# Iot Prediction Report 2024

Navigating the perfect storm: AloT to emerge as the defining enabler of digital transformation

# ΟΜΟΙΛ



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# **Executive Summary**

In an era marked by the rapid evolution of digital transformation, the need for enterprises to access timely, high-quality data and process such data sustainably is at the forefront of strategic considerations. This necessity extends to the integration of the Internet of Things (IoT), and the acquisition of new, unique sources of data in the form of real-time information from interconnected sensors and devices. This plays a pivotal role for fundamentally new ways of creating value across industries by combining digital and physical worlds. As a result, Omdia believes the global installed base for IoT will exceed 82 billion devices by the end of the decade.

However, the significance of an IoT solution transcends mere data collection, requiring processing and augmentation capabilities of modern Artificial Intelligence (AI) to achieve true impact. The combination of AI and IoT, often termed the Artificial Intelligence of Things (AIoT), further enabled by new generation connectivity such as 5G, represents more than an incremental enhancement. This convergence unlocks higher operational efficiencies, better customer experience, and higher productivity gains across diverse sectors, from automotive and industrial manufacturing to transport, utilities, and smart cities.

This report delves into the strategic importance of AloT for global IoT enterprises, emphasizing the operational necessity for businesses aiming to fortify their relevance and resilience in the digital age. The analysis is rooted in pragmatic considerations rather than hyperbole, offering a compelling call to action for enterprises seeking to navigate the complexities of Al integration in their IoT journeys.

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A must for enterprises in 2024: Al integration unlocks the next wave of success of IoT

Global digital transformation continues to accelerate in terms of the pace of change that it brings and the scalability of effects, fundamentally altering how businesses and entire industries operate into the future.

A core element in a successful digital transformation is access to high-quality, real-time data that can be used to make better informed decisions and do more advanced forms of automation for gaining higher operational efficiencies, improving customer experience, and employee productivity. It is therefore unsurprising that one ramification of the digital transformation has been the growth of the Internet of Things. IoT solutions provide enterprises with a reliable means to receive information from a range of connected assets, devices, and equipment – all of which are the core assets of any industrial organization. This correlation between IoT and digital transformation is evident in Omdia's 2023 IoT Enterprise survey in which 88% of respondents stated IoT was being implemented in multiple areas of their organization or was a key element in their digital transformation.

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Boosted in part by the increased pace of digital transformation. Omdia estimates the worldwide installed base of IoT devices to be almost 38 billion devices at the end of 2023 and that it will eclipse 82 billion in 2030. However, while standalone IoT applications can

number of endpoints and data increases. It's clear simply collecting data does not unleash its potential value. Augmenting the data collection with human intelligence to analyse and act upon it is a start, but the sheer amount of information makes this impractical and not even possible. Instead, organizations must infuse their IoT projects with analytical tools that make their applications smarter, more efficient and sustainable. The answer is AI. As we enter 2024, Omdia believes the integration of AI capabilities into IoT deployments, a movement commonly referred to as the Artificial Intelligence of Things (AloT), or Al4IoT, is no longer a luxury. Instead, the AloT will become an operational imperative for enterprises looking to secure their relevance and resilience in the digital age. By doing this, 'smart devices' become part of an 'intelligent system' solution - a holistic and transformative way to deliver the maximum value add to the organization.

deliver value they also create challenges. Foremost is the tremendous amount of data they generate and associated challenges of compute, with some estimates stating the global IoT market now accounts for around one billion gigabytes of data daily.

The result is many enterprises end up drowning in a 'data lake' as they lack the ability to effectively analyse and extract meaningful information that creates business value from the vast amounts of data. Predictably, this problem only grows as these IoT projects scale and the



### **AloT has arrived**

AloT is the convergence of Al technologies into an IoT application where IoT represents data and AI - a set of analytical tools that enable extraction of value from data, also commonly termed 'Internet of Intelligent Things', 'IoT with Al', and 'IoT Machine Learning'. These terms can be used interchangeably, and each describes an architecture that integrates both technologies in a single solution, a combination which can create a transformative impact.

