue owners to leverage location data and analytics to create safer environments for employees and the wider public. In recent months, there have been an explosion in the availability of Bluetooth solutions targeting COVID-19 responses as RTLS, smart building, and other IoT solution providers have adapted existing or created new products to help reopen safely.

A number of solutions have been proposed, ranging from shorter-term rollouts that either require no additional infrastructure or can take advantage of existing infrastructure and equipment to longer-term RTLS deployments that may require additional infrastructure but can also bring about higher accuracy location services and additional improvements to operations as companies desperately seek to make up for losses in production caused by COVID-19 shutdowns. By 2025, ABI Research anticipates over 300 million Bluetooth RTLS tags will be shipping annually, addressing asset tracking, personnel tracking, vehicle tracking, and tool and equipment tracking, among other use cases. These often require a combination of technologies, depending on the infrastructure and accuracy required. Many RTLS vendors have begun to offer a combination of infrastructure-free and full-infrastructure solutions to help combat some of the deployment challenges caused by lockdowns, travel restrictions, and difficulty deploying onsite during the pandemic. Many of these vendors have pivoted to offer COVID-19-related devices or extensions to their existing platforms in order to help businesses return to work safely. Some of the major areas in which Bluetooth technology is helping enable a safe return are detailed below.

300 MILLION
annual shipments of Bluetooth® RTLS tags by 2025

Social Distancing, Contact Tracing, and Occupancy Management

As COVID-19 primarily spreads among people who are in close contact for prolonged periods of time, governments across the globe recommend that most people stay at least six feet apart wherever possible. As a result, a number of new Bluetooth® solutions have emerged that help organizations enforce social distancing (Figure 1). Many of these solutions come in the form of wearables, whether a wristband, pendant, badge, lanyard, hard-hat, or pocket-worn device, that are capable of detecting when one person is in close proximity to another and providing visual, audio, or haptic cues that can notify users to reestablish a safe distance. This market is developing rapidly. Many Bluetooth integrated circuit (IC) vendors are reporting a growing interest in these solutions, while new startups continue to emerge. However, deployments are still somewhat limited due to many of these solutions arriving only in the last few months. Some notable examples of the market leveraging Bluetooth technology include the following.

EMERGING SOCIAL DISTANCING ENFORCEMENT, CONTACT TRACING, AND OCCUPANCY MANAGEMENT DEVICES	
HID	HID Global's employee social-distancing solution leverages its BEEKs Bluetooth® Low Energy (LE) tags to detect proximity of employees and visitors. This data can subsequently be transmitted via a BluFi gateway to enable cloud reporting and analytics, including contact tracing.
Laird™ CONNECTIVITY NORDIC SEMICONDUCTOR	Laird Connectivity introduced its Sentrius BT710 and BT720 Bluetooth® trackers in partnership with Nordic Semiconductor and Quuppa. The BT710 features visual, audio, and vibration alerts to help ensure social distancing while logging proximity events via a gateway, and it is equipped with a unique antenna configuration to help reduce false alarms. The BT720 leverages Quuppa's RTLS technology for sub-one-meter accuracy in more conventional RTLS deployments.
estimote	Estimote developed a range of Bluetooth® workplace safety wearables in a variety of form factors that register all close interactions with other colleagues. If an employee gets symptoms of the virus, they can report this to the employer who can generate a contact-tracing report to help protect other team members.
kontakt.io	Kontakt.io's COVID-19 Contact Tracer solution leverages Bluetooth® badges and Bluetooth radios embedded within Wi-Fi access points or dedicated Bluetooth gateway infrastructure to maintain a record of movement of all employees and visitors in a building. If any person reports an infection, the solution can trace back contact and help predict risk of exposure to others, helping to enable a more informed response to any outbreaks.
tracesafe Atmosic Forever Connected, Anywhere.	Ultra-low power Bluetooth® IC vendor Atmosic has supplied TraceSafe Inc. for its AllSafe Wristband social-distancing and contact-tracing solution. The solution will be deployed to all fans attending Toronto Wolfpack Rugby League Football Club games at Lamport Stadium and other Canadian Rugby Stadiums during the 2020-2021 season.
Quuppa	Quuppa's Bluetooth® LE technology is being leveraged within a number of applications through various partnerships to help tackle COVID-19. In the longer term, these solutions can be leveraged to adapt to different business needs, including asset tracking, workflow digitization, and process optimization.
ZEBRA	Zebra's MotionWorks Proximity solution leverages existing Bluetooth® and Wi-Fi mobile computers to alert workers when they are in close proximity and log any proximity events in the cloud via the existing Wi-Fi infrastructure. In the event of an exposure, the solution can create a contact-trace report that allows companies to determine potentially impacted employees and take necessary action.
PROGLOVE	Bluetooth® wearable barcode scanner provider ProGlove has upgraded its ProGlove Connect App to enable sound, light, and vibration alerts on its MARK family of devices to further encourage social-distancing compliance in busy and noisy warehouse environments where phone alerts may be easily overlooked.

