OT Predictions IoT will play a key role in fighting climate change

2020 Prediction Report With analysis from **Northstream**[™]

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IoT Predictions

2020

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1 Retrospective look at our 2019 predictions and how far we have come

This is our second edition of the IoT Predictions report. In the first edition we identified five predictions for 2019 and beyond on how IoT will drive the connected economy. We believe that these early trends remain very relevant today. Take a brief look at what we said and how far we have come:

Enterprise data will take the lead in data trading

The abundance of data coming from connected "things" in the IoT is leading many companies to explore opportunities for monetization by selling their data to third parties. We predicted that data from enterprise IoT (e.g. machines and sensors) will be in focus for large-scale data trading as it is subject to less data protection regulations than data from consumer IoT. A number of data marketplaces such as IOTA, DAWEX, Steamr and Terbine are enabling trading of aggregated anonymized data (e.g. environmental, agricultural, smart city and vehicle data). Since last year we have seen that these data marketplaces continue to evolve and strengthen their capabilities when it comes to data security, consistency and high quality, and companies are increasingly turning to these marketplaces both as data providers and data consumers.

Digital value will be unlocked faster

Enterprises that embarked early on a digitalization journey have achieved benefits but have often created a technology landscape comprised of disparate in-house systems with complex interactions. As more processes are digitalized, these early adopters may have to settle for diminishing returns on incremental investments.

However, we predicted that newcomers to digitalization will "leap" over the complexity that first movers experienced and develop and deploy IoT solutions faster and at lower cost. This is mainly enabled by the technological maturity reached in IoT cloud platforms from service providers like AWS, Microsoft Azure and many others. In 2019, we saw that Amazon Web Services and Microsoft Azure cloud continued to grow at double-digit rate, indicating continued strong demand. Apart from scalability and cost, two other important reasons for customers to embrace IoT cloudbased solutions are security and compliance, which are becoming increasingly important requirements.

Connectivity will be at the center of digital product innovation

A well-functioning connectivity solution is a crucial part of product performance and an enabler for a digital offering. However, connectivity is still too often an afterthought. We predicted that to enable new digital products and experiences, enterprises will integrate connectivity technology considerations into the overall product development cycle from the start. We see today that connectivity competence is increasingly in focus and the cost impact of connectivity on the overall profitability of digital products and services is more carefully considered, particularly in cases where data volumes are likely to fluctuate unpredictably, or multi-country service support is required.

Connectivity will push e-commerce even further

The logistics industry is undergoing rapid change, powered by the growth of e-commerce. Smart logistics, with connectivity at the centre linking all stakeholders (e.g. suppliers, carriers, warehouses) is expanding from high-value assets to mass deployment. Retailers are able to provide real-time and transparent tracking information

to the consumer, optimized even in the last mile of package delivery. Logistics operations in warehouses are increasingly automated through technologies such as AI and automated guided vehicles that allow to reduce cost and increase efficiency. We predicted that connectivity technologies combined with AI, robotics and sensors will be a main driving force for logistics innovation.

Managed connectivity will be even more important

In both the consumer and enterprise IoT domains, Wi-Fi has been widely adopted as a connectivity technology, especially when the product or service is aimed at a price-sensitive segment. The assumption is that the end-user will serve as a field service technician to install the product and troubleshoot in case of a connectivity issue. Typically, consumers accept this responsibility as the tasks involved are quite simple. However, there are scenarios where products need to be highly reliable and secure as in the case of smart locks or SLAs are involved (e.g. video surveillance security services). For a growing number of such use cases managed connectivity (cellular or Wi-Fi) is a better fit and is rising to be a primary technology selection criteria, in addition to the solution's technical and commercial merits.

In the first edition we identified five predictions for 2019 https://www.telenorconnexion.com/iot-insights/5-iot-trends-2019

In this edition of our Predictions report, which also comes at the beginning of a new decade, we add one more prediction for the coming years. We foresee that IoT will play a key role in fighting climate change. IoT will not only drive the connected economy, but will be an important enabler for a more sustainable and responsible connected economy.