As seen in the diagram to the left, the integration of Al into an IoT deployment can occur at either the edge or in the cloud. The ability of cloud computing to offer scale, flexibility, and power beyond the reach of traditional on premises equipment has made it the traditional platform for analytics and AI, helping manage vast volumes of data and transform them into impactful insights. Recently though, Edge AI has gained more traction as a way to address low-latency requirements, reduce cost, and mitigate security and privacy concerns.

In either scenario, the essential aim of using AI is to find patterns in data and run the analysis for extracting meaningful insights for business or automating the tasks, in turn improving decision making processes. Simply put, AloT enables a conversion of raw data into powerful action with a tangible business value. If done correctly, a faster, more robust and sustainable use of IoT data for value creation can be achieved when deploying most modern data and AI technologies, such as Generative AI. To put it another way, IoT provides the data while AI

### **EDGE AI**

The Edge AI refers to implementing AI on the physical devices where data is generated, rather than having these capabilities sit in the cloud. Also referred to as Intelligent Edge, Edge IoT, or Edge AI, this is drawing growing interest as we enter 2024. *As devices start to generate more* data, OEMs and semiconductor vendors are deploying AI models and AI inference chipsets to enable this increased analysis and

decision-making at the end point, also to secure lower latency, data privacy and security requirements of the applications. This is despite many edge devices typically being constrained by low energy capacity. *The most obvious driver for the* growth of the Intelligent Edge is applications that require intense response times, or where latency is vital for the delivery (e.g., AR and VR-enabled gaming). The time it

furnishes the power to unlock responses. A simple analogy for AloT is the human body. In this scenario, the IoT is the central nervous system, responsible for collecting data and transmitting this information through its network. AI would be the brain; it takes this collected information, analyzes it to determine its importance, and decides how to respond. Although each system has specific functions, they are all interconnected and dependent on one another, and their convergence makes the other more effective.

> takes for data to be collected, sent to a centralized data center, and back again is simply too long. In addition to the latency advantage, Edge AI allows for improved security and privacy as all the data is kept locally, as well as reducing costs associated with data traffic transfer and subsequent storage in the cloud. Sustainability advantages of relatively *lower computational budgets are* also prominent.



### 2024 is the time to act

Omdia believes several factors are set to align in 2024, signaling a pivotal year for AloT adoption. Rapid developments of Generative AI technologies and associated sense of urgency in the boardrooms of many enterprises show prioritization of AI/ML in IoT deployments, foreshadowing widespread AloT adoption. In addition to that, hardware advancements with more powerful, tiny and energy efficient devices, breakthroughs in AI models, and impending AI regulations setting requirements for more responsible and sustainable use of digital technologies contribute to the momentum. When combined, these conditions underscore the urgency and the window of opportunity for enterprises to integrate AI technologies into their IoT applications to stay ahead.

### **COMPETITIVE DYNAMICS**

In the Omdia IoT Enterprise Survey, over 48% of enterprise respondents stated that AI/ML was a priority for their future IoT deployments; the number one choice. Omdia believes this foreshadows wider AloT adoption in 2024. Enterprises must make this move or risk falling behind.

### **BREAKTHROUGHS IN AI RESEARCH AND** DEVELOPMENT

R&D efforts to minimize AI model size will be a key factor in scalability of applications of AI-enabled IoT applications, in particular for those running at the edge. Model compression, essentially the transformation of a large and complex model into more lightweight models, allows machine learning algorithms to be run on devices with limited memory and power budgets. At times referred to as TinyML, this development will enable increased use of AI in IoT applications in 2024 and beyond.