Figure 1: Emerging Social Distancing Enforcement, Contact Tracing, and Occupancy Management Devices. Source: ABI Research, 2020.

Other solution providers have adapted already-deployed Bluetooth devices to help enforce social distancing. Many RTLS vendors have added proximity sensing and contact tracing to their software platforms to enable tracking of existing deployed Bluetooth RTLS devices across a number of enterprise, healthcare, and industrial environments.

One benefit of such solutions is that they can be deployed quickly and effectively without the need for a more complex wider RTLS infrastructure to be installed. In addition, smartphones, data collectors, gateways, or Bluetooth enabled Wi-Fi APs can be leveraged to enable cloud reporting, contact tracing, and other valuable analytics. This has been important during COVID-19 lockdowns as more traditional RTLS vendors struggle to deploy and configure their solutions on site.

Additional Business Benefits of Safe Return to Work Solutions

110%
CAGR
of Bluetooth® occupancy sensors between 2020 and 2026

While some solutions only provide cues to help establish social distancing, many of these solutions provide more comprehensive cloud analytics and reporting to help provide businesses with additional tools to increase safety. Often, data can be collected from the tags and uploaded via smartphones, gateways, and Bluetooth® enabled Wi-Fi APs for subsequent analysis. If a worker tests positive for COVID-19, data can be gathered to help identify all workers they have come into contact with. This can allow businesses to make intelligent decisions on preventive measures, without resorting to shutting down entire factories, warehouses, offices, or other environments, minimizing the potential disruptive impact. Over 11 million Bluetooth tags are expected to be shipped throughout 2020 and 2021 that will target personnel tracking, worker safety, and access-control applications. More advanced infrastructure-based anchor and tag RTLS solutions can also provide hot-spot analysis, identifying areas where social-distancing violations are a regular occurrence or when there are too many people in one area at a time. This can enable decision makers to make changes to the workflow to help employees maintain social distancing while being able to carry out their day-to-day tasks effectively. By tracking personnel and activities, data can be provided on which rooms are used most frequently, or specific areas within rooms, to help ensure cleaning resources are prioritized to help reduce the risk of contracting the virus via a contaminated surface. RTLS and smart building platforms can also provide real-time updates of occupancy, allowing workers to find a desk or conference room that is available or if it needs to be cleaned. Bluetooth enabled occupancy sensors are anticipated to grow at a CAGR of 110 percent between 2020 and 2026, reaching six million annual shipments by 2026. Indoor wayfinding using Bluetooth technology and Wi-Fi can also be leveraged to notify users of densely congested areas and provide safer routing to their destination.

11
MILLION
Bluetooth® tags are expected to be shipped throughout 2020 and 2021

New Opportunities Emerging for Smart Buildings

As enterprises encourage people to come back into commercial buildings, there will be increasing demand to equip these spaces with connected devices to continuously monitor the environment and building assets to ensure health, safety, and security of the occupants with an increasing emphasis on efficient use of building resources. This will drive momentum for the next generation of managed Building Automation System (BAS) solutions, such as space management, environmental monitoring, cleanliness and hygiene management, and asset management. These new applications will be predominantly enabled by wireless sensor-based devices that can operate as either standalone applications or integrated with traditional BASs. Initially, most implementations of the new applications will operate as standalone sub-systems due to the immediacy of demand from building managers/owners to make commercial spaces ready for occupancy and due to the cost and complexity of integration with existing building systems. Eventually, these new applications will be integrated with existing BASs as building managers begin to realize Return on Investments (ROIs).

Companies such as Pointr leverage Bluetooth® beacons, sensors, and smartphones as part of its WorkSafe COVID-19 response solutions. The solution is capable of contact tracing, occupancy management, congestion supervision, cleaning monitoring, and safe wayfinding.