2 IoT to play a key role in fighting climate change and combatting global warming

Burning fossil fuels and cutting down rainforests, are activities that contribute to increased amounts of greenhouse gases in the atmosphere that lead to rising temperatures and global warming.

As a result, the earth's climate is changing. The glaciers are melting. Storms are heavier and droughts more frequent. Earths biodiversity hangs in the balance. It is a tremendous and complex problem, and the impact on human life is tangible – the World Health Organization listed air pollution and climate change as one of the top ten threats to global health in 2019¹.

Under rising pressure from society, customers, and regulators, businesses are searching for ways to balance their drive for profit with the need to reduce their environmental footprint. Are these two objectives necessarily at odds?

Over the coming pages we will explore the various drivers influencing these objectives and highlight the key role IoT has to play.

As companies have embarked on journeys of digitalization and implementation of IoT solutions as a part of those efforts, a lot of the focus has been placed on improving efficiency and reducing cost in the manufacturing, transport, supply chain and maintenance of products. The cost reduction achieved is often a result of optimizing the use of production materials ranging from electricity, fuel and water to cotton, iron, timber and more.

This means that as part of those commercial initiatives aimed at financial benefits, there has been a positive contribution to sustainability. Research² conducted on 643 IoT projects has found that 84% of these IoT deployments can address the 17 UN Sustainable Development Goals, with 70% of these projects led by the private sector.

In spite of this, sustainability has too often been an afterthought, a welcome by-product that brings PR value, but has not always been a conscious effort or priority. Environmental sustainability was often considered the sole domain and responsibility of the CSR department, who struggled to educate internal stakeholders and drive the sustainability agenda. From their perspective, many executives argued they had not seen convincing evidence of a direct link between their for-profit projects and sustainability goals.

We believe that IoT will play a key role in reducing humanity's environmental impact and fighting climate change.

Currently, we see a mindset shift and note a change is under way in companies' and cities' approach to sustainability. We expect to see in the coming years a much stronger link between digitalization and sustainability efforts.

We believe that IoT in particular will play a key role in reducing humanity's environmental impact and fight against climate change. In its essence, IoT is about collecting data and remotely controlling "things", which makes it a catalyst for smarter decisions and innovative business models. These can be applied to extract more value from less resources and ultimately reduce environmental impact.







¹ Ten threats to global health in 2019, World Health Organization, available at https://www.who.int/news-room/feature-stories/ten-threats-to-global-health-in-2019

² Research by IoT Analytics and the World Economic Forum, available at http://widgets.weforum.org/iot4d/

3 What are the drivers?

Customer and societal pressure is rising

More than ever before, companies that engage in unsustainable practices risk incurring the wrath of consumers, often via social media. This ultimately damages brands and revenues.

From their perspective, customers increasingly strive to make more ethical and sustainable choices, with many willing to pay a premium for such products and services. Sometimes it can be hard to discern which option is more sustainable. **Therefore, customers are also increasingly seeking greater transparency about how the products they buy are sourced, manufactured, transported as well as the total environmental impact.**

Businesses can come under pressure not only from their customers and the media but also from their investors. Both individual and institutional investors are increasingly scrutinising sustainability ratings, such as the Dow Jones Sustainability Indices that evaluate the sustainability performance of thousands of publicly traded companies.

Companies need to show greater authenticity, transparency and sustainable values. This means that they need to set relevant KPIs, collect and analyse data from their entire operations and supply chains to understand and reduce their carbon footprint.

Regulation puts new requirements on businesses

Governments worldwide are implementing stricter legislation on whole industries related to emissions, pollutants and use of natural resources.

