

2016 Edition

CONNECTED THINGS

Driving business transformation in the Nordics
– connected cars are leading the way



When things are connected, they become platforms for change. As the development towards increasingly intelligent and interconnected IoT solutions continues, exemplified by autonomous vehicles and smart cities, new disruptive business models are emerging across all industries. Business leaders need to rethink their strategies when digital transformation becomes synonymous with success in an increasingly connected world. The Nordic countries are leading the way in the Internet of Things (IoT) revolution, and there are already twice as many connected things as there are people in the region.

For the third year, TeliaSonera and Arthur D. Little have teamed up to draw insights from the development of the IoT in the Nordic region, highlighting benefits to businesses, people and society.

In this year's report we explore the connected car as a showcase for the transformative power of the IoT. We highlight how its impact is felt across the car industry and beyond, giving rise to new business opportunities ranging from automotive service to insurance and urban transportation. We believe the insights in this report can be used by your company or organization to understand how the IoT can create value for you and what role it should play on your digital journey.



Hans Dahlberg
Vice President, TeliaSonera Global IoT Solutions



Martin Glaumann
Partner, Arthur D. Little

TRANSFORMING BUSINESS, SOCIETY AND THE WAY WE LIVE

The Internet of Things (IoT) revolution has just started, but it is already driving the digital transformation of industries and society. It creates a new digital business logic, to which all industries must adapt in order to capture new value opportunities and ensure future competitiveness. What used to be long product development cycles are now continuous upgrades, jointly innovated with customers and partners. What used to be products are now sold as services. What used to be proven business models are now increasingly under pressure. At the same time, innovative new players are emerging across the IoT ecosystem, driving radical new product offerings in new value networks. It is a time of rapid change and innovation and much like the industrial revolution before it, these are defining years. The ability of companies to embrace new technologies will decide who will be the digital leaders of tomorrow.

This year's Consumer Electronics Show (CES) in Las Vegas highlights how the explosion of IoT devices continues. This is an extension of a trend that has been seen for the last three to four years, with the IoT as a major driving force for new products and services. Leading consumer brands such as Under Armor, the sports clothing and accessories company, are taking new bets via M&A activities. They are investing to enhance their customer propositions with complementary services in health monitoring and lifestyle.

Yet, the more significant development in the IoT since last year's Connected Things report is the surge in business-to-business related IoT offerings. New customer offerings are provided and businesses operations are transformed as an unprecedented number of companies make launches involving IoT. This development is taking

WHAT IS A CONNECTED THING?

When physical objects can communicate with the outside world, they are said to be connected things or smart objects: One can interact with them remotely, query how they are doing and change their state as required. In the report, laptops, tablets, desktop computers, ICT infrastructure and mobile phones are excluded from connected things market figures.



Connected Vehicle includes machines (regardless of modus, i.e. road, air, rail, water), that transport passengers or cargo



Connected People includes humans or living animals, e.g. tracking of people's geographical position, activity and measurement of bio markers



Connected Consumer Gadget includes electronic equipment intended for entertainment, communications and/or leisure, e.g. cameras, TVs, white goods, consumer wearables



Connected Money includes devices for payment and related services, e.g. vending machines, points-of-sale



Connected Building includes physical structures used as homes, office or a public facility



Connected Industrial Process is defined as part of a larger commercial process e.g. machinery



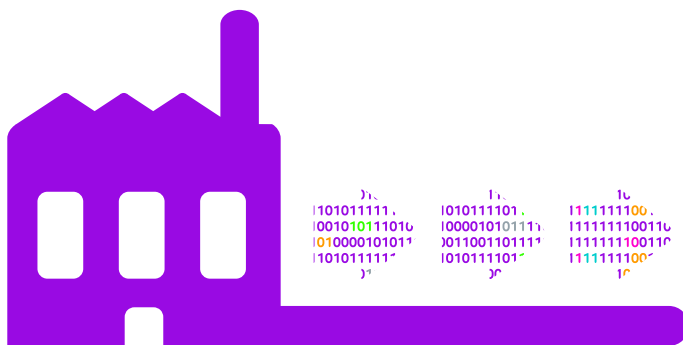
Connected Infrastructure includes physical objects optimized for public needs or regulatory demands, e.g. energy optimization

different forms and names in different industries: *industry 4.0*, *digital health*, and *intelligent transportation systems (ITS)* are but a few examples.

Another key theme in the market at present is big data along with the issues of collecting it, securing it, storing it, analysing it and monetizing it. The auspicious analogy that “data is the new oil” may have caused some confusion as the Brent barrel price continued to tumble on the global markets in early 2016. Yet, data and analytics are becoming integral in product development, customer analytics and more. Leading players in this area, such as IBM, claim to have surpassed 30bn USD investments in data analytics. Alongside this development, the debate about security and user data is picking up speed. Privacy issues are at the center of the IoT, and in the debate regarding handling of data there are winners and losers. In effect, transparency about data and how it is managed, along with opt-in offerings are becoming the new selling point for customers.

Leading companies in all industries as well as ICT leaders continue to explore opportunities in the IoT; both “vertical” IoT solutions (e.g. specific health-care solutions) and “horizontal” (e.g. IoT device management platforms). In 2015, Tesla launched its self-driving car through a software update. Just by letting the car wirelessly perform a software update, drivers can now press a button and the car will take control and drive itself. Not only can Teslas drive themselves, some owners have reported that since the update, the Teslas have improved their driving skills. Other recent developments include Google’s launch of Brillo, the embedded operating system for IoT devices. Similarly, Microsoft released Windows 10 IoT, which is optimized to be used for IoT purposes in smaller devices – with or without a display.

