

IoT in healthcare products: Innovating for cost-efficiency and enhancing care



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Key Points

- Healthcare is amongst the top 5 industries deploying IoT (Internet of Things) most successfully and is forecasted to grow from USD 94.44 billion in 2023 to USD 286.22 billion by 2030.
- IoT in healthcare products can be classified into six groups: wearable devices (e.g. smartwatches), implantable devices (e.g. cardiac pacemakers), stationary devices (e.g. smart beds), remote monitoring tools (e.g. home ECG monitors), hospital operation tools (e.g. asset tracking systems), and R&D tools (e.g. genetics analysers).
- IoT technologies are equipped with sensors and connectivity features, enabling them to collect real-time data from their environment (e.g. air quality) or users (e.g. heart rate).
- IoMT (Internet of Medical Things) technologies offer functionalities that traditional methods cannot easily achieve: Real-time monitoring; personalised insights and recommendations; remote accessibility, connectivity, and monitoring; automation and convenience; predictive analytics and early detection; improved patient engagement and empowerment; and reduced expenditure and cost-efficiency.
- Digital health trends in 2024 build upon existing technologies with increased innovation in fields such as AI and machine learning; Telehealth and remote patient monitoring; augmented reality, virtual reality, and mixed reality technologies; wearables; and biometric sensors.
- Challenges include cost constraints, data security and privacy concerns, interoperability issues, regulatory compliance, and improving adoption rates

and scalability.

- Flexible financing options, collaborative approaches (e.g. pilot projects, multi-disciplinary teams) and partnerships that share resources and pool expertise are ideal ways to reduce costs, improve interoperability, and increase scalability and adoption.

Enhance the capabilities of your healthcare product with our IoT solutions. Call us for a quote if you want cost-effective and quality-assured results!

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The Internet of Things (IoT) is more than a tech buzzword: It's a crucial player in the technological development of most – if not all – industries. As such, it has a leading role in driving the market value of these industries forward. When ranking the industries deploying new technologies the most successfully (based on the level of integration and adoption), healthcare is among the [top five](#) – along with manufacturing, urban infrastructure (e.g. smart cities and energy management), retail,

transportation and logistics. Examples of IoT in healthcare products include:

- Smartwatches that monitor and measure heart and respiration rates, sleep patterns, activity levels, blood oxygen levels and fall detection.
- Fertility trackers.
- Wearable electrocardiogram (ECG) devices for continuous monitoring of patients with cardiovascular conditions.
- Continuous glucose monitoring (CGM) systems for people with diabetes.
- Continuous positive airway pressure (CPAP) devices for people with sleep apnea.

The [transformational power of IoT in healthcare](#) – especially as it relates to enhancing patient care – is a topic we've covered extensively in the past and one we'll keep coming back to. [Developing products that support health](#) and well-being is at the heart of what we do – staying up-to-date with what's new and improved helps us innovate on demand, and we can do the same for you. If you're developing a healthcare product and looking for ways that IoT integration can enhance the user experience, [call us for a quote](#).

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How do IoT technologies improve healthcare?

[IoT-enabled devices](#) have sensors and connectivity features that enable them to collect real-time data from their environment or users. These sensors gather various types of data, such as atmospheric conditions (e.g. air quality) and biometric measurements (e.g. heart rate). When integrated into medical products, IoMT ([Internet of Medical Things](#)) products enhance user and healthcare providers'

experiences in several ways, offering functionalities and benefits that traditional methods cannot easily achieve.

1. **Real-Time Monitoring:** IoT-enabled healthcare products provide real-time monitoring of vital signs, health metrics, and medical conditions. This continuous monitoring offers users immediate feedback on their health status, enabling early detection of abnormalities, proactive interventions, and timely adjustments to treatment plans. Traditional methods, such as periodic clinic visits or manual tracking, cannot offer the same level of real-time insights and responsiveness.
2. **Personalised Insights and Recommendations:** Collecting, analysing, and interpreting vast amounts of user data allows for personalised insights and recommendations tailored to individual needs and preferences. By leveraging machine learning algorithms and data analytics, IoT-enabled healthcare products can generate personalised recommendations for lifestyle modifications, treatment adherence, and preventive care strategies, empowering users to make informed decisions about their health.
3. **Remote Accessibility, Connectivity, and Monitoring:** By facilitating remote accessibility and connectivity, users can easily access healthcare services, monitor their health, and communicate with healthcare providers from anywhere. This remote access eliminates geographical barriers and enhances convenience for users, particularly those with limited mobility or access to healthcare facilities. Traditional methods often require in-person visits or manual data collection, which can be time-consuming, costly, and inconvenient for users.
4. **Automation and Convenience:** IoMT technology automates various aspects of healthcare management, reducing manual tasks and streamlining user processes. For example, IoT-enabled medication dispensers can automate medication reminders, dosage tracking, and refill notifications, ensuring medication adherence and simplifying medication management for users. Similarly, IoT-connected medical devices can automate data collection, transmission, and analysis, saving users time and effort compared to traditional manual methods.
5. **Predictive Analytics and Early Detection:** Leveraging predictive analytics and machine learning algorithms identifies patterns, trends, and anomalies in user data, enabling early detection of health issues and proactive interventions. By analysing historical data and predicting future outcomes, IoT technology can alert users and healthcare providers to potential health risks, enabling timely interventions and preventive measures. Traditional methods often rely on reactive healthcare