The EU, for example, is applying stricter targets³ from 2021 onwards in the legislation on reducing CO2 emissions from passenger cars – the fleet-wide average emission target for new cars will be 95 grams of CO2 per kilometer (previously 130 grams of CO2 per kilometer). China, which is the world's largest automobile market and has been struggling with serious air quality issues, is also taking action. The Chinese government has introduced a series of emission legislation upgrades⁴ – the next one, referred to as China 6a is due to come into effect from July 2020 and will largely follow EU standards. It will be replaced by China 6b in July 2023, with revised targets that will be even stricter than their European equivalents.

Some governments are setting even more ambitious goals – **New** Zealand has made their emission targets into a new law that commits the country to zero net emissions of greenhouse gases by 2050⁵. An independent climate change commission will be created to advise the government on the action that should be taken to meet these environmental commitments.

Companies that fall short on compliance risk heavy fines. Meeting stricter regulations can be challenging for businesses of all sizes. It requires investments and innovative solution.

Companies are voluntarily setting ambitious goals to become carbon neutral

While regulation is a strong driver for change that is affecting many industries as described above, governments as a whole are not doing enough to reduce greenhouse gas emissions and are already falling behind the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C".

According to the Climate Action Tracker⁶, an independent scientific analysis, under the current global climate pledges the world is on track to warm by 2.8°C by the end of the century, close to twice the limit agreed in Paris and in terms of actual real-world action many governments are even further away from this goal.



However, there is a rising trend towards companies stepping up and making voluntary commitments to align their corporate strategies with the goals of the Paris Agreement by going "carbon neutral".

The Business Environmental Leadership Council (BELC), for example, is now comprising 35 industry leading, mostly Fortune 500 companies across a range of sectors, united in their commitment to establish and meet greenhouse gas (GHG) emission reduction targets, and/or invest in low and zero GHG products, practices and technologies.

One of these companies is Microsoft, which has pledged to reduce operational emissions by 75 percent by 2030, but has been operating as 100 percent carbon neutral since 2012⁷.

Another example of a company paving the way in its field is Air France-KLM Group, which was named again a world air transport leader⁸ in the 2019 Dow Jones Sustainability Index. The company's action plan includes renewing its fleet with more fuel-efficient jets, improving maintenance operations to minimize the time jets stay burning fuel on the tarmac and investing in biofuel development.

- ⁴ China light duty emissions, <u>https://www.transportpolicy.net/standard/china-light-duty-emissions/</u>
- ⁵ New Zealand Parliament, <u>https://www.parliament.nz/en/pb/bills-and-laws/bills-digests/do-</u> <u>cument/52PLLaw25931/climate-change-response-zero-carbon-amendment-bill-2019</u>
- ⁶ Climate Action Tracker, <u>https://climateactiontracker.org/publications/governments-still-not-acting-on-climate-crisis/</u>
- ⁷ More information about Microsoft's initiatives is available at <u>https://www.microsoft.com/en-us/corporate-responsibility/sustainability</u>
- ⁸ KLM, available at <u>https://www.airfranceklm.com/en/air-france-klm-group-once-again-world-air-</u> <u>transport-leader-2019-dow-jones-sustainability-index</u>

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³ European Commission, Policy on reducing CO2 emissions from passenger cars, available at <u>https://ec.europa.eu/clima/policies/transport/vehicles/cars_en</u>

4 What will be the impact?

IoT has the potential to play a very important role in decreasing humans' environmental footprint. In the coming years we expect that:

Sustainability goals will become an integral part in many commercial IoT deployments

Environmental sustainability will no longer be just a by-product of becoming "smart". IoT solutions will increasingly be designed with sustainability as a key component, alongside business and technology requirements. What this means is that companies will be considering sustainability already in the design phase of IoT deployments by looking at how the data collected from sensors and connected products can reduce the use of resources, cut waste and overall CO2 emissions, thus delivering on their sustainability goals.

When the efforts are targeted and led by a top-down sustainability strategy and goals, the impact will be larger compared to previous deployments that were purely focused on cost reduction.