“Much like the industrial revolution before it, these are defining years. The ability of companies to embrace new technologies will decide who will be the digital leaders of tomorrow”





NORDIC IoT MARKET DEVELOPMENT 2016-2020

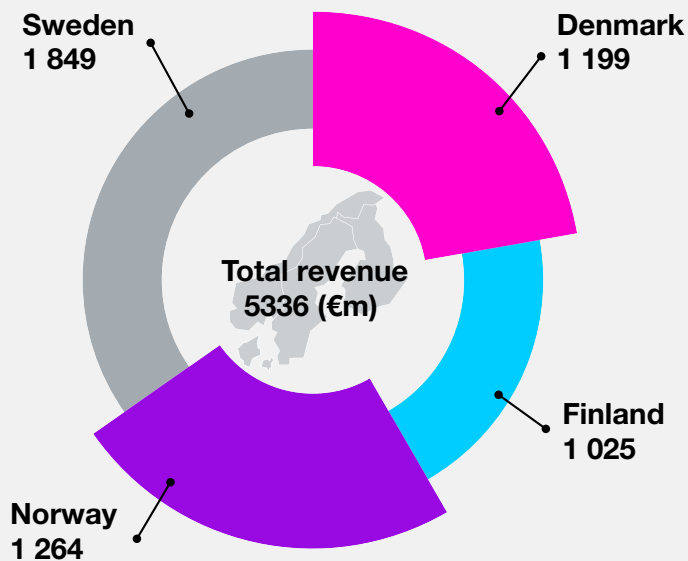
The Nordic countries continue¹ to be a hotbed for the IoT. The region is among the most mature markets in the world with almost four times as many connected devices per person than the rest of the world. The number of connected devices is expected to reach 150mn by 2020. This is well over five connected devices per person in the region. ICT-infrastructure with high penetration of fixed and mobile broadband, coupled with technology savvy consumers and businesses has created excellent preconditions for the growth of the IoT.

Consequently an innovative start-up scene, with a growing number of new companies, is trying to seize the IoT opportunities. In the global investor community and media there is talk about a “start-up wonder” in the region. For example, Stockholm has its own IoT-hardware hub, THINGS, and is

home to more “unicorns”² per capita than any other region in the world but Silicon Valley. Famous Swedish start-up examples include Skype, Spotify, King, Klarna, and iZettle. In Finland, the demise of Nokia has led to a spur in digital innovation and it also has its share of famous start-ups including mobile gaming company Rovio.

Other innovative IoT developments in the Nordic include pilot testing of cognitive behavioural therapy via HD video. This is especially beneficial in rural parts of the Nordics with low population density, where distances to the nearest care provider are large. Moreover, Swedish car manufacturer Volvo Cars recently bought super computer Drive PX2 from visual computing company Nvidia. The computer is planned to be installed in around 100 cars aimed for testing fully automated driving in 2017.

NORDIC IoT MARKET SIZE 2015



Source: Machina Research

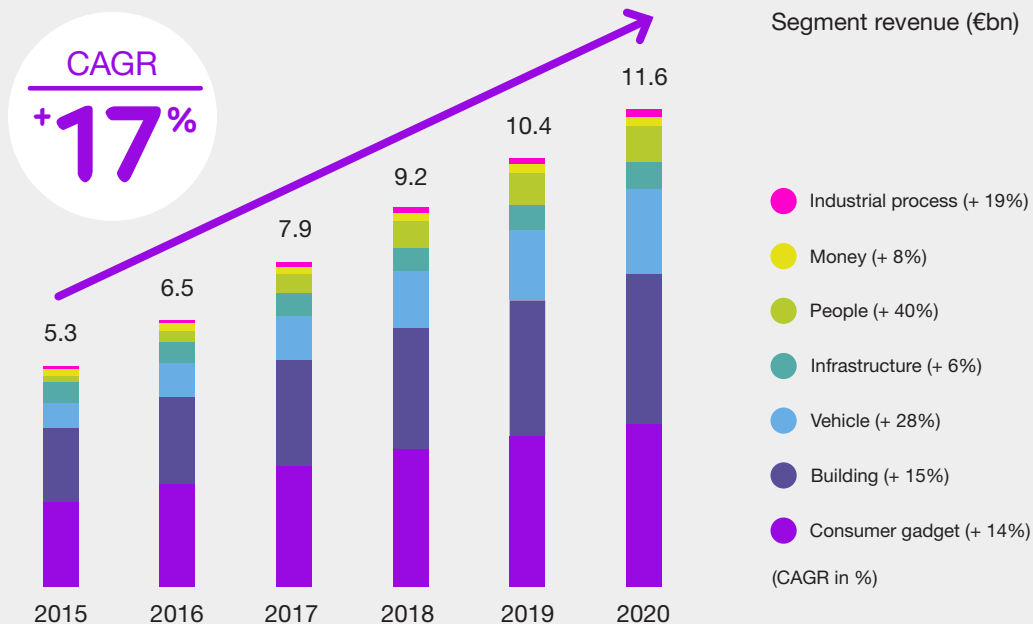


Between 2014 and 2015, revenues and connected devices have grown by 22 and 16 percent, respectively. The explosion of demand for Consumer Gadgets are reflected in €500mn worth of growth. This accounts for half of the growth in total IoT revenues in the Nordics 2014-2015. In terms of the number of connected devices, the increase was to a large degree driven by an increase in the Connected Building group, which accounted for over 40 percent of the total increase, especially within building security and building automation.

Looking ahead, IoT revenues in the Nordics is expected to grow by 17 percent per year, reaching €12bn by 2020. Connected People are the fastest-growing connected group at over 40 percent revenue growth per year, though it started

at a low level. Half of that growth is expected to come from home health care. Assisted living, tracking applications and remote monitoring are other strong growth areas in Connected People. Connected Vehicles are the second fastest growing segment with almost 30 percent annual revenue growth. Growth in Connected Vehicles is to a large extent driven by stolen vehicle recovery and vehicle navigation. Connected Industrial processes are third, at around 20 percent, highlighting the uptake for industrial internet solutions.

NORDIC IoT MARKET GROWTH 2015-2020



Source: Machina Research



INCREASINGLY INTELLIGENT AND INTERCONNECTED

The trend towards increasingly intelligent and interconnected IoT ecosystems is expected to continue through 2020 and beyond. However, this development is taking different paths in different connected groups.

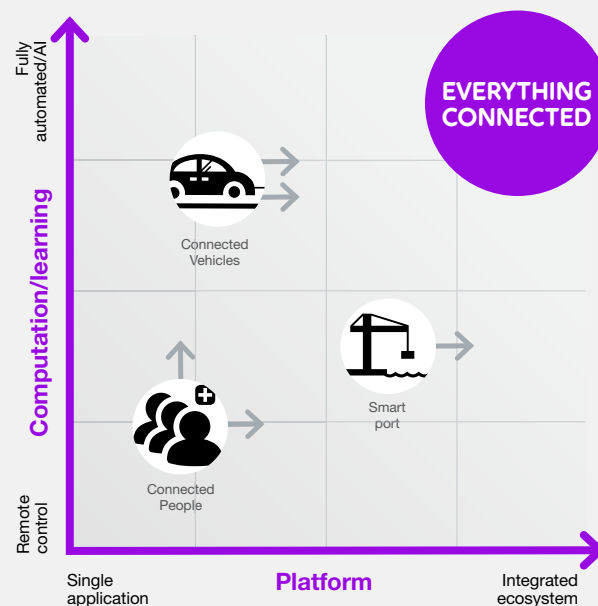
In terms of becoming more intelligent, IoT solutions are evolving in three distinct steps. First, the IoT enables remote control and monitoring, such as checking that the front door is locked via smartphone and monitoring insulin levels for diabetes patients. Next, the IoT enables new innovative services and improved productivity as collected data is analyzed. For example, ball bearing manufacturer SKF can offer predictive service as well as optimize its R&D efforts based on product use data. Still on the horizon is a third wave, in which connected things become increasingly autonomous and seamlessly integrated into the most critical systems of society;

this can already be seen in the development of for example driverless vehicles. A key enabler of this development is the decreasing prices of computational power and sensors, as well as new advances in fields such as machine learning for patient diagnostics.