While many may opt for some of these infrastructure-free solutions, ABI Research believes that planning an effective RTLS strategy will provide much greater value in the long run and allow enterprises to maximize their return on investment while delivering huge operational efficiencies that help them remain competitive in a post-COVID 19 world. Angle of Arrival based solutions from the likes of Quuppa can also provide ten-centimeter-level accuracy for COVID-19-related RTLS applications and beyond. These comprehensive solutions offer additional benefits when compared with more basic tag-to-tag deployments.

As Bluetooth Low Energy (LE) functionality and location services are increasingly incorporated within access points from leading Wi-Fi AP vendors, this will also help make deployment easier and more commonplace. ABI Research anticipates Bluetooth integration within enterprise access points to achieve a 14 percent CAGR between 2020 and 2025 as the value of the technology for location technologies becomes more widely acknowledged. There is a strong need for more plug-and-play solutions that can easily be deployed out of the box without the requirement of extensive cabling, configuration, and surveying. There are many use cases that Bluetooth technology can enable without requiring stringent centimeter-level accuracy, such as room-level asset tracking or occupancy sensing.

Hygiene Enforcement

Governments around the world have reinforced the need to regularly wash hands and clean surfaces to reduce the risk of spreading COVID-19. Bluetooth® smart building and RTLS solutions can further help enforce hygiene compliance to minimize the risk of the virus being

transmitted via touch or contaminated surfaces. In healthcare environments, RTLS has been leveraged to help enforce hand-hygiene compliance for some time. According to the World Health Organization (WHO), healthcare associated infections (HAI) still causes complications in five to ten percent of admissions to acute-care hospitals in developed countries, while in the US alone, there are at least 80,000 fatalities a year, equating to 200 deaths per day, from HAI.

The figure below provides an example of one Bluetooth enabled solution targeting hand hygiene from HID Global. Bluetooth beacons are embedded within the dispensers, while the employees own tag or badge monitors each use and registers the event and is subsequently logged to the cloud via a gateway.

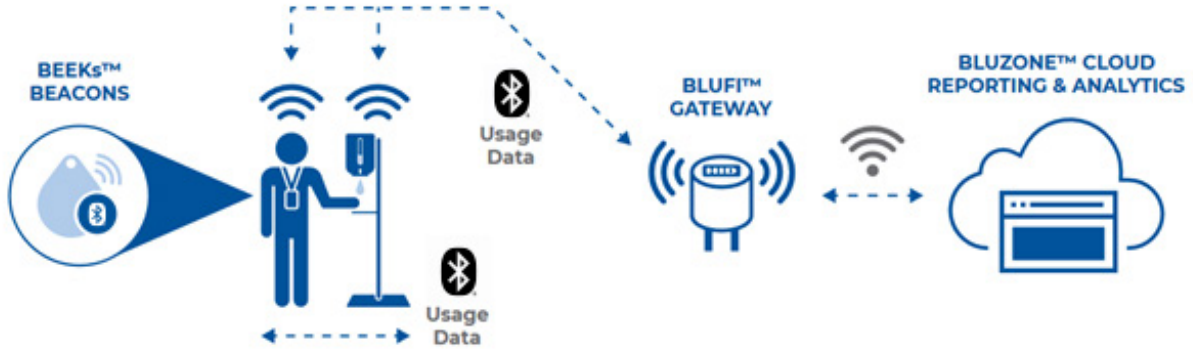
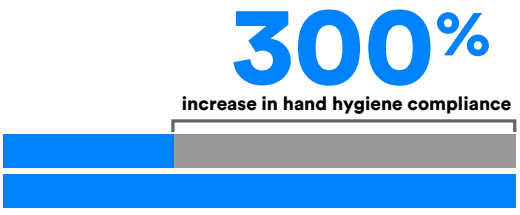


Figure 2: Example of hand hygiene application by HID Global. Source: HID Global, 2020

Healthcare Applications

Other Bluetooth® RTLS solution providers, such as Quuppa, have deployed solutions within hospitals capable of detecting when medical staff enter or exit a room, whether they use a hand-sanitizer dispenser, and their proximity to patients. Quuppa's technology has been deployed in the University of Fukui Hospital in Japan, resulting in a 300-percent increase in hand-hygiene compliance while attending to patients, seamlessly monitoring without the need for additional intrusion or slowing down processes. In addition, AiRISTA Flow deployed a Bluetooth and Wi-Fi-based hand-hygiene-compliance solution in a 240-bed regional medical center for all staff and 900 gel dispensers. The solution covered all patient rooms, treatment rooms, restrooms, canteens, and other common areas and resulted in an increase in compliance from 65 percent to 89 percent in the first six months.