### HARDWARE ADVANCEMENTS

Integrating AI capabilities into edge IoT solutions requires greater computing power. Traditionally, a key challenge for this implementation has been getting hardware at the right combination of price, power usage, performance, and form factor. However, strong competition in the semiconductor market has led to tremendous advances in each of these areas in recent years. A large number of silicon vendors already offer an AI acceleration option in price points down to microcontrollers, and those that don't, are trying to address this gap. Omdia forecasts shipments for AI Edge processors will grow from 2.3bn in 2023 to nearly 4B in 2028.

### **EXTERNAL FACTORS**

A range of other factors are also expected to compel enterprises to move toward AloT in 2024. Labor shortages in high-cost countries will drive more enterprises to utilize automated solutions where possible. Another interesting development in 2024 will be AI regulation, where different government bodies expect to address the impact of AI and create responsible AI governance frameworks to safeguard against its potential harm (e.g., privacy thefts, disinformation, bias and discrimination). While at first glance this might seem like a market inhibitor, Omdia surveys show an overwhelming number of enterprises believe government regulations are important for the long-term governance of the space. When asked in an Omdia survey, 65% of enterprise AI practitioners felt that Al should be regulated.

Taken together, these factors are setting up to make 2024 a monumental year for AloT in enterprises. However, as with any technology the ultimate factor for future success will be the return on investment that AloT projects deliver. The following use cases exemplify some of the areas where we believe AIoT will, or already does, provide a practical and tangible ROI.

### **GENERATIVE AI**

Any discussion about AI in 2024 will include Generative Al (GenAl). Omdia's simple definition of GenAl is leveraging Al technology to "create something new". The content created by GenAl can vary, including conversational or longform text generation, software code creation, image synthesis, and even music composition.

Omdia research *indicates enterprises* have enthusiastically embraced generative AI: 38% of respondents in Omdia's 2024 IT Enterprise Insights reported that they had either already fully

adopted generative Al or were implementing it. Only 10% said they had no interest in generative Al.

*In these early days, it is* difficult to assess how precisely GenAl will impact AloT. One nearterm impact could be *in automated software* code generation. GenAl's ability to accelerate the coding process could be applied and aid the development of coding IoT applications, helping to reduce the time to market. Another potential convergence of these technologies could be synthetic data generation.





Key AloT benefits and use cases

The marriage of AI and IoT is not an incremental upgrade but rather holds the key to unlocking higher operational efficiencies, better customer experience, and higher productivity gains across diverse sectors from automotive and industrial manufacturing to transport, utilities, and smart cities. In these and other applications, this convergence can turn simple solutions into those with greater impact and value. Predictive maintenance, robotics improvement, and enhanced in-car experiences underscore the tangible ROI of AloT.



Simple: Your machine is offline **Complex:** *Detect failure in* advance (predictive maintenance)



Simple: In-car WiFi, emergency call **Complex:** *Autonomous* automobiles



**Simple:** *This shelf is empty* **Complex:** *Demand* forecasting, dynamic pricing, optimized product placement



Simple: *remote patient* monitoring **Complex:** *Predict, identify* diseases or serious conditions before they do greater harm

MANUFACTURING 2.18 Billion of IoT devices

By adding IoT to a factory setting, manufacturers can access real-time monitoring of various factory assets. Deployment of most modern AI/ML technologies can take this to another level, allowing these solutions to identify anomalies and in turn predict equipment failures before they cause downtime. The ROI of predictive maintenance is evident. If trained on high quality data, not only can AI systems trigger appropriate actions to be taken automatically to prevent component failure and replacement, but also ensure that manual inspections are only done when needed. Thus, allowing for reduced equipment and personnel expenses.

The ability of AloT to improve robotics is also important for the manufacturing industry. Already, Tier 1 manufacturers are pushing hard for autonomous factories and warehouses where robots and Automated Guided Vehicles (AGV's) are integrated for identification, retrieval, and smart palletization – for example, DHL expanding their partnership with AutoStore for 1,000 automated warehouse robots. The trajectory of collaborative systems will likely be accelerated by the more advanced capabilities of AI, connectivity and guidance systems such as Robot Operating System (ROS). Communication between these robots and humans will also be improved using natural language processing (NLP) technologies.