Companies will also place more importance on sustainability when selecting vendors. This will benefit vendors that are, for example, developing more energy-efficient technology, using reusable wind and solar energy to power their operations and investing in carbon offset projects.

Newer generation technology is typically more energyefficient and thus kinder to the planet. In mobile networks, for

example, the 5G New Radio standard is designed to decrease power consumption significantly⁹ by switching off hardware components and thus putting the base station into a sleep-state when there is no traffic to serve, in contrast to previous generations mobile networks that have frequent transmission of always-on signals to secure coverage and good connection.

Companies will leverage the data from IoT to create offerings for environmentally conscious consumers and businesses

Companies will collect and act upon IoT data to optimize resource usage and respond to environmental legislation, for example stricter regulations on emissions in the shipping and maritime industry that require both technical and operational measures.

Many companies will also go the next mile – create new offerings based on sustainable products and services that are targeted for environmentally conscious consumers. These businesses see sustainability not as a cost but as a competitive edge that they place at the core of their brand identity and product design.

In such offerings, we expect not only eco-friendly labels but also greater transparency and factual information about the product's environmental impact. This means that products will need to tell stories across their whole supply chain, from sourcing to manufacturing to distribution.

This transparency will eventually spread to the mass market over time. For example, as a part of its plan to become carbon neutral by 2050, the Danish government has announced a plan to work with

supermarkets to create a labeling system for food products to clearly indicate each product's carbon footprint.

The labels may have to consider water and land usage, life-cycle analysis, greenhouse gas emissions, and carbon footprint from transport. The idea of carbon labeling is not new in itself, but calculating the carbon footprint was in the past considered too complex and costly. Now, with IoT sensors in the form of RFID transmitters and GPS systems that are sending data from manufacturing plants, logistics warehouses and transport vehicles it becomes possible to track the footprint even of individual products.

⁹ Ericsson, A technical look at 5G energy consumption and performance, available at https://www.ericsson.com/en/blog/2019/9/energy-consumption-5g-nr







5 How can loT contribute to a more sustainable product lifecycle?



The 3Rs

Companies have historically focused on making and selling as many products as possible at the lowest cost possible, with less focus on how often a product is used or what happens when it is no longer needed.

Businesses and consumers are realizing that this "take-make-dispose" model is no longer suited to the reality we are facing. Innovative companies are starting to apply circular-economy principles to their product lifecycle management.

This approach is based on 3Rs: reduce the use of resources, reuse products and parts as much as possible and recycle the raw materials. This approach therefore entails not only planning for what happens at the end of the product's useful life but also rethinking the whole product lifecycle, and how value is created and delivered.

By connecting the whole value chain, from sourcing, manufacturing, distribution, and product use, to collection and recycling, IoT plays a crucial and integral role in emissions reduction.

Next we will take a look at some examples. Some of these use cases and applications are already established, some are in the growth stage and others are still in nascency and will be scaled up in the future.

Source: Use fewer natural resources

According to the World Bank¹⁰, over 70 percent of freshwater globally is used for agriculture. A lot of waste is caused by inefficient irrigation. Farmers can use IoT to reduce excess watering by implementing moisture sensing systems in the soil and automated sprinkler systems that ensure crops receive the right amount of water when needed.

Sensors can also be used to monitor environmental conditions such as sun intensity, soil nutrients, and air temperature and humidity, thus defining the optimum time and location for planting, irrigation, adding fertilizers etc., resulting in more efficient use of agricultural land and resources and improving output and producing quality.

Use case: Grundfos smart water management pumps

A lot of fresh water is wasted during distribution. Therefore, smart water management solutions are very important in mitigating water scarcity and flooding. Grundfos, a manufacturer of advanced pump solutions, has embarked on a journey to connect its water management pumps¹¹.

The global IoT connectivity solution is enabling Grundfos to monitor and digitalize millions of connected water pumps worldwide. Grundfos will be able to access real-time data and plans to use this information for product development, facility monitoring and the creation of new business models and services for its millions of global customers.