Bluetooth® hygiene management solutions helped drive a 300% increase in hand hygiene compliance

Enterprise Applications

Outside of healthcare environments, hand-hygiene compliance can be leveraged in many

different enterprise settings to help mitigate the risk of infection. In offices and other workspaces, hand sanitizers may be placed around the entry to shared spaces such as restrooms, kitchens, canteens, and other areas, and solutions can help monitor and encourage staff compliance in usage each time they enter or exit the room.

When combined with contact-tracing capabilities and location analytics, deep-cleaning resources can be prioritized in areas that have more extensively been used by an employee who has tested positive rather than being forced to clean the entire site, which can add to cleaning and disinfectant costs and possibly create a costly site-wide shutdown, resulting in additional lost productivity. Cleaning staff can be tracked to ensure all potentially contaminated areas have been cleaned effectively while maximizing the efficiency and effectiveness of cleaning resources on hand. Cleaning staff who are equipped with an app or badges can be monitored to ensure they have spent adequate time cleaning an area, as well as being guided to the busiest areas to optimize efficiency. Audit trails with completion checks can be provided and shared with employees to increase confidence in returning to work. By tracking both personnel and tags, as is common in many RTLS deployments, equipment or areas that an employee who tests positive for COVID-19 has used can be traced and disinfected to reduce the risk of wider contamination or to ensure that an asset has been disinfected before another person uses it. For example, in a hospital environment, shared resources such as wheelchairs, ventilators, IV pumps, scanners, and other medical equipment can be marked soiled or disinfected to prevent any further spread, while office users who share desks can be notified if it has been cleaned since the last person used it. In warehouse and manufacturing environments, workers who touched the same tool or equipment can be tracked, while certain devices can be marked as needing to be disinfected at the end of a shift and not used again until it is safe to do so.

Industry examples of health monitoring and exposure management through Bluetooth wearables is another key area in which Bluetooth solutions are being leveraged. Many Bluetooth enabled wearable devices are being utilized to help contribute to early detection of coronavirus through temperature, heart rate, and other biometric monitoring. Around 25 percent of the NBA bubble in Disney World utilized the Bluetooth Oura ring to help detect early signs of COVID-19 infection. Leveraging a variety of sensors, the wearable device can monitor resting heart rate, heart-rate variability, respiratory rate, body temperature, and sleep quality, and, during the bubble, its Health Risk Management (HRM) platform was made available to the NBA to assign a unique risk score to players and staff members who opted to use it. This risk score serves as an indicator that the individual is experiencing symptoms that correlate with illness.

Early Symptom Detection

In a similar vein, Oakland University recently made available the FDA-approved BioButton for students and staff to be leveraged as a screening device to help identify early symptoms of

COVID-19 via subtle increases in temperature, respiratory rate, and other metrics while also leveraging its Bluetooth® technology for contact tracing by reporting proximity with other wearers. The solution is paired with an app that monitors daily exposure risk and that can allow users to self-report symptoms such as coughs that the device cannot detect itself. The same solution has also been deployed for tourists to the Cayman Islands, providing them with the option to avoid quarantine by wearing the device for 14 days after entry. In addition, the US Army Medical Research and Development Command (USAMRDC) recently partnered with Empatica to help deploy a wrist-worn Bluetooth enabled device equipped with a variety of sensors and algorithms to help enable early detection of COVID-19. The EmbracePlus device will pair with an app to give a daily risk indicator of infection and alert the user if any early signs are present.

Further devices continue to emerge. Nordic Semiconductor and Laird's Bluetooth technology is being leveraged by UK-based Waire Health to enable its *C-Detect*, an arm-worn wearable health monitor that can measure heart rate, respiration rate, core body temperature, and oxygen saturation every ten minutes for ten days. Like other solutions, the C-Detect aims to indicate if the user is showing possible signs of infection and if they should stay home and isolate. The solution is also capable of enforcing social distancing a well as contact tracing. Cassia Networks has deployed its long-range Bluetooth gateways in schools across China to help monitor temperature of staff and students remotely via a wristband without requiring manual readings. This enables lessons to remain uninterrupted while providing real-time monitoring to help detect any early signs of abnormal temperature to help implement isolation measures. However, more work needs to be done to help validate the effectiveness of such solutions in detecting early signs of COVID-19 for these to be widely accepted and adopted.