In parallel to the development of more intelligent IoT solutions, another trend has now emerged that will intensify in coming years: the interconnectivity and the convergence of IoT ecosystems. When different types of connected things start to interact, connected cars transform into intelligent transportation systems (ITS), connected medical devices into digital health, and connected homes into smart cities.

This trend creates business opportunities for players to become an IoT platform provider and system integrator to enable different ecosystems

ECOSYSTEMS ARE EVOLVING IN TWO DIMENSIONS





to interconnect and systems and services to be integrated. These can be both “bespoke” for a smart port/harbor and “mass-customized” solutions to flexibly enable a citizen’s home, in any city, to connect to their car, regardless of make or model. Integration and service platforms can cover up to 40 percent of the total value for an IoT service. However, the IoT market landscape remains fragmented at present, with focus on connecting single applications or customer use cases with proprietary types of protocols used within each connected group.

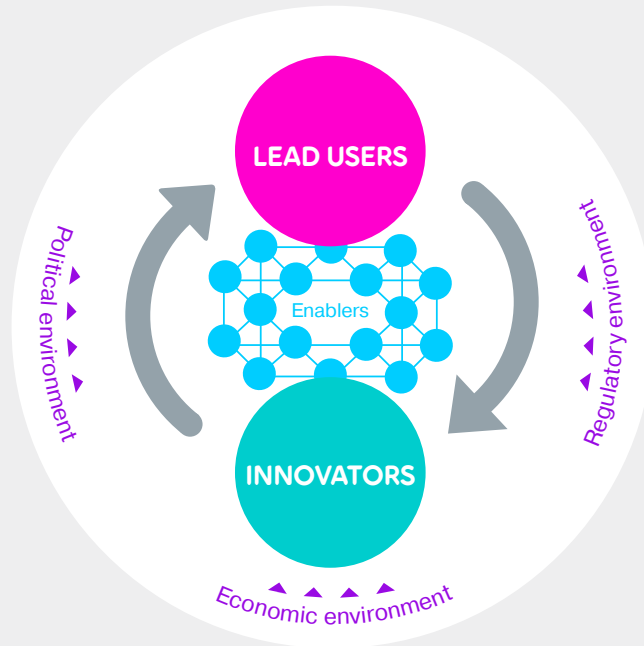
These dynamics drive different development paths for different connected groups:

- Connected Vehicles are an example of how IoT solutions have seen an intelligence explosion. Fully autonomous vehicles (like the Google self-driving car project) will continue to mature until their commercial launch around 2025. Next, self-driving cars, buses, and congestion management measures (tolls, traffic control, etc.) will become increasingly integrated and form multi modal transportation solutions for the smart city.
- At present, some the most comprehensively integrated IoT applications are in high-mobility industrial applications such as smart ports (Connected Industrial processes). These capital-intensive endeavors provide a sufficient business case for developing integrated and customized IoT solutions to increase operational efficiency through automation. For example, Hamburg is utilizing the IoT to create smart port infrastructure, optimizing traffic and trade flows in its smartPORT project. It is built on a platform which gathers data from around the port, creates intelligence, and puts it to use in real-time via signage and mobile applications.
- Health care (Connected People) remains one of the less mature areas within the IoT, but also the one with perhaps the greatest potential. At present many medical equipment-grade IoT solutions remain at a “pilot stage” focusing on remote monitoring and control for single use cases. Health-care regulation, cultural barriers and competency gaps of health-care professionals, as well as privacy concerns from patients, are key barriers. In the coming five years, it is expected that single-use applications will remain predominant in clinical applications. At the same time, fitness/wellness type of applications, similar to Apple Health, are becoming increasingly integrated to provide a “360-degree view” of your wellbeing and health.

“ The next frontier for Connected Vehicles is the creation of intelligent transport systems, bringing social, economical and environmental value to people, industries and society as a whole ”



KEY ROLES IN THE INTERNET OF THINGS ECOSYSTEM



ROLE

DESCRIPTION

EXAMPLE

Lead Users

Lead users are the customers that adopt new technology before others, leading the way in their respective industry

New hospitals and county councils in the Nordics are pushing IoT innovations with demands on interoperability in tendering of medical technology solutions and digital services

Enablers

Enablers are companies that ensure provisioning, installation, security and connectivity for IoT services

Telecom operators collaborate to ensure cross-border functionality necessary for service development in for example the connected car market

Innovators

Innovators are entrepreneurs and technology focused companies that develop new IoT applications and devices

New services and applications can be seen in both innovative startups and leading listed companies in all sectors, from smart consumer products for finding that lost key, or monitoring health and fitness to IoT-based industrial solutions for optimized productivity



GEARING THE IoT ECOSYSTEM FOR GROWTH

To realize the full potential of the IoT, ecosystems are dependent on the interaction of several types of players: lead users, enablers, and innovators. Both industrial players, service providers and the likes of Microsoft, Apple and Google are racing to address this opportunity, either through creating open ecosystems or by proprietary end-to-end solutions.

Regulatory, political, and economic conditions play an important role. This is evident from, for example, Nordic smart meter regulation, as well as from electric vehicle subsidies in Norway that have boosted connected car uptake. However, this presents challenges as legislation struggles to keep up with the rapid pace in technological development as evident in both the case of health care as well as autonomous cars. Furthermore, the lack of common and open standards obstructs communication across different IoT solutions, and is one of the largest barriers to IoT growth.

IoT ecosystems constitute new value networks that challenge traditional value chains. Leading companies are leveraging these to co-innovate with customers and partners as well as to pilot new business initiatives, monetize on data and realize acquisition opportunities of innovative tech start-ups.