approaches, whereas IoT facilitates a proactive and predictive approach to healthcare management.

6. **Improved Patient Engagement and Empowerment:** IoT in healthcare products engage users in their healthcare journey and empowers them to actively manage their health. Through personalised feedback, actionable insights, and interactive features, IoT technology fosters greater user engagement and motivation to adhere to treatment plans, adopt healthier behaviours, and achieve health goals. Traditional methods may need higher user engagement, leading to lower adherence rates and suboptimal health outcomes.
7. **Reduced Expenditure and Cost- Efficiency:** The sensors in IoT devices in healthcare and sensors empower patients to independently monitor their health conditions, reducing the need for frequent consultations. Concurrently, the extensive data amassed through IoT applications in healthcare renders these visits more impactful, as doctors possess comprehensive insights at their fingertips. While traditional methods still have their place in healthcare, IoT technology enables new capabilities and functionalities that significantly enhance how users - including healthcare providers - manage their health and interact with healthcare services.

How are IoMT devices classified?

WEARABLE DEVICES	IMPLANTABLE DEVICES	STATIONARY DEVICES
Fitness trackers Smartwatches Wearable ECG monitors Pulse Oximeters Smart blood pressure monitor Temperature monitors Glucose monitors Neurological monitors Respiratory devices	Cardiac pacemakers Neurostimulators Continuous Glucose Monitors (CGM) Spinal cord stimulators Cochlear implants Intraocular pressure sensors Implantable drug delivery systems	Smart beds and foetal monitoring devices Automated dispensing systems ECG machines Smart ventilators MRI and CT scanners Dialysis machines Vital signs monitors Connected medical imaging systems Smart infusion pumps
REMOTE MONITORING TOOLS	HOSPITAL OPERATION TOOLS	RESEARCH & DEVELOPMENT TOOLS
Blood pressure monitors Smart scales Smart pill dispensers Specialised cameras Glucose monitoring systems Home ECG monitors Pulse oximeters	Asset tracking systems Environmental monitoring Hand hygiene monitoring Waste management systems Patient flow management systems Surgical instruments	Organ-on-a-chip Genetics analysers Robot-assisted surgery systems Wearable devices for clinical trials Laboratory information management systems (LIMS) Digital biomarkers platforms

As you can see, IoT devices in healthcare have diverse applications and [highlight](#) the point at which these technologies have become increasingly prevalent in most – if not all – medical practices. If you want to integrate IoT technologies into product development, [call us](#). We have a range of end-to-end services and a multi-disciplinary expert team to ensure an outcome that's cost-efficient, quality-assured, and market-ready!

What's the IoT in healthcare products market size?

The IoT in the healthcare products market is rapidly growing. While estimates vary, the market size forecasts are substantial: The [global IoT medical devices market](#) was valued at USD 42.21 billion in 2023 and is estimated to reach USD 166.5 billion by 2030. This displays a compound annual growth market (CAGR) size between 21.2 – 31.2% and confirms that market demand for IoT in healthcare products will continue. Factors driving [market growth](#) include:

- Increasing use of smartphones, smart devices, and wearables to monitor health.
- Increasing adoption of remote patient monitoring tools for improved out-of-hospital care.
- Government initiatives promoting digital health.
- Rising investments for implementing digital technologies in health institutions.
- Growing need to contain/reduce costs in healthcare systems.
- Growing need to democratise healthcare and make services more accessible.
- Rising focus on active patient engagement and patient-centric healthcare.
- Increasing penetration of mobile platforms in healthcare (e.g. telemedicine).
- A growing geriatric population and rising prevalence of chronic conditions increase the demand for intelligent technologies.
- Growing affordability and reduced hardware costs.
- The advancement of high-speed networking technologies.