Expansion of Bluetooth Technology Application in Exposure Notification

The Bluetooth Special Interest Group (SIG) is also continuing to expand the smartphone-based exposure notification systems to wearable devices, ensuring that all ages and segments of the population can potentially gain information around if they have been in close proximity to someone who has later been diagnosed with COVID-19. Over 150 Bluetooth member companies have joined the Exposure Notification Working Group to help expand support to wearable devices.

At the same time, Bluetooth® enabled medical equipment that can pair with smartphones to provide remote monitoring is also increasingly being leveraged with patient diagnosis and monitoring applications. As part of the NBA bubble, all players were required to take their vitals via Kinsa Bluetooth thermometers and Masimo pulse oximeters, logging the metrics via a smartphone app.

Several wearable, platform, and healthcare companies are working together on different projects that use healthcare wearable devices, smartwatches, or activity trackers to aid

with tracking the progress of the virus or monitoring the vital statistics of potential sufferers. The wearable trials and deployments that record vitals and monitor symptoms alert medical professionals if a patient's condition worsens. This becomes particularly important when the number of hospital beds is limited and so many patients are being sent home, ensuring that the seriously ill are cared for in a hospital while the less ill are still monitored when at home. With COVID-19, these wearables also help to reduce the amount of unnecessary contact between the seriously ill and medical staff, who are at serious risk of exposure to the virus while also potentially transmitting it to other vulnerable patients.

New deployments and studies during the pandemic will boost the healthcare wearables market (which includes connected blood pressure monitors, continuous glucose monitors, pulse oximeters, and electrocardiogram monitors) to 12 million shipments in 2020, increasing to 52 million shipments in 2025 at a CAGR of 34.4 percent. In addition, smartwatches and activity trackers that can provide other fitness, health-tracking, and contact-tracing functionality over time are anticipated to grow to nearly 275 million units by 2025.

52
MILLION
annual shipments of Bluetooth® healthcare wearables by 2025

Contactless Access and Control

Though the numbers vary and are continuing to change as our understanding evolves, it has been reported that COVID-19 can survive on a variety of surfaces for up to 72 hours. As a result, door handles, keypads, door surfaces, light switches, and other potential shared touch hotspots could increase the risk of infection. As a result, Bluetooth® access-control solutions, such as door locks that can be unlocked via Bluetooth badges and smartphone-based entry systems that minimize these risks, are likely to be increasingly desired over time across a variety of enterprise and hospitality environments. These solutions can also fit into wider RTLS deployments and COVID-19 responses. For example, workers who tested positive for the virus may be refused entry to a building until they have been given the all clear to return. Within different areas of a building, access could be restricted to avoid large gatherings or prevent access to a potentially contaminated area. Building managers could limit access to ensure there are only a certain number of people onsite at one time, reducing the risk of overcrowding and proximity events. Workers in different shifts can be prevented from mixing together by limiting access to the building, further preventing the spread. As a result, Bluetooth enabled access-control-reader and field-panel shipments are expected to reach nearly 16 million annual shipments by 2026 from less than 250 thousand today, achieving a CAGR of 102 percent between 2021 and 2026.