The next section of the report dives deeper into new business opportunities and challenges offered by Connected Vehicles, and in particular the connected car. It is experiencing rapid development of new business models related to the IoT and many of the lessons that can be learned from the car industry will help to understand the effect of the IoT in other industries as well.

“Digital leaders build value networks - leveraging customers and partners to co-innovate”



CONNECTED CARS – TRANSFORMING AN INDUSTRY

Connected Vehicles demonstrate how the IoT can fundamentally change value propositions and put pressure on companies to digitally transform. Not only are Connected Vehicles driving the transformation of the automotive industry, but also of adjacent industries such as insurance and automotive service, breaking old value chains and shaping new value networks in their stead. Executives in all industries can learn from this development, and draw insight from leading players' moves in the market.

“What we see now is that roles within the value chain are evolving and changing; this applies to customers, suppliers, partners and even competitors. It is important for us to be part of and lead the development in our industry.”
– Klas Bendrik, SVP & CIO Volvo Cars

Only a few years ago, the story around the IoT for vehicles was focused on navigation and e-call functionality. These remain important application areas that drive growth opportunities for automotive original equipment manufacturers (“OEMs”). However, the focus is now shifting to the car as a digital platform for new services, similar to how smartphones transformed the mobile phone into a marketplace for a diversity of applications.

At the center of these opportunities is the data generated from Connected Vehicles; there is a need for secure and reliable ways to transmit and manage the data, as well as applications and analytics to turn data into actionable insight. Whether to offer proactive service or to innovate new urban mobility solutions, data is a key enabler.

At present the most developed application areas for connected cars are:

- **Usage-based insurance (UBI)** – The use of data to determine insurance premiums based on the usage of the vehicle, e.g. distance driven, accelerations and harsh brakes, time of day driven and other possible variables
- **Service and diagnostics** – Data used for remote diagnostics, maintenance scheduling and monitoring user experience
- **Lease, rental, car-sharing** – Monitoring and tracking of vehicles used by private individuals or commercial organizations, but owned by third parties such as car rental agencies or car pools
- **Fleet management** – Tracking of commercial vehicles for the purpose of increasing efficiency, e.g. through driver performance monitoring, fuel consumption reduction and route optimization

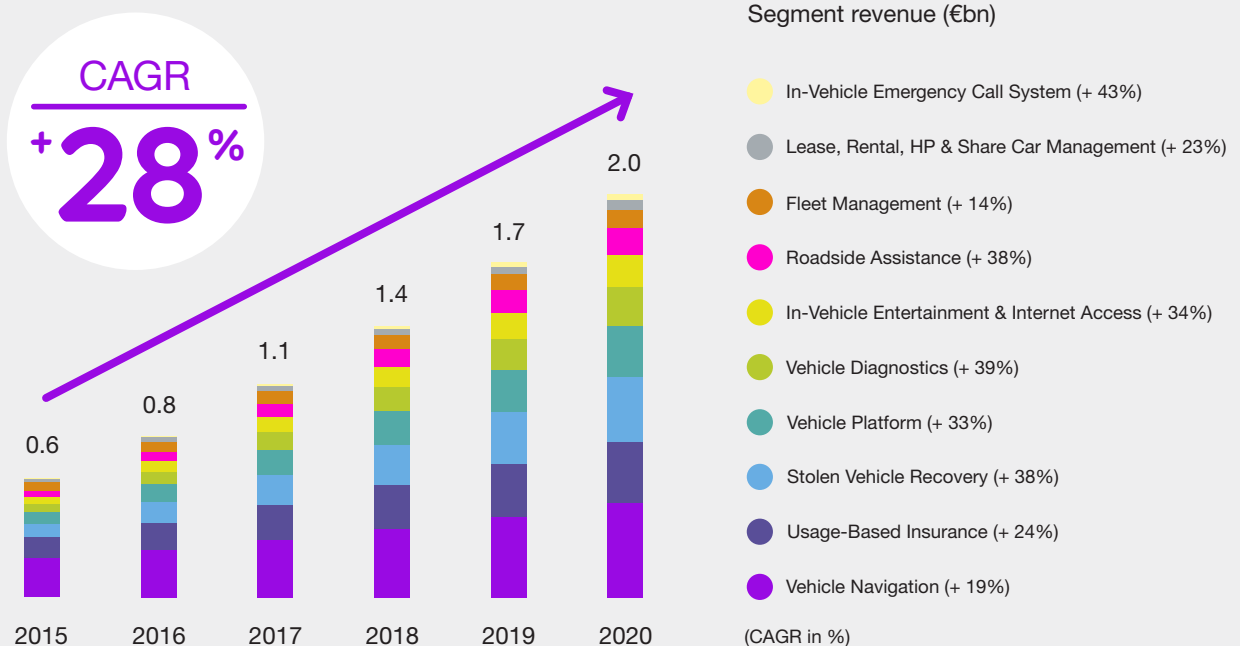
“The focus is now shifting to the car as a digital platform for new services, similar to how smartphones transformed the mobile phone into a marketplace for a diversity of applications”



- **Vehicle platform** – Factory-fit connectivity
- **eCall** – A device that automatically calls emergency services and sends impact sensor data as well as GPS coordinates
- **Stolen vehicle recovery** – Applications that help to track and recover stolen vehicles
- **Vehicle navigation** – Features that allow drivers to find directions while driving
- **Entertainment & internet access** – Access to in-vehicle entertainment features such as music or movies as well as in-vehicle internet hot spots (e.g. 3G or 4G)
- **Roadside assistance** – Application to assist in case of minor emergencies, such as flat tires or empty tank

As more cars become connected, combined with developments in other connected groups such as connected infrastructure, a new generation of connected car services is emerging rapidly. New solutions include connecting vehicles to homes, roads and other modes of transportation. Many OEMs are already investing in this. For example, BMW's Open Mobility Cloud enables communication between smart-home applications and the car. Both Ford and Volkswagen have announced similar technologies. This development increase the demand for integration platforms, which creates an opportunity for both ICT players and potentially OEMs to take on roles as enablers across ecosystems. Real-time, location-based data that can be linked to driving behavior also provides an opportunity to be used for advertising in vehicles.