When considering the IoT in the healthcare ecosystem and product types, it's interesting to note that during the [forecast period](#):

1. The vital signs monitoring device segment was the fastest-growing product type in 2022. This is attributed to an increasing prevalence of hypertension, a growing obese population, and an increasing preference for self-healthcare management tools.
2. The stationary medical devices segment accounted for the largest market share. This is attributed to government regulations mandating electronic healthcare records (EHR),

the high cost of these devices, and the advantages they offer in data accessibility.

3. In 2022, the North American segment held the largest global market share, followed by Europe, the Asia Pacific, the Middle East and Africa, and Latin America.
4. Key established players in the IoT Medical Devices market: Medtronic (Ireland), GE Healthcare (US), Koninklijke Philips N.V (Netherlands), and Abbott (US).

The proliferation of connected devices, advancements in sensor technology, and the integration of artificial intelligence (AI) and machine learning (ML) algorithms have fueled the expansion of IoT solutions in healthcare. Moreover, the COVID-19 pandemic accelerated the adoption of telemedicine, remote patient monitoring, and digital health solutions, further driving the growth of IoT in healthcare.

IoT in digital health trends in 2024

Most IoT in [digital healthcare trends](#) in 2024 build upon existing technologies. This highlights these solutions' viability in yielding positive outcomes for users and the opportunities these technologies create for future innovation. It also demonstrates tangible business advantages for the companies and entrepreneurs who develop them. Ready to join the IoT healthcare transformation and help innovate future trends? [Call us, and let's talk](#) about IoT solutions!

1. AI and ML in healthcare

According to [research](#) conducted by Morgan Stanley, 94% of healthcare companies use AI and ML in some capacity, and the industry's average estimated budget allocation to these technologies is projected to grow from 5.7% in 2022 to 10.5% in 2024. Trending applications include:

- Healthcare data management
- New drug development
- Cancer Diagnosis
- Mental health solutions

2. Telehealth, telemonitoring, and remote patient monitoring

IoT in healthcare products enables remote consultations, real-time health monitoring, and personalised care delivery, enhancing access to healthcare services. While the use of telehealth applications peaked during the pandemic and has subsequently dropped, the market is still growing. It is [forecasted to grow](#) from USD 94.44 billion in 2023 to USD 286.22 billion by 2030.

3. Using extended reality in healthcare settings

Extended reality is an umbrella term that includes augmented reality (AR), virtual reality (VR), and mixed reality (MR). From assisting surgery to improving telehealth applications, these technologies can improve the healthcare industry substantially.

- Enables remote consultations and empowers healthcare providers to share visual information and guide their patients through procedures in real time.
- Serves as an enhanced learning tool that can be used to simulate surgeries or provide interactive and immersive anatomy training.
- Provides interactive and captivating exercises for physiotherapy and rehabilitation.
- It can be used as an aid to therapy, such as overcoming a phobia of heights.

4. Wearable Health Technology

Wearable devices with sensors collect biometric data, such as heart rate, blood pressure, and activity levels, empowering individuals to monitor their health and wellness. Read our post on '[How wearables detect disease now and in the future](#)' for more insight into the increasing role wearables play in healthcare.

5. Biometric Sensors

Compact accessories that use people's individual biological and physical characteristics for identification, authentication, and monitoring. [Biometric sensors](#) play a crucial role in healthcare, offering various solutions that improve patient care and monitoring, enhance identification and security, and streamline processes such as imaging, diagnostics, and transfusions with increased accuracy.

The growing digital healthcare market and the speed of technological innovation and advancement make this an exciting time for healthcare product developers.

At the same time, it also means that the digital healthcare landscape is evolving so rapidly that it's challenging to predict the future definitively. When, if ever, will 3D-printed body parts and [bioprinting](#) become mainstream? Can [smart pills or ingestibles](#) overcome safety, reliability, and privacy challenges? How will medical device regulations, which existed before many technologies such as AI and healthcare apps were developed and haven't been updated, impact future IoMT product development?

What are possible solutions for IoT in

healthcare challenges?

Despite its transformative potential, IoT in healthcare also presents [challenges and restraints](#).