5 How can loT contribute to a more sustainable product lifecycle?

Design and manufacture: Improve processes and reduce waste

IoT can help make products more sustainably, from design through manufacturing. Version 1.0 of a product released to market is often not optimal but empowered with the data collected from a connected product, companies can gain insight into how the product is used and improve the design of future versions, making them more efficient, more useful and more durable. For example, knowing which parts are most likely to break first allows not only to do predictive maintenance but also to find design solutions to make those parts more resilient.

Smart factories that are using IoT, robotics and machine learning technologies can optimize the production process based on real-time data, thus reducing energy consumption in their production activities and decreasing process waste resulting from inefficient use of input materials or making defective products that are discarded.

Distribute: Enable more efficient transport and logistics

Connected fleet is one of the domains where IoT is already widely applied by companies such as Scania. Significant savings in fuel consumption can be made by optimizing routes and improving drivers' behavior through real-time feedback. In addition, the level of congestion, noise and pollution in cities can be reduced.

With the help of IoT, companies can now track materials and goods in real-time, transforming the whole supply chain. Previously, goods were tracked at key destinations, for example, when leaving a factory and arriving at a warehouse but what happened in-between

those points was often a dead zone with no or limited information on potential delays.

Being able to track goods from anywhere, at any time, on a global scale, enables now businesses to streamline and optimize their whole supply chain, which ultimately contributes to lowered emissions.

Not only the location of goods can be monitored during distribution but also their state. A lot of food intended for human consumption is spoiled or damaged during transportation and delivery.

Suppliers can decrease the waste by implementing temperature monitoring and alert systems that combine data from environmental and temperature sensors with logistics data and can send an alert when sensitive products and perishable goods are exposed to excessive heat, cold, vibration or other adverse conditions.

Product use and reuse: Optimize use, extend lifetime and share products

One of the areas where IoT can deliver the most impact is in making cities and buildings more sustainable by reducing energy consumption since fossil fuels burned for energy are one of the greatest contributors to carbon dioxide emissions.

The UN predicts¹² that urbanization will continue and 60% of the world population will be living in urban areas in 2030, while 10 more cities will break the 10 million inhabitant mark. Smart meters connected to smart grids, smart street lighting, and smart buildings that can respond to occupants' habits and behavior and adjust the lightning and temperature accordingly can deliver significant savings in energy consumption.

For example, Swegon is a company that provides an IoT enabled climate control system for the regulation of air, heat and cold with the lowest possible energy consumption. The fully wireless demandcontrolled ventilation system can achieve cost savings of up to 70% compared to a traditional system¹³.

Many businesses are also realizing that implementing IoT solutions and connecting their products is opening the door for transforming their business models from product-centered to as-a-service. Empowered by the data of how the product is used, companies can improve their offering and create deeper customer relationships, increase sales and improve profitability. We have explored this topic in more detail in a previous report¹⁴.

The as-a-service model for connected assets is also at the heart of the growing sharing economy for anything from electric scooters, bikes and vehicles to garden tools and pest control. The sharing economy powered by IoT solutions is thus contributing to the circular economy by increasing the utilization and lifetime of products and thus reducing waste. It is also giving the service providers a clearer responsibility for disposing and recycling the product at the end of its useful life since they retain ownership of the product.







5 How can loT contribute to a more sustainable product lifecycle?

Husqvarna: Chainsaws enter the sharing economy with Husqvarna Battery Box

Husqvarna decided to test adapting a sharing economy model and enable consumers to rent battery-powered garden tools by the day. The company introduced a concept called the Battery Box15, a shipping container that was transformed into a connected, fully automated tool-rental shop where the customer can easily via an app open the locker containing their tool.