### AUTOMOTIVE



Over a fifth of all vehicles in circulation are already connected, and this is anticipated to reach 100% by 2030 -with each individual vehicle generating huge amounts of data from a vast array of sensors in multiple applications and functions. The next logical step is to embed Al/ML within these vehicles to help use this data to deliver safer driving experience, improved vehicle performance, and enriched customer experiences.

Already AloT is playing a role in the in-car experience through voice assistance. Using the new generation mobile and IoT connectivity and the power of Al, these systems interpret driver cues and speech and convert those into recommendations for action. The functionality and reliability of these systems continues to grow as advancements are made in NLP. Al is also contributing to driver assist safety systems seen on many vehicle models such as blind spot monitoring which warns drivers when potential obstacles are nearby.

Looking ahead, AIoT will play a central role in reaching the goal of fully autonomous cars. These vehicles will require continuous, uninterrupted streams of data through IoT connectivity and advanced AI models that can immediately and accurately identify, label and respond with action to vehicles, people and objects on the road. These solutions will be complex, requiring an enormous amount of training on a wide range of datasets so that every scenario can be processed and acted on in split-seconds. While the challenges are tremendous, so too are the benefits as most studies estimate over 90% of serious automotive accidents

\* Omdia IoT Devices Market Tracker

are due to human error. As a result, Omdia believes autonomous driving could represent one of the most impactful AloT solutions in the years to come.

### **SMART CITIES**



AloT also becomes a key enabler for sustainable smart cities, as enterprises and governments across the globe work towards the sustainable development goals (SDGs) set by the United Nations in 2015 and focus on the transformation within cities. IoT is among the fundamental technologies here, where sensors and devices collect all the necessary data and information that allow city planners to monitor their progress against sustainability KPIs, such as improving energy efficiency, reduce pollution, optimize traffic networks and similar.

As the number of sensors and generated data increase within city environments, AI and ML are important for automating processes and creating more value from this data. For example, AIoT solutions can combine historical and real-time traffic data to predict and in turn alleviate congestion areas. Similar to the predictive maintenance in manufacturing, AI can enable more accurate predictions of potential downtimes/failures in city services (such as waste management and water supply) and risks such as natural disasters.

### ZENSEACT AND AUTONOMOUS VEHICLES

Zenseact is an AI software company known for its OnePilot product, founded and since fully acquired by Volvo Cars in 2023– a clear sign of the increasing importance of embedded AI within automotive as the industry moves from connected car to smart vehicle. Zenseact are even working with CERN, one of the world's largest and most respected centres for scientific research, in exploring deep learning models and computer vision techniques to help improve decision making in autonomous vehicles, with faster algorithms and more energy efficient models for delivery at the edge.

OnePilot is an Al-powered software platform for autonomous driving and advanced driver-assistance system (ADAS) applications. This platform is already at work in Volvo and Polestar vehicles, with the first production launch on the Polestar 3 in October 2022. The focus is on advanced driver assistance, using AI methods to power active safety capabilities, termed 'precautionary safety' by Zenseact- allowing the vehicle to be able to anticipate dangerous traffic scenarios before they happen and adjust the car's speed and position accordingly. For example, this includes the use of high-definition maps to allow the vehicle to understand positioning and stay in the centre of lanes, even when markings are difficult to identify. Real-life data from the vehicle fleet is also then used to build 'collective fleet intelligence' to aid continuous improvement of the solution.

All of this of course requires strong and reliable connectivity, especially since the vehicle will continuously improve its performance and functionality through over-the-air software updates.



### **TELENOR AND ERICSSON AIM TO IMPROVE ENERGY EFFICIENCY IN TELECOMS**

In November 2023, Telenor and Ericsson announced the signature of a Memorandum of Understanding (MoU) focused on the aim of advancing the realm of artificial intelligence and machine learning technologies within the telecommunications industry, but particularly towards enhancing energy efficiency without compromising on connectivity quality. The partnership is based on the clear trend towards more programmable mobile networks, such as through AI-enabled decision and operational support.