Cost constraints

The upfront costs associated with deploying IoT infrastructure and devices and ongoing maintenance and support expenses can be prohibitive for healthcare organisations, especially in resource-constrained settings. IoT implementation's cost-effectiveness and return on investment must be carefully evaluated to justify adoption and ensure scalability over time. Possible solutions:

- Partnerships and collaborations that share resources and pool expertise help reduce implementation costs and provide access to funding opportunities.
- Exploring alternative financing models (e.g. leasing, subscription-based pricing, or pay-for-performance arrangement) helps to manage upfront costs and align investments with outcomes.

Data security and privacy concerns

The interconnected nature of IoT devices increases the risk of data breaches, exposing sensitive patient information to security threats. Inappropriate access to user data can lead to sensitive information misuse and exposure. Possible solutions include:

- Ensure strict security protocols on all user info, whether stored or sent.
- Two-step verification systems
- Strictly regulate access to third-party data collection companies (e.g. insurance and marketing companies) and ensure user data is only shared with informed consent.

Interoperability issues

Communication issues between IoT devices and platforms hinder seamless data exchange and interoperability, impacting care coordination and decision-making. In addition, a lack of standardisation (e.g. between different product developers) leads to gaps in healthcare security and an inability for products/platforms to communicate seamlessly (e.g. an IoT medical device and a hospital's EHR system).

Possible solutions include:

- Open platforms.
- Open data standards.

- Secure open platforms based on open data standards make it possible to extend the data interoperability between the various care providers.
- Collaborate with IoMT companies to develop products to ensure well-known technology standards and communication protocols are used, and devices will work well with others.

Regulatory Compliance

Compliance with healthcare regulations, such as HIPAA (Health Insurance Portability and Accountability Act in the USA) or the GDPR (General Data Protection Regulation in the UK), poses challenges for IoT implementation. The IoT landscape is evolving rapidly, and the framework of legal requirements can be complex – especially for new technologies that aren't covered by existing frameworks.

Possible solutions include:

- Stay informed about the evolving regulatory environment and adapt your compliance strategy accordingly.

Improving the adoption and scalability

While the IoT in the healthcare product market is growing rapidly, scalability (capacity to handle growth) and adoption (user acceptance and utilisation rate) are significant challenges.

Possible solutions include:

- Collaborative approaches (e.g. multi-disciplinary teams, user feedback sessions, and participatory design workshops) enable stakeholders to voice their concerns, provide input, and co-create solutions that address their needs and preferences. By involving stakeholders early and throughout the implementation process, healthcare organisations can gain buy-in and support for IoT initiatives.
- Providing comprehensive education and training programs for healthcare professionals, staff, and patients is essential to improving IoMT product adoption.
- Implementing small-scale pilot projects or proof of concept allows healthcare organisations to demonstrate the value and feasibility of IoT technology in real-world settings while minimising cost and risk.
- Flexible financing options (e.g. subscriptions) allow healthcare organisations to spread the cost of IoT implementations over time, reduce financial risk, and scale deployments according to demand and budget constraints.

Do the IoT healthcare benefits outweigh the challenges?

The benefits of IoT in healthcare products far outweigh the challenges, offering unique opportunities for greater collaboration to overcome them. For healthcare providers, these opportunities include:

- Improved patient outcomes and reduced hospital visits due to remote monitoring and predictive analytics capabilities.
- Efficient resource utilisation as real-time data insights enable healthcare providers to optimise resource allocation, streamline workflows, and deliver cost-effective care.
- Improved patient engagement.
- Remote monitoring and predictive analytics features of IoT in healthcare reduce costs by enabling timely interventions, preventing costly complications, reducing hospitalisation, reducing waste, and optimising operational efficiency.
- Improved care coordination and continuity: IoT facilitates seamless communication and data sharing among healthcare providers, ensuring coordinated care delivery and continuity of patient care across different settings.

From a user/patient perspective, these technologies are equally beneficial:

- Enhanced quality of life as the point of care is wherever the patient is, i.e. the comfort of their home.
- Increases engagement and empowerment as users can track and actively participate in their healthcare journey.
- Reduces the cost of hospital visits and consultations.
- Makes managing chronic health conditions easier as users receive real-time alerts and actionable recommendations.
- Allows for personalised treatment plans that are tailored to individual needs, preferences, and goals.
- Improved care coordination and continuity for the same reasons listed above.

Final thoughts on IoT healthcare products

IoT-enabled products hold immense promise for transforming the healthcare industry by driving cost-efficiency, improving patient outcomes, and revolutionising care delivery. While challenges such as

data cybersecurity and interoperability persist, the opportunities presented by IoT in healthcare are vast, offering innovative solutions to address the evolving needs of patients and healthcare providers alike.