The model has both business and sustainability benefits. On the business side, Husqvarna can reach new customers who would not purchase such a tool due to lack of storage space or willingness to make an upfront investment. The model was at the same time a more sustainable solution, allowing many people to share a garden tool instead of purchasing their own tool that would remain stored unused in a garage for most of its useful life.

Collect and recycle: Improve waste sorting and collection

In many cities worldwide, waste management systems are outdated and very resource intensive. Waste management can be made more efficient by installing smart bins with sensors that detect and alert when the it is approaching full capacity, enabling collection when necessary rather than at fixed schedules. Furthermore, drivers' routes can be optimized based on traffic and weather data allowing to save fuel.

remanufacture and reuse materials from discarded products.

One area with a lot of potential is to use sensors to automate the separation of different types of waste such as plastics, paper, glass and metal. This is a task that most people find cumbersome and where some make mistakes.

Last but not least, businesses need to remember that IoT can be a solution but can also contribute to the problem. As billions of IoT devices (and the whole connected products which they are part of) reach end of life, they can also become part of the mounting e-waste.

An orderly and well-functioning recycling and waste collection system can also encourage people to put more effort into separating their waste, which is crucial for a circular economy that aims to repurpose,

Companies need to plan for how IoT devices and the whole product can be redeployed, donated or their constituent components can be recovered and reused to minimize waste.

¹⁰ https://www.worldbank.org/en/topic/water-in-agriculture







¹¹ Press release by Grundfos and Telenor Connexion,

https://www.mynewsdesk.com/telenor_connexion/pressreleases/grundfos-selects-telenor-connexion-to-connect-its-global-pump-business-2945654

¹² The World's Cities in 2018, UN, available at <u>https://www.un.org/en/development/desa/population/</u> publications/pdf/urbanization/the worlds cities in 2018 data booklet.pdf

¹³ Telenor Connexion case, available at <u>https://www.telenorconnexion.com/smart-buildings-crea-</u> te-significant-energy-savings/

¹⁴ From product to a connected product-as-a-service, Northstream, available at <u>https://www.telenor-</u> connexion.com/from-product-to-connected-product-as-a-service-seven-things-to-consider

¹⁵ Telenor Connexion Case, available at <u>https://www.telenorconnexion.com/husgvarna-chainsaws-en-</u> ter-the-sharing-economy-with-husqvarna-battery-box/



IoT Predictions

2020



IoT has great potential to play a key role in helping fight climate change by helping us to reduce our greenhouse gas emissions and live more sustainably. Thought leaders across many companies and industries are embracing IoT solutions to create innovative products and services that are both competitive from a business perspective and at the same time more environmentally conscious.

A key to success will be to leverage managed connectivity solutions and work with an ecosystem of partners with proven capabilities in their domain in order to create IoT solutions that can be deployed globally and scale quickly. As global temperatures are rising, the time to act is now if we are to prevent irreversible damage to our planet.







Telenor Connexion is the specialized IoT company within the Telenor Group, one of the world's major mobile operators. Building on more than 20 years of experience, Telenor Connexion provides global IoT connectivity and cloud services to enterprises with large fleets of connected devices as well as third-party service providers.

Telenor Connexion manages more than 10 million connected things in more than 180 countries for global customers including Volvo, Scania, Hitachi, Verisure Securitas Direct and Husqvarna. With headquarters and tech centre located in Sweden, the company has regional sales representation in the UK, US, Germany, Italy, South Africa, Singapore, South Korea, China, Malaysia and Japan.

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Northstream is a consulting group dedicated to serve domestic and international clients. We have put our competence, passion and efforts at the intersection of business and mobile technologies, providing strategies handcrafted for each client's unique business and competitive dynamics. We are proud to say that we come highly recommended by many of the most successful players in the ecosystem of a connected world. We typically work with business strategy development and planning, technology and product assessment, strategic sourcing of systems and services, reorganization and transformation, market analysis and due diligence.

Northstream was founded in 1998 – as of August 2019, we are part of Accenture.



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