Ieva Martinkenaite, Senior Vice President & Head of Telenor Research & Innovation, says, "Al adoption is essential for Telenor to unlock our customers' potential. We expect this collaboration to break new ground when it comes to leveraging AI and automation to help address the

complexity of 5G networks, drive energy efficiencies, improve customer experience – and make Telenor an Al-first company."

### The partnership focuses on two key areas of engagement:

• Energy Management and Network Optimization: Telenor and Ericsson will work together to develop and implement AI-driven solutions to optimize energy consumption and enhance network performance, particularly in radio access networks (RAN).

• Implementation of Safe and Trustworthy AI: The partnership will also emphasize the development of explainable AI systems to ensure transparency and reliability in network operations.

### The collaboration also includes:

• Research Insights: Joint publications on advanced *ML* methods in mobile networks, covering topics such as energy optimization in RAN and secure, explainable Ål.

• Live Test Network Deployment: Testing and deployment of AI/ML systems in a live test network, including energy efficiency, anomaly detection, and spectrum sharing, in cooperation with early adopters and Telenor customers.

• Validation of Business Models: The validation of Aldriven 5G use cases and business models.

• *Knowledge Building: Creation of teaching modules* and similar resources to accelerate growth potential *in Al-native telecommunications.* 





Cellular connectivity will allow AloT to flourish



The transformational power of AloT is clear – and one essential element to allow these applications to improve over time and solve new business problems is connectivity. Fullscale, deployments of AloT simply will not be impactful unless they have access to reliable and ubiquitous communication networks. Connectivity is the lynchpin bringing it all together.

The importance of connectivity for the growth of AloT, comes down to one word: data. The incredible amount of data provided via the IoT is an essential fuel driving Al/ML algorithms to improve the accuracy and speed of decisions. Quite simply, the more data and more highquality data these AI systems have access to, the more capable and powerful tools they can be for enterprises.

The combination of IoT connectivity and AI essentially creates a mutually beneficial loop. Of course, if the transmission of this data is limited, inconsistent, or never occurs then this loop cannot be completed.

Today, enterprises have a wide variety of short-range, long-range, wired, and wireless connectivity protocols they can use in their AloT deployments. In many instances, cellular connectivity has advantages; including the technology's proven scalability, and its inherent security thanks to encryption and the well established protections. Additionally, a unique challenge related to AloT is the diversity of devices and environments. Each can present different requirements and necessitates a service provider that can support multiple connectivity standards. Here again, cellular technology shines as its diverse protocols can meet these various demands. For i ofter chall corre sour avail as L<sup>-</sup> At th that are r Fina ubiq still v Al m It's c all lc prot ente (bas

For instance, many IoT devices are deployed in the field, often in remote locations. This presents a tremendous challenge in terms of network coverage, but also often correlates to these devices having limited access to power sources. Energy efficiency is required. In these instances, availability of low-power wireless cellular networks, such as LTE-M or NB IoT, is essential.

At the other end of the spectrum are IoT applications that require high speed and low latency. In this scenario, availability of advanced network standards such as 5G are required, that provide high-bandwidth connectivity. Finally, even in cases of Edge AI where the need for ubiquitous connectivity is certainly lessened, a network is still vital to ensure firmware updates, and updates to the AI model itself, can be communicated.

It's clear no single connectivity technology is suitable for all IoT applications. In fact, many IoT projects use multiple protocols. A partner with years of experience can help an enterprise choose the technology that is most suitable (based on cost, coverage reach, power consumption, etc.) for a specific project. This partner can also assist in interoperability testing when multiple protocols are being used together.



Omdia urges enterprises to seize the AI advantage in 2024. The transformative nature of AIoT is acknowledged, marking a shift from 'smart' connected products to a seismic advancement in the market. The time to act is now for organizations aspiring to compete in the digital age or they will fall behind.