16
MILLION
annual shipments of Bluetooth® access control reader and field panels by 2026

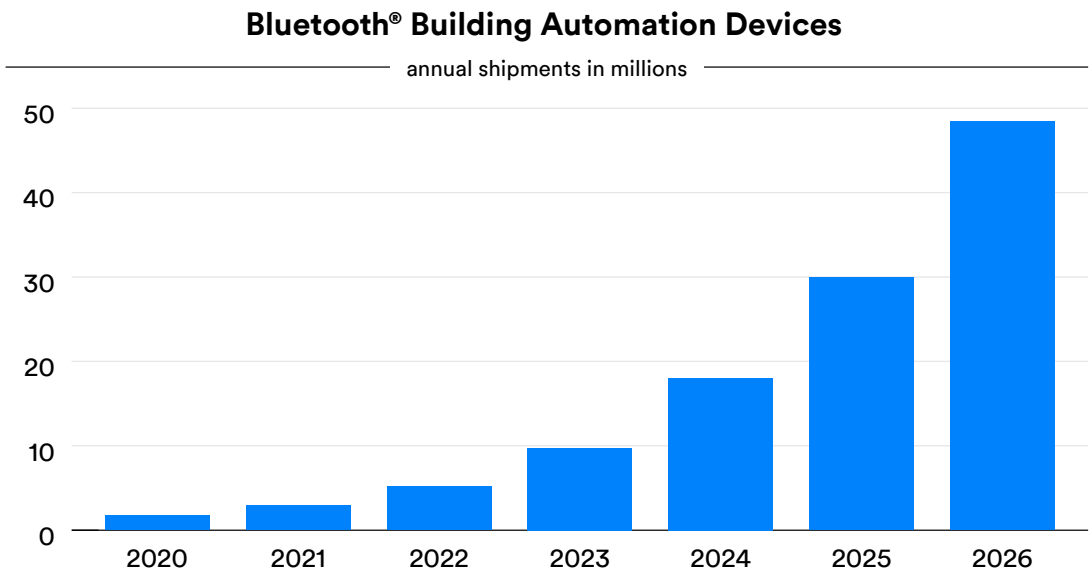


Figure 3: Annual Bluetooth Building Automation Devices Shipment Forecast.

To reduce potential contamination via light switches, Bluetooth connected luminaires can be controlled by smartphones to adjust lighting to their individual preferences without the need to touch a physical switch.

Bluetooth enabled commercial lighting solutions are expected to become the fastest growing wireless solution over the next few years, growing to over six million annual shipments by 2026, and achieving a CAGR of 130 percent.

As Figure 3 shows, Bluetooth building automation devices within HVAC, lighting, access, and wireless sensors are set to grow rapidly over the next few years, from around 1.7 million annual device shipments in 2020 to nearly 50 million by 2026 as these and other use cases continue to develop.

130%

CAGR

of annual shipments of Bluetooth® enabled commercial lighting solutions by 2026

Market Challenges

Despite this projected growth, there are still several challenges facing widespread adoption of safe return to work solutions. These include the following:

- **Many of the solutions that target social-distancing applications are relatively new and somewhat unproven in their effectiveness.** Some organizations may be hesitant to adopt them until more data can be provided on their ability to reduce the spread of infection.
- **Similarly, for early detection wearables, more evidence and studies are needed to demonstrate how effective these are in early detection for COVID-19 and how wearables can improve clinical-grade healthcare monitoring across the board.**

- **For some businesses and buildings, enforcing social distancing may be difficult to achieve due to physical restrictions, and many employers may be better served by continuing to enable remote working, shift working, or transitioning to a permanent remote solution.** Fujitsu, for example, has launched a permanent work from home solution for 80,000 of its workers.
- **Some solutions have more limited functionality that only provide proximity alerts and do not offer any additional analytics.** While these may be adequate temporary solutions, they are not capable of offering additional safe-return functionalities, such as occupancy management, heatmapping, and process optimization. Single use-case solutions also mean that extra infrastructure and investment will be required to enable these additional safe return to work use cases.
- **Some solutions are still very expensive, and businesses may struggle to afford the necessary investment required if they have been significantly impacted by COVID-19.** Many devices will require additional infrastructure investment for data logging, such as Bluetooth enabled Wi-Fi APs or gateways.
- **The accuracy of some solutions may limit their effectiveness.** Tag-to-tag type applications that leverage Bluetooth RSSI to understand the distance between people are not always the most accurate and may limit their effectiveness. RTLS type applications that leverage an advanced infrastructure can also deliver varying degrees of location accuracy. For example, RTLS solutions that leverage Bluetooth RSSI can typically only provide accuracy within several meters, which may limit their effectiveness for certain applications. RTLS solutions that leverage the new Bluetooth Direction Finding capability, on the other hand, can provide location accuracy that is measured in centimeters. In addition, Bluetooth technology also faces strong competition in RTLS applications from the likes of Ultra-Wide Band (UWB) which can also offer centimeter-level accuracy for these applications. However, Bluetooth technology can often be leveraged in conjunction with UWB to give the best of low power management, ubiquity, and data transfer while UWB is used for ranging.
- **Some solutions can be impeded by and dampened by objects and body parts, meaning it is important to keep it exposed and facing in a certain direction.** This may diminish effectiveness as well as result in a poorer user experience and comfort when using the technology.