NORDIC CONNECTED VEHICLES MARKET 2015-2020



Source: Machina Research



THE NORDICS ARE THE FOREFRONT OF THE CONNECTED CAR REVOLUTION

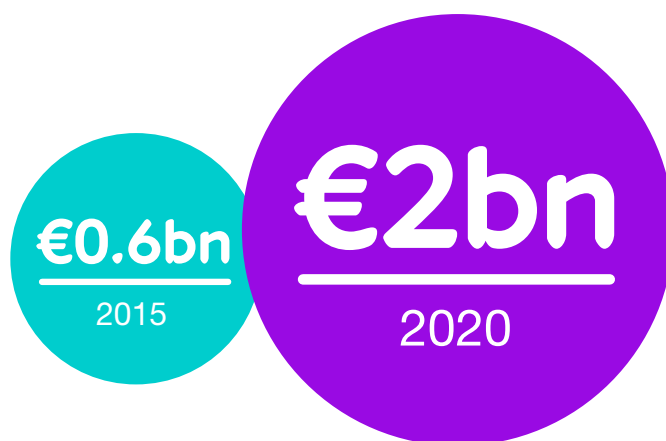
Today, Connected Vehicles are a €30bn opportunity worldwide. It is expected to reach close to €130bn by 2020, with growth of 35 percent per year. The Nordics, with a strong automotive and vehicle sector in Sweden, progressive city and traffic authorities throughout the region, as well as tech-savvy consumers, are expected to take the lead in connected-car development. In the region, Connected Vehicle amounts to over €600mn in revenue today and is expected to reach over €2bn in 2020 at an annual growth of 28 percent. By then up to 50 percent of all cars will be connected to the Internet. On average, people in the Nordics will spend close to €75 on Connected Vehicle devices per person in 2020.

In the Nordics, Vehicle navigation is the largest segment, followed by UBI, with close to €200mn and €110mn in revenues, respectively. eCall is the

fastest-growing application, with 43 percent yearly growth in revenue between 2015 and 2020 and over 200 percent yearly growth in number of units. The high growth rate is due to the European eCall regulation being implemented. Vehicle diagnostics is the second-fastest-growing application, with around 40 percent yearly growth in both revenue and number of units. Lease, rental and car-sharing is expected to grow by 20–25 percent annually in both revenue and number of units. The growth in UBI, stolen vehicle recovery and vehicle navigation combined is expected to account for more than half of the total growth in revenue between 2015 and 2020.

The Nordics are looking to be early adopters of autonomous vehicles, which remain one of the hot topics within connected cars. Volvo Cars is already running autonomous car pilot projects in Gothenburg and in the fall of 2015, Microsoft and Volvo Cars announced a deal to work together in further developing driverless cars. Road safety goals among Nordic traffic authorities may lead

“Between 2015 and 2020, revenue of Connected Vehicle will more than triple and up to 50 percent of all cars will be connected to the Internet”





regulators to changes in legislation in favor of autonomous vehicles. It is likely that one will see the first legal driverless cars in the region before 2025.

New consumer behavior and increasing demand for convenience and sustainability are promoting growth. High environmental awareness among companies, customers and authorities in the region is expected to drive the growth of urban mobility as a service, such as car pools. In Stockholm, there has been a surge in different car-sharing services such as Car2Go and Sunfleet. The decrease in car ownership has transformative implications for the car industry.

Governments play a crucial role in this development. For example, Nordic governments have “green agendas” and promote features that lead to more fuel-efficient driving. Norway’s subsidy on electric cars is one example of this, leading to Tesla being the most sold car in 2014. Furthermore, security regulations, such as the eCall (EU), are equally important drivers.

Many Nordic cities have declared an objective to become smart cities in the coming years. To achieve these objectives, many cities will start to invest in intelligent traffic systems (ITSs). This will result in more effective transportation through smart route planning, fewer traffic jams and lower fuel emissions.

Retrofit solutions are another hot topic for Connected Vehicles. The opportunity to connect older, “non-connected” cars is expected to be a major driver for growth. One such retrofit solution is AT&T and ZTE Mobley, a Wi-Fi hotspot. Another is Telia Sense, a more advanced solution that allows owners of older cars to connect them and access a wide array of services, making TeliaSonera the only operator in the world to provide a complete solution for the connected car.

TELIA SENSE

As the first operator in the world, TeliaSonera is introducing a cloud-based solution enabling high-end car features for all types of cars, including those lacking built-in connectivity. The solution is developed with partners from the automotive and insurance industries and offers a combination of car-control functionalities like car diagnostics, high performance connectivity through 4G, Wi-Fi and value-added services like tailored car insurance. Commercial launch of Telia Sense is planned for 2016, starting with Sweden followed by a successive rollout in other countries in the Nordic and Baltic region.

However there are several challenges that need to be overcome for Connected Vehicles. One important barrier is the challenge to reshape product development cycles; while a new car typically takes several years to develop; new IT-features need to be provided monthly or even weekly. This is a major challenge for automotive OEMs, that requires them to move towards more modular development so that new technology and upgrades easily can be added to existing cars. Furthermore, for widespread adoption of different connected car applications there is a need to migrate from single-application solutions to integrated car solutions. From a consumer perspective, having to use different interfaces for different functions may inhibit adoption. In retrofit scenarios this is very tangible; there is only one OBD-II port in cars and the competition for this port will become intense. For the customer, a single application will not be competitive in the long run.



In the following sections, we dive deeper into three of the most interesting opportunities within the Connected Vehicle group: usage-based insurance, service and diagnostics as well as mobility-as-a-service. These have been selected due to their size, growth and the degree to which they disrupt existing business models. Usage-based insurance (UBI) is the second-largest application for Connected Vehicles in terms of revenue and service and diagnostics is the second-fastest-growing segment. The development in UBI has a major impact on both the car industry and the insurance industry. The context for service and diagnostics players is changing due to the rapid growth of connected cars. The new shared economy has implications for the entire car industry. But, the lessons learned in the following chapters can be applied to many other industries as well, where the IoT is now being deployed.

“Digitization and the associated technical possibilities are set to change the automobile and its fundamental role in our society”

Harald Krueger, CEO of BMW



CHALLENGING OLDS TRUTHS – IoT ECOSYSTEMS ENABLE NEW DYNAMIC INSURANCE SERVICES

Automotive insurance is at a turning point, as old business models are challenged by new user behavior and new technology. Forward-thinking insurance companies are leveraging IoT ecosystems to shape new value propositions and become digital leaders in tomorrow's insurance. It may seem an improbable outcome given the traditionally conservative insurance market, yet with yields in insurance investments being challenged by historically low interest rates; companies need to rethink their strategies. As the IoT and data analytics are enabling smaller challengers to outsmart their larger competitors, it is also a crucial time for established insurance companies to invest in order to ensure continued leadership.