As the IoT healthcare market expands, collaboration among industry stakeholders, regulatory bodies, and technology innovators will be essential to realise the full potential of IoT-enabled healthcare solutions.

Are you looking for a multi-disciplinary partner to help reduce the cost of your next healthcare product while increasing its market fit? Call us for a quote or free consultation with an expert on our team!

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FAQ's

Why is IoT important in healthcare products?

IoT enhances healthcare products by providing real-time monitoring, personalised insights, and remote accessibility, improving patient outcomes and streamlining clinical workflows.

How does IoT improve patient care in healthcare products?

IoT enables continuous monitoring of patient vital signs, facilitates remote patient management, and empowers patients to actively participate in their healthcare, leading to better health outcomes and enhanced patient engagement.

What are the benefits of using IoT in healthcare products?

IoT technology in healthcare products offers benefits such as real-time monitoring, personalised care, improved efficiency, and enhanced patient safety, revolutionising the delivery of healthcare services.

When should healthcare providers consider integrating IoT into their products?

Healthcare providers should consider integrating IoT into their products to enhance patient monitoring, streamline clinical workflows, and improve the delivery of personalised care to patients.

Which healthcare products can benefit most from IoT integration?

Healthcare products such as wearable devices, medical sensors, patient monitoring systems, and smart medical devices can benefit significantly from IoT integration, enabling real-time data collection, analysis, and insights.

How does IoT technology impact the cost efficiency of healthcare products?

IoT technology in healthcare products can improve cost efficiency by reducing hospital readmissions, optimising resource utilisation, and enabling proactive interventions, ultimately lowering healthcare costs and improving patient outcomes.

What challenges do healthcare providers face when implementing IoT in healthcare products?

Healthcare providers may face challenges such as interoperability issues, data security concerns, and resistance to change when implementing IoT in healthcare products, requiring careful planning and collaboration to overcome these barriers.

What role does data analytics play in IoT-enabled healthcare products?

Data analytics in IoT-enabled healthcare products allows for analysing large volumes of patient data, enabling predictive insights, personalised recommendations, and data-driven decision-making to improve patient outcomes and optimise healthcare delivery.

How can IoT technology enhance remote patient monitoring in healthcare products?

IoT technology enables remote patient monitoring in healthcare products by providing real-time data transmission, automated alerts, and personalised feedback, allowing healthcare providers to remotely monitor patient health status and intervene proactively when necessary.

What impact does IoT have on the interoperability of healthcare products?

IoT improves the interoperability of healthcare products by enabling seamless data exchange and integration across different devices, platforms, and systems, facilitating communication and collaboration among healthcare stakeholders.

Why is patient engagement crucial in IoT-enabled healthcare products?

Patient engagement is crucial in IoT-enabled healthcare products as it promotes active participation in healthcare management, improves treatment adherence, and enhances patient satisfaction and

outcomes, leading to better overall health and well-being.

How can IoT technology help address healthcare resource shortages?

IoT technology can help address healthcare resource shortages by optimising resource utilisation, reducing unnecessary hospital visits, enabling remote patient monitoring and telehealth consultations, and maximising the efficiency and effectiveness of healthcare delivery.

What are the privacy concerns associated with IoT-enabled healthcare products?

Privacy concerns associated with IoT-enabled healthcare products include unauthorised access to patient data, data breaches, and potential misuse of personal health information, highlighting the importance of robust security measures and regulatory compliance in protecting patient privacy.

What impact does IoT technology have on patient safety in healthcare products?

IoT technology improves patient safety in healthcare products by enabling real-time monitoring of patient vital signs, automated alerts for critical events, and remote access to patient data, facilitating timely interventions and reducing the risk of adverse events.

How does IoT integration affect the workflow of healthcare providers?

IoT integration in healthcare products streamlines the workflow of healthcare providers by automating routine tasks, providing real-time access to patient data, enabling remote monitoring and collaboration, and improving efficiency and productivity in healthcare delivery.

What are the potential risks of relying on IoT technology in

healthcare products?

Potential risks of relying on IoT technology in healthcare products include data security breaches, system failures, and dependence on technology, underscoring the need for robust risk management strategies and contingency plans to mitigate these risks effectively.

Why is it essential to ensure data accuracy in IoT-enabled healthcare products?

Ensuring data accuracy in IoT-enabled healthcare products is essential for making informed clinical decisions, maintaining patient safety, and achieving reliable outcomes, highlighting the importance of data validation, quality assurance, and error detection mechanisms.