- **Interest and momentum for these devices may diminish as the prospect of a vaccine becomes more realistic.** Companies are unlikely to want to invest in a short-term solution or may hold off investing until the vaccine situation becomes clearer. The value proposition of a COVID-19 response solution will diminish as COVID-19 itself diminishes. Solution providers should therefore take this opportunity to build discussions around what other benefits that RTLS and Bluetooth® technologies can provide and encourage the adoption of solutions for asset and equipment tracking and other operational efficiencies that can lead to wider digital transformation post COVID-19.
- **The RTLS market has so far attracted hundreds of start-ups and small players developing various location software algorithms and hardware technologies, including Bluetooth, Wi-Fi, Ultra-Wide Band (UWB), Active-RFID, Visual Light communication (VLC), acoustic sensors, or geomagnetic sensors.** The lack of an established ecosystem for indoor location solutions means these players are often pushed to create proprietary solutions that serve as proof of concept for their technologies. As a result, they have struggled to generate scale for their products and they often address installations requiring massive efforts and time for customization, which makes the implementation cost (e.g., anchor points positioning, tag dimensioning and testing, integration with IT/OT systems, etc.) higher than the cost of equipment installed in many cases. The spread of the COVID-19 pandemic has worsened the case of RTLS players as the lockdown measures have made it difficult for them to implement their equipment in the marketplace.
- **Privacy concerns are also enormous. While the urgent health concerns have led to some companies placing these concerns on the backburner, concerns about wider tracking are legitimate, and any personnel tracking solutions will need to fit within various regional regulations and restrictions.** While the benefits may be obvious, end users will be rightly concerned about how data is being leveraged, and vendors must do their utmost to ensure that personal information is removed and that only events related to the COVID-19 response or other safety applications are logged. While tracking may be more accepted in safety applications in industrial or healthcare environments, it may be less so in offices and educational settings. Oakland University, for example, was forced to make its BioButton solution optional, thanks to privacy concerns and pushback. In addition, when the impact of COVID-19 diminishes, concerns are likely to grow further. End users will need to be educated on how their data is being managed and will require input from all areas of the organization.
- **The COVID-19 pandemic has exposed both the need for RTLS solutions as well as exacerbated the deployment challenges of the technology.** There is anticipated to be a considerable impact on traditional RTLS deployment growth in 2020 due to shutdowns and physical restrictions in terms of being able to deploy and configure on site. Many vendors

have reported struggles with travel restrictions, while RTLS deployments often require extensive configuration of anchor points and surveys in order to maximize the potential and accuracy of a solution, which can be difficult or impossible to do remotely. However, ABI Research anticipates that once restrictions are loosened, companies will take advantage of a renewed interest in Bluetooth® RTLS solutions, and the market will remain one of the fastest growing for Bluetooth technology over the next five years, achieving a CAGR of 47 percent between 2020 and 2025. To help enable this, a balance needs to be struck around ease of deployment and the utility and accuracy that solutions can provide. Ideally, deployments need to move to out-of-the-box solutions where configuration can be done simply or remotely. The continued integration of Bluetooth technology within Wi-Fi APs from the likes of Cisco, Juniper, Aruba, and others can also help reduce deployment costs and challenges for Bluetooth based RTLS.

Conclusion and Strategic Recommendations

While it is clear that many solutions are emerging that target COVID-19 related applications, there is benefit in devising an overall RTLS and smart building strategy that can leverage location insights using Bluetooth® technology to provide both COVID-19-related and other, wider use cases in a holistic manner while also opening up the possibility for additional valuable use cases to be added over time.

RTLS vendors are finding that location intelligence is becoming a primary concern of key stakeholders within a variety of healthcare, manufacturing, logistics, and other smart building environments post COVID-19.

While many vendors reported growth in COVID-19-related inquiries in Q2 2020, many have seen growing interest on more typical asset tracking applications as more businesses become aware of and increasingly acknowledge the benefits of RTLS along the supply chain. COVID-19 has put the need for process improvement at the forefront of future planning processes and is likely to increase the understanding of RTLS as it relates to the wider business impact. Increasingly, there is growing awareness that RTLS solutions can provide much more value than simple location data.

While these solutions can help to solve initial COVID-19 related challenges, once the impact of COVID-19 diminishes, there will be other advantages that the location infrastructure can enable – starting with safety applications and expanding to other areas of the business to help drive much needed improvements in efficiency.