The competitiveness of the car insurance market is driving UBI growth as a means for insurance companies to differentiate their customer propositions as well as improving operational efficiency. UBI also offers possibilities for insurers to do more efficient market segmentation and accurate risk assessment and pricing. Insurers collect data via an IoT solution, such as Telia Sense, and then analyze performance.

By evaluating how customers interact with risk when driving, insurance companies can boost profitability, as well as induce safer driving behavior and ultimately save lives. More precisely, insurers can improve pricing, allow claims to be closed more quickly as well as improve loss adjustment ratios by automation. They can do this all while rewarding their less-risky customers with discounts and enhancing their value propositions to the consumer (emergency roadside assistance, vehicle recovery and vehicle maintenance alerts).

Today, UBI is the second largest sub-segment in the connected-vehicle group, both in terms of revenue and in terms of the number of connected devices. With a growth of 27 percent per year 2015–2020, UBI will reach 3 million connected devices by 2020 in the Nordics, which is more than seven times as many UBI devices per person as in the rest of the world. With this growth, the UBI revenue opportunity will reach €309mn in revenues by 2020 in the Nordics, excluding insurance premiums.

DEFINITION OF SEGMENT:

The use of data to determine insurance premiums based on the usage of the vehicle, e.g. distance driven, accelerations and harsh brakes, time of day driven and other possible variables

Several big telecom and ICT companies are already engaging and partnering with insurance companies to provide UBI services. For example, Generali Seguros and Masternaut provide full risk assessment services. Towers Watson has partnered with Vodafone to provide a UBI service to multiple clients, initially with AIG Europe. Yet, at present relatively few UBI services at present offer benefits to users beyond insurance premium advantages, such as advice regarding safe driving.

Looking ahead, UBI will need to become an integrated part of a larger offering as multiple customer services compete for the OBD II port. UBI is also showing the way for governments to potentially push “green agenda” - services, in which IoT solutions can improve road taxation and environmental taxation, for consumers and businesses, and create “tax-as-you-drive” services.

Despite benefits to both insurance companies and car owners, there are barriers limiting UBI from growing even faster. Privacy and pricing issues that affect the end users, the insured car owners, is one such barrier. There are concerns around how they will respond to new pricing, what happens if prices increase, and how companies will ensure sensitive information is kept secure and confidential.

All of these barriers stand against the traditional business logic employed by automotive insurers in the Nordics, whereby a consolidated market allows major players to leverage their scale to pool risks and deliver competitive insurance premiums for all customers. Insurance companies rely on these scale dynamics, and despite advancements in data analytics, many companies still have rather rudimentary models for assessing risk profiles and



set premiums for automotive insurance. UBI is a potential game-changer, but the reality as of today is that many insurance companies are not yet ready to fully act on that insight, both considering technical and business challenges, but also the legal challenges that arise from having critical equipment installed in the car.

To succeed, insurance companies must step up their digital innovation performance, develop new analytical models and new modern ways to engage with the customer, or face increasing competition from challengers in the market.

Ownership of data and being the best at understanding one's risk pool, while creating leverage by scale, has been at the core of business success in the insurance business for more than 100 years. Yet data relevant to insurance policies may now be kept by automotive OEMs, telecom operators, or other new types of players (e.g. smart home providers), that customers may or may not wish to have traded to insurance companies. Therefore, insurance players need to engage in IoT ecosystems to ensure access to this increasingly strategic asset, while at the same time developing new measures to ensure user privacy and integrity.

DYNAMIC INSURANCE SERVICES IN OTHER APPLICATIONS

Life insurance companies are also beginning to look in to what the IoT can offer them to improve profitability and customer satisfaction. For example several insurance companies are now looking in to the opportunities for the smart home; example the claim reductions due to ensuring that whitegoods warn for example if a water leakage is detected.

Internationally, companies can also seek to improve their group life insurance terms by equipping their staff with wearables to boost performance in employee health. Similarly, insurance in logistics and transportation can gain from the IoT by using sensor data that provides a better understanding of the risks being underwritten.

USE CASE SAFETY FIRST WITH FOLKSAM

Folksam, a leading Swedish mutual insurance company, recently announced its commitment to developing new services that leverage the power of connected cars using Telia Sense. Owned entirely by its customers, Folksam is continuously engaged in research and development to find new ways to support its customers in driving safely on the road and, ultimately, to save lives.

With Telia Sense, Folksam is now launching the most comprehensive user-based insurance solution in Sweden, offering it to owners of both new and older cars. With Folksam's new UBI offering, the customer receives via an app drive

journal advice on how to drive more safely, and up to a 20 percent discount on their insurance premiums for doing so. The offering also includes a separate "green light" installed easily in the car to help the driver maintain the speed limit.

"Safer driving is important from a human as well as a more environmentally friendly perspective. The combination of our commitment to our customers and focus for safer driving with the expertise and connectivity by Telia is the first step out of many towards the future of connected insurances," says Jens Henriksson, CEO of Folksam.



FROM REPAIRED TO PREPARED – TRANSFORMING AUTOMOTIVE SERVICE AND REPAIRS

Since the days of Henry Ford, car service and repairs have been an inescapable aspect of car ownership. Services are performed after a certain mileage and larger services after twice that distance. Most often today, service is included as part of the car's warranty, during which the service was performed by the OEM's own shops or licensed independent shops. But automotive service is transforming.

While mechanical service is still needed, increasing digitalization of cars has led to the need for firmware and software updates to complement service and repairs. Instead of repairing cars once they have broken down, real-time data from connected cars enables predictive and proactive service. This creates new opportunities for OEMs to increase the direct relationship to the end customer. Conversely, repair shops need to adapt to these new conditions and innovate new business models to ensure future competitiveness.

An illustrative example of the power of remote service and diagnostics can be found in the comparison between two similar recall announcements in 2014 for Tesla Motors and GM. Both recalls were related to issues that risked causing fires. While the GM car owners had to find time to book an appointment and go to the repair shop, Tesla fixed the issue remotely via a software update the same day that the recall was announced. And speaking of potential large-scale recalls due to software, Volkswagen's emission issues, uncovered in 2015, may yet lead to some of the largest legal and financial repercussions in automotive history. Remote service may not have

helped the company with its legal issues, but could have eased the costly logistics of reconfiguring thousands of cars at repair shops.