How does IoT technology support personalised medicine in healthcare products?

IoT technology supports personalised medicine in healthcare products by enabling the collection of real-time patient data, analysis of individual health metrics, and delivery of tailored interventions and treatment plans, optimising patient care and outcomes based on unique patient characteristics and needs.

What are the long-term implications of adopting IoT technology in healthcare products?

The long-term implications of adopting IoT technology in healthcare products include improved patient outcomes, enhanced operational efficiency, and transformative changes in healthcare delivery models, shaping the future of healthcare towards more personalised, proactive, and accessible services.

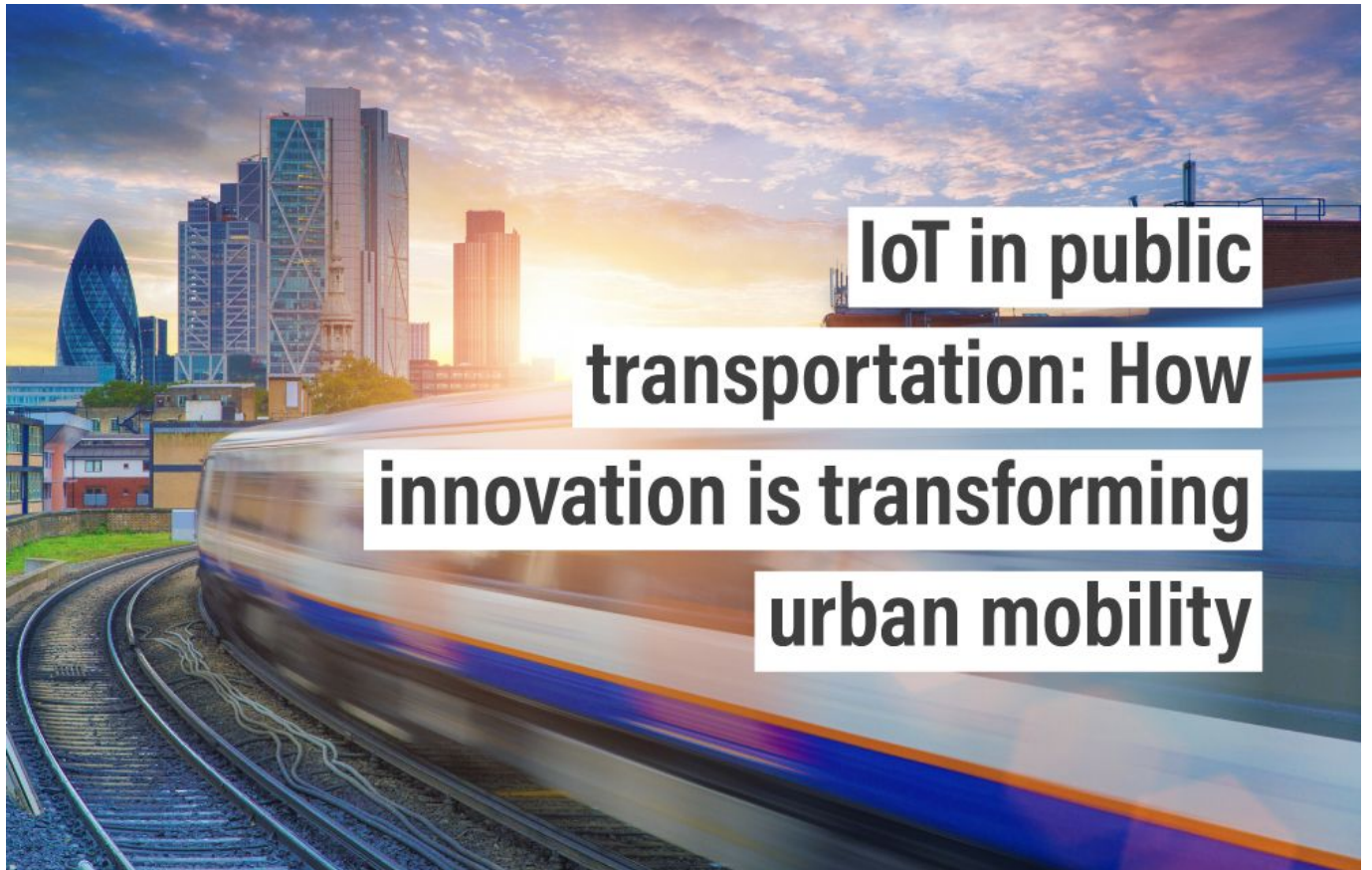
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