For example, the ability of Bluetooth based RTLS to generate intelligence around asset tracking, worker safety, equipment utilization, and other operational efficiencies will be vital in a post-COVID-19 world. RTLS-based contact-tracing technology, once implemented within a facility, can be subsequently extended to help improve the entire operations and provide

numerous efficiencies post COVID-19 and beyond. Social distancing and contact-tracing RTLS should ultimately be viewed as just another process that can be monitored to help deliver wider improvements in production processes.

With vaccine approvals happening now, Bluetooth solution providers should therefore begin to promote more widely not just what RTLS solutions can do during COVID-19 response but also the longer-term improvements that these location technologies can create.

RTLS can help enable wider operational efficiencies, asset and equipment tracking, worker safety, hygiene enforcement, and access control while futureproofing against any further outbreaks. In essence, an RTLS solution that can also address COVID-19-related use cases will be much more beneficial in the long run than a COVID-19 solution that is incapable of being expanded to other use cases. While the value of a COVID-19 social-distancing solution may diminish over time as the impact of COVID-19 subsides, instead, the value of a solution that can address multiple use cases will only grow over time, maximizing return on investment. Longer term strategies and planning around location services will help futureproof businesses for any similar disruptions while taking advantage of other operational efficiencies moving forward.

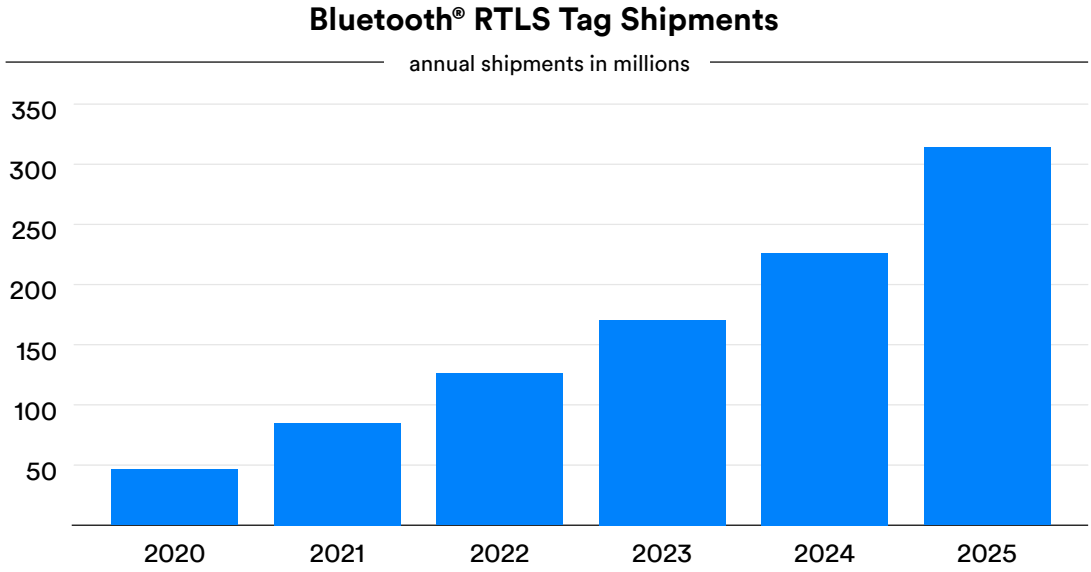


Figure 4: Annual Bluetooth RTLS Tag Shipments Forecast.

As a result, ABI Research anticipates that RTLS-based solutions will continue to grow over the next decade as awareness grows and businesses increasingly realize the wider benefits they can provide. We are anticipating considerable growth in RTLS deployments within manufacturing and logistics environments over the next few years as companies optimize various aspects of their production and logistics operations, require greater visibility of assets and resources, and develop more automated and efficient production processes. ABI Research expects Bluetooth® RTLS deployments in manufacturing, warehousing, and logistics environments to quadruple between 2020 and 2025 as the market transitions

away from smaller-scale pilot implementations to more widespread and integrated RTLS deployments. In addition, the healthcare market is expected to grow considerably as maximizing the resources of already stretched healthcare facilities becomes even more vital in the post-COVID-19 era. Considerable growth is also projected within a number of smart building applications. Combined, as Figure 4 shows, this will result in hundreds of millions of tag shipments over the next few years. However, in order to achieve this, challenges around deployment complexity, scalability, cost, education, fragmentation, and IT/OT integration are still barriers that need to be overcome.

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