As the saying goes "nothing great ever came that easy". It is not a surprise given the impact of these solutions that they also are complex to adopt. Amongst many factors as enterprises begin their AloT journey, they should certainly consider the following.

### SET DIGITAL TRANSFORMATION AMBITIONS AND TRANSLATE THOSE TO TANGIBLE AND MEASURABLE **BUSINESS GOALS (AND ADJUST THEM IF NEEDED)**

While urgency to move forward with AloT is needed, don't start your adoption unless your AIoT initiative is either solving a business problem or creating a genuine business opportunity. Furthermore, ensure you have mechanisms in place to measure the success of that project. Also expect those KPIs to evolve. Given their infancy, KPIs for less mature AloT use cases will evolve rapidly.

### **ENABLE EXPERIMENTAL, LEARNING CULTURE WITH APPETITE FOR HIGHER RISK**

Implementing AI within organizations is not a simple hardware or software implementation; it requires a fundamental mindset shift and new leadership on how we do things in an organization. One element of this is to enable an experimental culture allowing people to break things fast with calculated risks and shared accountability, learn from mistakes and ensure continuous skills development. This also requires broader, longer-term thinking about the AloT lifecycle, particularly ongoing tuning and maintenance and the important role of data integration and governance.

Al experts are scarce resources and will remain so in the upcoming years. As a result, for many enterprises working with AI technology partners is critical to completing their AloT journey. These partners may help the users to remove roadblocks, do joint upskilling, deliver projects on time and achieve ROI targets.

### **TAKE A PRACTICAL APPROACH TO MANAGING RESPONSIBLE AI RISKS**

The power of AI is immense but used improperly it creates exposure to risk that include regulatory penalties, litigation, loss of revenue, and loss of customer/partner confidence. Building trustworthy AI outcomes is no trivial matter, demanding effort and expertise across a wide range of disciplines, including privacy, security, transparency, bias, and safety. For AI to flourish, Omdia believes enterprise AI practitioners must practice Responsible AI and address issues of ethics and governance by establishing a set of transparent, measurable, and enforceable ethical standards, taking the opportunity to upskill teams and deliver better outcomes.

### WORK WITH THE RIGHT PARTNERS

As with any transformative technology the ultimate impact of AloT is hard to gauge. However, Omdia does believe that 2024 marks a significant fork in the road, a point in which AloT will go from optional to a requirement for any organization with ambitions on competing in the digital age.

### The time to act is now.



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### Omdia

Omdia is a global technology research powerhouse, established following the merger of the research division of Informa Tech (Ovum, Heavy Reading, and Tractica) and the acquired IHS Markit technology research portfolio<sup>\*</sup>.

We combine the expertise of more than 400 analysts across the entire technology spectrum, covering 150 markets. We publish over 3,000 research reports annually, reaching more than 14,000 subscribers, and cover thousands of technology, media, and telecommunications companies.



### **Telenor Connexion**

Telenor IoT is the portfolio of IoT solutions from Telenor Group, one of the world's major mobile operators. With more than 20 years' experience of providing global IoT connectivity, cloud services and expert support to companies of all sizes, Telenor is one of the world's most advanced IoT solution providers.Telenor IoT manages international IoT deployments for global customers in some 200 countries and today operates more than 20 million connected devices to enterprises such as Volvo, Scania, Hitachi, Verisure Securitas Direct and Our exhaustive intelligence and deep technology expertise enable us to uncover actionable insights that help our customers connect the dots in today's constantly evolving technology environment and empower them to improve their businesses – today and tomorrow.

\*The majority of IHS Markit technology research products and solutions were acquired by Informa in August 2019 and are now part of Omdia.

Husqvarna. The IoT solutions are offered to national customers in the Nordics through the local Telenor operations in each country, and on a global level through Telenor Connexion, Telenor's specialized unit that provides IoT solutions for large, international enterprises who need a customized offer with advanced support.

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