DEFINITION OF SEGMENT:

Applications enabling data transfer that can be used for remote diagnostics, maintenance scheduling and monitoring of user experience.

In the Nordics, "services and diagnostics" is the second-fastest-growing application in the Connected Vehicle segment in terms of revenue. With growth in both revenue and number of devices of around 40 percent, connected services and diagnostics will increase from today's €40mn to reach close to €200mn in revenue, and from 50,000 to almost 300,000 connected devices by 2020.

To consumers, convenience is one of the major drivers for service and diagnostics. Similar to other IoT applications, car owners are increasingly expecting these types of digital services for their cars. Customers are already able to choose from different repair shops through service aggregation platforms. For example, WhoCanFixMyCar in the UK, RepairPal in the US, and Carly in Sweden let customers digitally enter their problems and vehicle models and receive quotes from different repair shops. Openbay is piloting a new app that enables remote diagnostics and online payment, leading to something much like Uber, but for



service and diagnostics. Service aggregation is expected to put further price pressure on the market, especially for independent shops.

Nordic repair shops and automotive dealers face two key developments: decreasing sales and weakening of customer loyalty due to increasing channel competition from OEMs' online sales, as well as the increasing complexity in service technology. For example some service for connected cars such as the Tesla Model S doesn't even require the owner to visit a repair shop. This, in combination with overall car industry trends such as decreased ownership of cars, is changing the dynamics for the automotive repair segment, and especially its traditional repair shops.

At the same time, independent dealers have an opportunity to provide connected car services for older cars with retrofit solutions. By utilizing existing industry standards, such as the OBD-II port, customers are able to connect older cars of different brands. Repair shops can seize this opportunity and respond early to the changing market environment. Furthermore, with decreasing car ownership and increasing share of customers using car pools, businesses offering service and repairs need to adjust accordingly. Service and diagnostic companies have the opportunity to develop new B2B offerings to meet the demand from an increasing number of business customers.

For a business to successfully offer predictive and proactive automotive service there is also a need to handle data issues. Connected cars can transfer both data related to location, driving behavior and the condition of vital car parts. The same

real-time, location-based data that can be linked to driving behavior also provides an opportunity for in-vehicle advertising. All these opportunities are about to emerge on the automotive market within the next few years, and forever change the way we regard service, repairs and driving in itself.



REMOTE SERVICE AND DIAGNOSTICS IN OTHER INDUSTRIES

The car industry is far from alone in being revolutionized by increases in remote and predictive diagnostics and repair. Increased connectivity in industrial processes, infrastructure and even smart-home appliances is creating new opportunities for service and repairs. Increased proactivity in the service of critical infrastructure, such as traffic lights, has the potential to save lives. Dishwashers may soon let their users know when service or repair is due before a breakdown, instead of the customer having to wash by hand while waiting for a free time slot, [or leading to an insurance claim.] Players in these industries need to start anticipating these changes in order to stay ahead of competition, similar to what can be seen in the car industry.

USE CASE BILIA'S NEW DEAL

In 2015, Bilia, a leading Nordic automotive service company, announced its commitment to develop new services leveraging the power of connected cars. Using Telia Sense, Bilia can offer owners of both new and older cars new IoT service offerings, such as car diagnostics, pro-active car maintenance [but also tailored customer offerings and promotions through the Telia Sense app].

"We know that simplicity and accessibility are important for our customers and the all-in-one-solution of Wi-Fi together with smart services will be an important tool in living up to our customers

high demands", says Per Ovrén, Head of Business Development & Purchasing at Bilia

This service will enable Bilia to provide features such as remote diagnostics for the vast majority of cars produced after 2011. As a first phase, this service is aimed at consumers. But long term could also open up opportunities for services provided to B2B customers, such as driver journal data and eco driving feedback as well as alarm features and remote monitoring for smaller company car fleets.



THE RISE OF URBAN MOBILITY-AS-A-SERVICE

In an increasingly urban world, mobility has become a key issue. The cities have become increasingly crowded as more and more people share the same space. Meanwhile, the average car is parked 90 percent of the time, and such mundane tasks as finding a parking space can seem an endless challenge. The need to increase the utilization of cars to cut costs and free up space, as well as a desire for flexibility, has prompted new views on car ownership, where consumers share their cars. Advancements in IoT technology have enabled these new ownership structures and made them practical. End users of cars are becoming subscribers of a service rather than buyers of a product. This shift is an opportunity as well as a challenge to the car industry; they need to act now to adapt their business models to better suit the mobility of the future.

In the Nordics, fleet management, including rental and car sharing services, represents a €60mn opportunity. It is expected that both revenue generated from these services as well as number of connected devices will more than double, reaching €135mn and close to 1Mn devices respectively, in 2020. This implies an annual growth of around 17 percent.

Developments and investments in public transportation, combined with an increased environmental awareness, have influenced the urban population to drive less. It is costly to own a car that is used only a couple of hours per day, fewer people are willing to purchase a car that will be unused 90 percent of the time. For drivers nowadays, flexibility and price are two very important criteria. The development of the sharing economy and easier transactions with the widespread adoption of smartphones is driving development in car pools.

Vehicle ownership is still important to many customers, especially in conservative segments like haulage contractors (trucks), which has resulted in few business-to-business vehicle pools as of yet. Other barriers that inhibit customers' adoption are legal and liability issues, i.e. not all car-sharing operators offer full insurance. Inappropriate or unsure sharing conditions and/or

return conditions can be intimidating to customers. Customers are also demanding transparent and non-invasive handling of data. The ability of car pool companies to track location, driving behavior and other personal information is a barrier to many potential customers. Transparency on what data is collected and how it is used will be important buying criteria in the segment.



DEFINITION OF SEGMENT

Monitoring and tracking of vehicles used by private individuals or commercial organizations, but owned by third parties such as car rental agencies or car clubs. Tracking of commercial vehicles for the purpose of increasing efficiency, e.g. through driver performance monitoring, fuel consumption reduction and route optimization.

Many companies in the transport industry have been experiencing increasing competition and decreasing margins for many years. This has driven the demand for fleet management for commercial players to a large extent. The need to optimize both driving efficiency and asset utilization is of utmost importance for players in this segment. In line with this development, combined with a decrease in conservatism among the companies, an increase in car pools targeting business customers is expected. Ever-increasing safety regulation on driving behavior and session lengths puts pressure on businesses to find new ways to optimize utilization. Car pools can be one way forward in this segment.

For car pools, successful business will rely on reaching a scale at which availability for customers is not an issue. If a customer has to travel far to pick up or drop off a car, the flexibility of car pools is lost. This is a function of both the number of cars and the pick-up/drop-off system. The threshold size can be reached by either rapid expansion or different partnerships. Also, add-on services will be of importance. For example, different price segments within the same car pool



give drivers the ability to choose the right car for each occasion.

The development of urban mobility is also dependent on development in other connected segments, and its transformation is itself affecting other segments to a large degree. For example, advancements in usage-based insurance (UBI) affect car pools. Usage-based insurance will enable insurance companies to charge car pools a fair price, despite a heterogeneous group of drivers. Car pools will even be able to add the charges from the UBI into their pricing models. Another example is remote diagnostics and predictive service, which are especially important to car pools. For car pools, drivers of the cars will have little or no perception of how the car has been driven and/or serviced throughout its life. Proactive service and remote monitoring for these cars will thus become a safety factor.

The rise of urban mobility as a service demonstrates how dependent different emerging IoT ecosystems are of each other's development. When ownership of cars becomes more concentrated, the dynamics in the entire car

industry change. This transformation opens up opportunities for consumers and businesses to cut costs and optimize their operations. However, at the same time, this puts pressure on players in other Connected Vehicle segments, who are now facing a different customer landscape with a significantly higher ratio of business customers.

LIVING AS A SERVICE

The sharing economy is booming in many industries, not only the car. The service Airbnb has done to the hotel industry what Uber did to the taxi industry. With over 2mn listings in 34 000 cities, it is much larger than any hotel brand, and cheaper for the customers. A logical next step for Airbnb and similar services is to add the ability to unlock the rented apartment with your smartphone. Hotel Tonight, a last minute hotel booking platform, already offers this functionality.

USE CASE NORDIC MOBILITY TRENDS

People in the Nordic region are at the forefront of urban mobility. The adoption rate of new technology of people in the region is very fast, and an innovative climate gives rise to many new trends and services.

Customers in the Nordic urban areas do no longer want to own the car the way they used to. There has been a surge in car pools to meet this new demand for flexibility, price and environmentally friendly solutions. Sunfleet and Car2Go are two of the car pools present in the Nordic region. The difference between the two car pools illustrates the different approaches car pools can take. Customers of Sunfleet, are more like car subscribers, where the cars are booked in advance, picked up from designated parking spots and unlocked with a key card. Car2Go customers

are met with greater flexibility in that the company uses "home areas" instead of designated parking spots, in which the driver can park on any legal parking spot.

Travelers in the region are not only willing to share the actual cars, but also to share a ride when suitable. GoMore is another interesting startup, which lets their customers do just that. Using a smartphone app travelers can check whether someone else in their vicinity is traveling the same distance, and either ride along as a passenger or pick up passengers as a driver. GoMore also offer P2P rental, much like an Airbnb of cars. Another interesting service is the combined car lease with a built in P2P rental option. Customers can lease a car, and rent it out 4 days per week to cut costs.

ACT NOW TO BECOME A DIGITAL LEADER OF TOMORROW

When things are connected, they become platforms for change; new ecosystems are created, and traditional business models are challenged. The IoT is still in its early stages, but it has already become a driving force for the digital transformation of industries and society as a whole.

Thanks to excellent preconditions, the Nordics is keeping it front runner position in the IoT revolution. There are 4 times as many connected devices in the region per person, as in the rest of world. The region is host to a vibrant start-up community, generating innovative new IoT solutions. Industrial companies and the public sector embrace new technology in order to ensure future competitiveness. This development is supported by a state of the art ICT-infrastructure, with fiber broadband and a 4G-network well on its way to 5G. The region is also host to a rising number of datacenterson behalf of some of the world's leading online companies.

While B2C offerings, like fitness devices and self-driving cars, have attracted most of the media attention in recent years, it is B2B applications that will constitute more than two thirds of the IoT market value by 2020 and beyond, transforming both value propositions and operating models.

At the same time, IoT solutions are expected to become increasingly intelligent and interconnected. Driverless vehicles and smart cities are leading examples in the Nordics; OEMs are investing to provide self driving vehicles while leading Nordic cities such as Stockholm and Copenhagen are deploying the IoT to connect citizens, businesses and government to enhance transportation and healthcare. The goal is to achieve economic, social and environmental benefits to its citizens through innovation.

The technical thrill of moving objects (the car) combined with critical infrastructure (the road and transportation network) as well as security, privacy and safety issues (tracking, geolocation and road safety), makes it a powerful showcase for how the IoT is driving transformation of both businesses and broader society.

In this year's Connected Things report we have shown how connected cars are reshaping business models in the car industry and other segments as well. But the most transformative changes may be yet to come; what happens to auto insurance when vehicles become autonomous? Is the driver no longer liable? But then who is? And what happens to automotive service when people adopt mobility-as-a-service on massive scale and the majority of cars are owned by car pools instead of individuals?

As the report demonstrates, innovative players in and around the car industry is acting now to become the digital leaders of tomorrow. They engage in new value networks, securing partners and customers to co-create the IoT solutions that will help lead their businesses and organizations into the future. Players that do not act on these new opportunities risk facing increased competition from digital leaders with more attractive offers and more effective operating models. If that happens they may be pushed back in the value chain, becoming less relevant to their customers.

Business leaders in all industries should pay close attention to what is now happening around connected cars. Because what happens in cars today, is likely to happen in your industry tomorrow.

ABOUT TELIASONERA GLOBAL IoT SOLUTIONS

TeliaSonera provides network access and telecommunication services in the Nordic and Baltic countries, parts of Eurasia and in Spain. TeliaSonera Global IoT Solutions is a global unit in the TeliaSonera group, responsible for business-critical IoT solutions and applications. As a founding member of the Global M2M Association and with dedicated IoT

infrastructure, platforms and services maintained by 24/7 global support, TeliaSonera helps customers deliver value from IoT solutions in its core markets as well as globally. TeliaSonera believes that IoT has the power to digitally transform the way companies do business as well as how people live their lives. Read more on www.teliasonera.com/m2m

ABOUT ARTHUR D. LITTLE

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations. Our consultants

have strong practical industry experience combined with excellent knowledge of key trends and dynamics. Arthur D. Little is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations. For further information please visit www.adlittle.com

Authors:

Hans Dahlberg, Johan Öberg, Martin Glaumann, Andreas Gjelstrup, Gabriel Leifland Berntsson, Jens-Peter Meesenburg, Nicholas Rundbom

